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HEARINGS OFFICE

POLLUTION CONTROL HEARINGS BOARD
FOR THE STATE OF WASHINGTON

AIRPORT COMMUNITIES COALITION, Appellant, v. DEPARTMENT OF ECOLOGY AND THE PORT OF SEATTLE, Respondents.	PCHB Case No. 01-160 DECLARATION OF MICHAEL FELDMAN SUPPORTING PORT OF SEATTLE'S MOTION FOR PARTIAL SUMMARY JUDGMENT ON SEPA ISSUE

MICHAEL FELDMAN declares as follows:

1. Identity of declarant. I am employed by the Port of Seattle as the Director, Aviation Facilities and Environmental Programs. I have personal knowledge of the facts contained in this declaration and am competent to testify to those facts.

2. The Port's and FAA's Final Environmental Impact Statement. In February 1996, the Port and FAA issued a Final Environmental Impact Statement ("FEIS") for the proposed master plan development actions at the Seattle-Tacoma International Airport (the "Airport"). A true and correct copy of the summary section and other selected sections of the FEIS are attached as Exhibit A to this declaration. The FEIS discussed the impacts of the preferred alternative and a number of other on-site alternatives at the Airport. Off-site alternatives had been considered in the Flight Plan Environmental Impact Statement issued by the Port and the Puget Sound Regional Council ("PSRC"). A true and

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correct copy of the executive summary of the Flight Plan Environmental Impact Statement is attached as Exhibit B to this declaration.

3. The Port's and FAA's Supplemental Environmental Impact Statement. After the FEIS was issued, the FAA and Port realized that the growth in air transportation demand at STIA was higher than the range of forecasts on which the FEIS had been based. Accordingly, the FAA and Port issued a full Supplemental Environmental Impact Statement ("SEIS"). True and correct copies of the summary section and other selected sections of the SEIS are attached as Exhibit C to this declaration. The SEIS was published in May 1997.

4. The FAA's Record of Decision . On July 3, 1997, the FAA published its Record of Decision for the Master Plan Update Development Actions at STIA ("ROD"). A true and correct of the FAA's ROD (without appendices) is attached as Exhibit D to this declaration. The FAA determined that the environmental review (the FEIS and SEIS) for the project were legally adequate, and further determined that no possible and prudent alternative to the project existed and that every reasonable step had been taken to minimize the project's adverse environmental effects. The FAA also determined that the project would conform with applicable air quality standards.

5. Ninth Circuit Upholds FAA's ROD. The Airport Communities Coalition appealed the ROD to the Ninth Circuit Court of Appeals. The Ninth Circuit upheld the FAA's ROD. A true and correct copy of the Ninth Circuit decision upholding the ROD is attached as Exhibit E to this declaration.

6. The FEIS and SEIS Are Upheld After Appeal to the Port's Hearing Examiner. In addition to appealing the ROD, the ACC also appealed the legal adequacy of the FEIS and SEIS to the Port's independent Hearing Examiner. The Port of Seattle has an officially established SEPA administrative appeal process. A true and correct copy of Port Resolution 3211, which establishes that administrative appeal process, is attached as Exhibit F to this declaration. The Port's independent Hearing Examiner determined that the FEIS and SEIS for the Master Plan Update development actions

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were legally adequate. A true and correct copy of the Hearing Examiner's Findings, Conclusions, and Decision is attached as Exhibit G to this declaration.

7. Superior Court and Court of Appeals Uphold the Port's Hearing Examiner. The decision of the Port's independent Hearing Examiner was further appealed by ACC to the King County Superior Court. The Superior Court upheld the Hearing Examiner's decision and determined that the FEIS and SEIS were legally adequate. A true and correct of the Superior Court's Findings of Fact, Conclusions of Law and Final Order is attached as Exhibit H to this declaration. The Superior Court decision was further appealed to Division One of the Washington State Court of Appeals. The Court of Appeals upheld the Port's Hearing Examiner and the King County Superior Court and affirmed that the Port's environmental review was legally adequate. A true and correct copy of the published Division One opinion is attached as Exhibit I to this declaration.

8. The Port Conducts Additional Environmental Review of Wetland Impacts. As new information regarding the Port's Master Plan Update developments has come to light, both the Port and FAA have continued to conduct environmental review of the project's impacts. As part of that review, the Port issued a SEPA Addendum on January 24, 2000. A true and correct copy of the January 24, 2000, SEPA Addendum is attached as Exhibit J to this declaration. In the addendum, the Port re-evaluated wetland impacts in light of the refined delineations of wetlands. The Port concluded that the functions of the additional wetlands were essentially the same as those analyzed in the FEIS and SEIS. More importantly, the Port concluded that the extensive mitigation commitments will compensate for the adverse impacts to wetland functions. The January 24, 2000 Addendum also discussed the impact of the development of temporary, construction-only interchanges. Those interchanges were planned in order to decrease truck traffic impacts on surface streets in surrounding communities. To ensure adequate mitigation, the Port also committed to construction of noise attenuation walls along portions of the temporary interchange, acquisition of residences closest to the interchanges, and sound insulation of affected residences.

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The Port has conducted additional environmental review of other project elements as additional information has been developed – including a May 2000 Addendum regarding the proposed 67-acre wetland mitigation site near the Green River in Auburn. A true and correct copy of the May 2000 Addendum is attached as Exhibit K to this declaration.

9. The FAA Conducts Additional Environmental Review and Determines No Supplemental EIS Is Required. In response to suggestions that another supplemental environmental impact statement might be required, on August 8, 2001, the FAA issued a formal Environmental Reevaluation in a revised Record of Decision. A true and correct copy of the FAA Reevaluation is attached as Exhibit L to this declaration. As part of its Reevalution, the FAA issued a formal, appealable order that preparation of a new supplemental environmental impact statement was not warranted. Neither the ACC nor any other party appealed that FAA order.

10. Port Adopts FAA Environmental Evaluation and Conclusion That No Supplemental EIS Is Required. On August 10, 2001, the Port formally adopted those portions of the FAA Reevaluation on which the Port had not already issued supplemental environmental review, including the conclusion that a supplemental EIS was not required. A true and correct copy of the August 10, 2001 Port adoption is attached as Exhibit M to this declaration.

11. Ecology's 401 Certification. In September 2001, Ecology issued its Amended 401 Certification and Coastal Zone Management Act certification, which has been appealed to the Pollution Control Hearings Board. A true and correct copy of Ecology's 401 Certification is attached as Exhibit N to this declaration

I declare under penalty of perjury under the laws of the state of Washington that the foregoing is true and correct.

Executed this 7th day of February 2002 at Seattle, Washington.

Michael Feldman

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A

U.S. Department
of Transportation

Federal Aviation
Administration

Port of Seattle

FINAL
ENVIRONMENTAL IMPACT STATEMENT

for

PROPOSED MASTER PLAN UPDATE DEVELOPMENT ACTIONS

at

SEATTLE-TACOMA INTERNATIONAL AIRPORT

VOLUME 1 OF 7

CHAPTERS I THROUGH VI, APPENDICIES A - B

This statement is submitted for review pursuant to the requirements of Section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq); E.O. 11990, Protection of Wetlands; E.O. 11998, Floodplain Management; the 49 USC Subtitle VII; 42 U.S.C. 7401 et seq; 49 U.S.C. 47101 et seq; Washington State Environmental Policy Act (RCW 43.21C); and other applicable laws. The proposed action will impact the 100-year floodplain as indicated on the Federal Emergency Management Agency's Flood Insurance Rate Map. This Environmental Impact Statement (EIS) is a combined National Environmental Policy Act and Washington State Environmental Policy Act (SEPA) document. With regard to SEPA requirements, this EIS represents the second step of a phased environmental review which began with publication of the 1992 Flight Plan Final EIS, which assessed alternatives for addressing regional aviation needs. This Final EIS also contains the draft conformity statement, as required by the Clean Air Act amendments.

The Port of Seattle, operator of Seattle-Tacoma International Airport, has prepared a Master Plan Update for the Airport. The Plan shows the need to address the poor weather operating capability of the Airport through the development of a third parallel runway (Runway 16X/34X) with a length of up to 8,500 feet, separated by 2,500 feet from existing Runway 16L/34R, with associated taxiways and navigational aids. Other development needs include: extension of Runway 34R by 600 feet; establishment of standard Runway Safety Areas for Runways 16R/34L and 16L/34R; development of a new air traffic control tower; development of a new north unit terminal, Main Terminal improvements and terminal expansion; parking and access improvements and expansion; development of the South Aviation Support Area for cargo and/or maintenance facilities, and relocation, redevelopment, and expansion of support facilities. This Environmental Impact Statement assesses the impact of alternative airport improvements, including installation of navigational aids, airspace use, and approach and departure procedures. The proposed improvements would be completed during the 1996-2020 period, with initial 5-year development focused on the proposed new parallel runway, and existing passenger terminal, parking and access improvements. The proposed improvements and its alternatives would result in wetland impacts, floodplain encroachment, stream relocation, social, noise, water, and air quality impacts.

Responsible Federal Official:
Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Ave, S.W.
Renton, Washington 98055-4056

SEPA contact:
Ms. Barbara Hinkle
Health, Safety and Environmental Management
Port of Seattle
P.O. Box 68727
Seattle, Washington 98168

Date: February, 1996

AR 003778

Federal Aviation Administration
Northwest Region
1601 Lind Ave, SW
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Port of Seattle
Seattle-Tacoma International Airport
P. O. Box 68727
Seattle, Washington 98168

February 1, 1996

Dear Reader:

Officials of the Central Puget Sound Region have been faced with developing a plan to meet the future transportation demands in the Region, that exist now and will continue to grow in the future. The Master Plan Update for Seattle-Tacoma International Airport has confirmed earlier studies which indicated that poor weather conditions currently produce significant delays and that the present airside, terminal, and landside facilities will no longer be able to efficiently accommodate air travel needs. As was noted in the 1992 Flight Plan Study, without undertaking expansion of the transportation facilities in the Region, delays and inefficient facilities "could ultimately affect the Region's economy". This Final Environmental Impact Statement examines the range of alternatives for addressing these needs and the resulting environmental consequences.

In late 1993, the Port of Seattle initiated a Master Plan Update for Sea-Tac to examine the types of facilities that would be needed through the year 2020. The Master Plan Update began with the development of aviation demand forecasts, the review of airside facilities (runways, taxiways, etc.) and the review of landside facilities (roadways, terminals, cargo facilities, etc.). Based on the review of various landside options and airside options, a series of development alternatives were formulated. This Environmental Impact Statement is a project specific assessment and examines the full range of alternatives to satisfying these needs, ranging from alternative modes of transportation, use of a new or existing airport, activity management/system management, development alternatives at Sea-Tac, and the Do-Nothing/No Build. Based on the public and agency comments, the Master Plan Update analysis, and the Draft EIS, the Port of Seattle staff selected Alternative 3 as the Preferred Alternative. Primary features of the Preferred Alternative are a proposed North Unit Terminal and a new parallel runway with a length of 8,500 feet located about 2,500 feet west of existing runway 16L/34R. To present information for review by regional decision-makers, the Final EIS addresses three runway lengths (7,000 feet, 7,500 feet and 8,500 feet), and thus, consideration of the runway is noted as "up to 8,500 feet".

This Environmental Impact Statement has been a joint effort between the Federal Aviation Administration (FAA) and the Port of Seattle, with the FAA taking the lead in preparation of the technical analysis and report production. To solicit public comments on the Draft EIS, the FAA provided a 90-day comment period and conducted two public hearings. This Final EIS reflects comments received at the Hearings and during the comment period.

Key issues addressed in this Environmental Impact Statement are:

1. Why is development needed at Sea-Tac Airport? If it proceeds, when will it occur?

Chapter I describes the background leading to preparation of this Draft EIS and the issues and needs that were identified. Chapter II, "Alternatives " describes the specific alternatives that could meet the need.

2. Why are improvements planned at Sea-Tac versus development of a new airport?

Following the 1992 Flight Plan Study, two planning efforts were undertaken, the Major Supplemental Airport Study (called the MSA) and the Sea-Tac Master Plan Update. Chapters I and II and Appendix B provide detailed descriptions of these efforts that led the Executive Board of the Puget Sound Regional Council (PSRC) to determine that there were no feasible alternative airport sites. After extensive study

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by the officials of the Region, as led by the PSRC, Sea-Tac Airport was identified as the only feasible site for addressing a portion of the future air transportation needs of the Region through 2020. The Port of Seattle and the FAA have reviewed the regional planning studies and have independently concluded that a new airport can not meet the needs addressed by this Environmental Impact Statement.

3. What are the impacts of noise, air pollution, and water pollution, as well as the human heath impacts?

This Environmental Impact Statement identifies the environmental consequences of the alternatives across twenty-four environmental categories, including noise, air, water, and human health. Chapter IV, and Appendices C through Q contain this analysis.

4. What mitigation will be recommended to implement any of the alternatives?

Each section in Chapter IV contains a summary of recommended mitigation. In addition, Chapter V contains an overall summary of the environmental impacts and mitigation measures.

5. What comments were submitted on the Draft EIS and how did you change the document in response to these comments?

Appendix T of the Final EIS contains all of the comments received on the Draft EIS. Responses to applicable comments are provided in Appendix R. To aid in public review of the Final EIS, the entire document has been reproduced, with changes made in the Draft EIS text in response to the comments.

6. Federal Approval Declaration

After careful and thorough consideration of the facts contained herein, and following consideration of the views of those Federal agencies having jurisdiction by law or special expertise with respect to the environmental impacts described, the undersigned finds that the proposed Federal actions are consistent with existing national environmental policies and objectives as set forth in Section 101(a) of the National Environmental Policy Act of 1969.

Lowell H. Johnson
Lowell H. Johnson
Manager
Northwest Mountain Region Airports Division

1 Feb. 1996
Date

FACT SHEET

'oject Title: Master Plan Update improvements for Seattle-Tacoma International Airport.

Description of Project: The proposed Master Plan Update improvements at Sea-Tac Airport would reduce existing poor weather aircraft operating delay and accommodate forecast growth in passengers, cargo and aircraft operations. Port of Seattle staff have recommended Alternative 3 - North Unit Terminal with a new 8,500 foot long parallel runway. To present information for consideration by regional decision-makers, this EIS addresses a proposed runway with a length up to 8,500 feet. Proposed airport improvements would include:

- Third parallel runway with a length of up to 8,500 feet located about 2,500 feet west of existing Runway 16L/34R, and associated taxiways, safety areas, relocated utilities, and navigational aids
- 600 foot extension southward of Runway 34R
- Standard Runway Safety Areas for existing Runways 16R/34L and 16L/34R
- Terminal improvements and expansion, including the development of a North Unit Terminal
- Parking and access improvements and expansion
- Development of the South Aviation Support Area
- Relocation, redevelopment and expansion of support facilities

Project Sponsor: Port of Seattle

Lead Agencies: The Federal Aviation Administration (FAA) and the Port of Seattle are joint lead agencies for the purpose of the National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS).

The Port of Seattle contact is: Ms. Barbara Hinkle, Health, Safety and Environmental Management Division, Port of Seattle, P.O. Box 68727, Seattle, Washington, 98168.

The FAA responsible official is: Mr. Dennis Ossenkop, Northwest Mountain Region, Airports Division, Federal Aviation Administration, 1601 Lind Avenue, S.W., Renton, Washington 98055-4056.

Cooperating Agency: The U.S. Army Corps of Engineers is a cooperating agency under NEPA.

Licenses, Permits and Other Approvals Potentially Required:

Federal: FAA Record of Decision, Air Quality Conformity Determination; and approval of the Airport Layout Plan; U.S. Army Corps of Engineers Section 404 permit;

State: Department of Ecology Water Quality Certification and National Pollutant Discharge Elimination System Permit for Stormwater; Department of Fisheries and Wildlife Hydraulic Project Approval; Temporary Modification of Water Quality, Department of Natural Resources Forest Practices Permit, Governors Clean Air and Water Certification;

Local: Puget Sound Regional Council Review; Port of Seattle Commission project decisions; City of SeaTac comprehensive plan and zoning process, clearing and grading permits, floodplain filling permits, demolition permits, and others.

Principal Authors and Contributors to the Draft and/or Final EIS: This NEPA/SEPA EIS was prepared under the direction of the Federal Aviation Administration and Port of Seattle. Technical analysis was provided by:

Landrum & Brown, Incorporated
Shapiro and Associates, Inc.
INCA Engineers, Inc.
Metro Communications, Inc.
Gambrell Urban, Inc.
Parametrix, Inc.
Synergy Consultants, Inc.

FACT SHEET (Continued)

Date of Issue of Final EIS: February 9, 1996

Public Meetings: Two *scoping meetings* were held. The Public Scoping meeting was held on February 9, 1994. A meeting with Federal, State and local agencies was held at Sea-Tac Airport on February 10, 1994.

Two *public hearings* were conducted: June 1, 1995 at the SeaTac Red Lion and on June 14, 1995 at the Calvary Lutheran Church in Federal Way. Copies of comments received are provided in Appendix T (Volumes 5 through 7); responses to applicable comments are provided in Appendix R (Volume 4).

Approximate Date of Final Action by Lead Agencies: In accordance with the National Environmental Policy Act, the issuance of the Final EIS is followed by a 30-day cool down period, which will end on March 18, 1996. After compliance with applicable requirements, the FAA will issue the Record of Decision and then sign the Airport Layout Plan. Similarly, the Port of Seattle action approving the Master Plan Update is expected in early 1996.

Approximate Date of Implementation: Limited terminal development, cargo area expansion, development of an On-Airport hotel and existing terminal entrance roadway improvements could be initiated as early as 1996. The new runway, and associated navigational aids and taxiway development, could be completed by 2001.

Availability of Copies: Copies of the Draft and Final EIS are available for inspection at:

Federal Aviation Administration, Airports Regional Office, Room 540, 1601 Lind Avenue, SW, Renton, WA

Port of Seattle, *Aviation Planning*, 3rd floor, Terminal Building, Sea-Tac Airport, and *Pier 69* Bid Office, 2711 Alaskan Way, Seattle

Puget Sound Regional Council, Information Center, 216-1st Avenue, Seattle

Beacon Hill Library, 2519 - 1st Avenue, South, Seattle

Boulevard Park Library, 12015 Roseberg South, Seattle

Seattle Public Library, 1000 - 4th Avenue, Seattle

Magnolia Library, 2801 - 34th Ave W, Seattle

Rainier Beach Library, 9125 Rainier Avenue S., Seattle

Bothell Regional Library, 9654 NE 182nd, Bothell

Burien Library, 14700-6th SW, Burien

Des Moines Library, 21620-11th South, Des Moines

Federal Way Regional Library, 34200-1st South, Federal Way

Foster Library, 4205 South 142nd, Tukwila

Kent Regional Library, 212 - 2nd Ave N, Kent

Vashon Ober Park, 17210 Vashon Highway, Vashon

Tacoma Public Library, 1102 Tacoma Ave S., Tacoma

University of Washington, Suzallo Library, Government Publications, Seattle

Valley View Library, 17850 Military Road South, SeaTac

West Seattle Library, 2306 - 42nd Ave SW, Seattle

Bellevue Regional Library, 1111 - 110th Ave NE, Bellevue

To Purchase A Copy: This document is available for public reproduction at Kinko's located at Kent-Des Moines Way and International Blvd./SR 99. All 7 volumes of this report cost over $350, including color exhibits.

Locations of Other Documents: The Flight Plan EIS issued in 1992, technical reports, background data, adopted documents, and material incorporated by reference in this EIS are, unless otherwise stated in this EIS, located at:

Federal Aviation Administration, Airports Regional Office, Room 540, 1601 Lind Avenue, SW, Renton, WA

Port of Seattle, Aviation Planning, 3rd Floor, Terminal Building, Sea-Tac Airport

Puget Sound Regional Council, Information Center, 216-1st Avenue, Seattle

FINAL ENVIRONMENTAL IMPACT STATEMENT

PROPOSED MASTER PLAN UPDATE

Seattle-Tacoma International Airport

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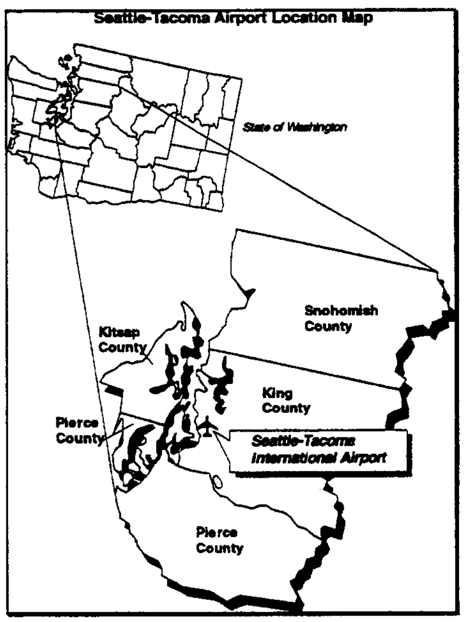
EXECUTIVE SUMMARY

FINAL ENVIRONMENTAL IMPACT STATEMENT

For the Seattle-Tacoma International Airport Master Plan Update

Seattle-Tacoma International Airport (Sea-Tac Airport) is the primary air transportation hub of Washington State and the Northwestern United States. As the primary commercial service airport for the Pacific Northwest, Sea-Tac Airport is the only airport which provides scheduled commercial air carrier service in the four-county Central Puget Sound area serving 2.8 million residents. The Region consists of: King, Pierce, Snohomish, and Kitsap counties. Sea-Tac Airport is operated by the Port of Seattle (also referred to as "The Port"), a municipal corporation of the State of Washington. Located within King County and the City of SeaTac, the Airport is 12 miles south of downtown Seattle and about 20 miles north of Tacoma.



As of August 1995, service is provided by 54 airlines. Non-stop air service is provided to 44 cities nationwide and to the international cities of Copenhagen, London, Tokyo, Hong Kong, Taipei, Seoul, Shanghai, Osaka, Vancouver and Victoria. Sea-Tac Airport is the 21st busiest airport in the country, as measured by total passengers. It is also the 8th largest international air gateway to Europe and Asia, and the 18th busiest cargo airport.

CHAPTER I

BACKGROUND AND PURPOSE AND NEED

A number of studies conducted in the late 1980s concluded that the existing two runways at Sea-Tac would not be adequate to meet regional air travel needs beyond the year 2000. As a result, the Port of Seattle and the regional planning council (now called the Puget Sound Regional Council - PSRC) co-sponsored a process, called the Flight Plan Study, to identify a long-term solution to the Puget Sound Region's air transportation needs. Based on the two and a half year effort which examined ways to accommodate demand, the 1992 Flight Plan Study recommended a multiple airport system that included a new runway at Sea-Tac Airport.

In response to the Flight Plan Study and additional study by the PSRC, the PSRC General Assembly adopted a Resolution (No. A-93-03) in April 1993 to amend the Regional Aviation System Plan. The PSRC resolution states:

" ... That the region should pursue vigorously, as the preferred alternative, a major supplemental airport and a third runway at Sea-Tac.

1. The major supplemental airport should be located in the four-county area within a reasonable travel time from significant markets in the region.
2. The third runway shall be authorized by April 1, 1996:
   a. Unless shown through an environmental assessment, which will include financial and market feasibility studies, that a supplemental site is feasible and can eliminate the need for the third runway; and
   b. After demand management and system management programs are pursued and achieved or determined not to be feasible, based on independent evaluation; and
   c. When noise reduction performance objectives are scheduled, pursued and achieved based on independent evaluation and based on measurement of real noise impacts.
3. The Regional Council requests consideration by the Federal Aviation Administration of modifying the Four-Post Plan to reduce noise impacts, and the related impacts on regional military air traffic.
4. Evaluation of the major supplemental airport shall be accomplished in cooperation with the state of Washington."

5. Proceed immediately to conduct site-specific studies, including an environmental impact statement on a Sea-Tac third runway.
6. Eliminate small supplemental airports, including Paine Field, as a preferred alternative."

The PSRC undertook a study of the feasibility of a major supplemental airport -- which became known as the Major Supplemental Airport (MSA) study -- in response to the recommendations of the Flight Plan Study and subsequent Resolution A-93-03. MSA Phase I consisted of an exhaustive examination of new airport sites which subsequently narrowed the site evaluation to 3 sites (Arlington, Marysville and Tanwax Lake). However, MSA Phase II was not initiated following the Executive Board Resolution EB-94-01 (dated October 27, 1994) which states:

"WHEREAS, regional studies completed by the Puget Sound Air Transportation Committee, the Washington State Air Transportation Committee, and the Puget Sound Regional Council (PSRC) have clearly identified a near term air transportation capacity problem at Sea-Tac International Airport, and concluded that the addition of a third all-weather runway at Sea-Tac would provide adequate capacity for the region through the year 2030; ....WHEREAS, **the Executive Board concludes that there are no feasible sites for a major supplemental airport within the four-county region** and that continued examination of any local site will prolong community anxiety while eroding the credibility of regional governance; and.....NOW, THEREFORE BE IT RESOLVED, that the Executive Board further clarifies that the 'Resolution A-93-03: Implementation Steps' adopted by the Executive Board allow the Executive Board to determine whether the Regional Council should go forward with additional supplemental airport studies and pursuant to that authority, **the Executive Board determines that further studies should not be undertaken. ...**" (Emphasis added)

This Environmental Impact Statement for the Master Plan Update is the second step of a phased State Environmental Policy Act (SEPA) environmental review process that began with the publication of the EIS accompanying the 1992 Flight Plan EIS. The Flight Plan EIS examined alternative sites and configurations for new or expanded airports, along with demand management techniques, rail and other ground transportation, and technological alternatives to limit the number of flight operations and encourage alternatives to air travel. The Flight Plan EIS and related materials are listed and described, and their locations are identified, in **Appendix B**.

The Master Plan Update forecast the following aviation demand:

MASTER PLAN UPDATE FORECASTS

	Actual	Master Plan Update Forecast		
	1993	2000	2010	2020
Enplaned Passengers:				
Domestic	8,700,000	10,800,000	13,800,000	17,200,000
International	700,000	1,100,000	1,500,000	1,900,000
Total Enplanements	9,400,000	11,900,000	15,300,000	19,100,000
Aircraft Operations:				
Air Carrier	188,000	223,000	255,000	287,000
Air Taxi/Commuter	127,000	127,000	118,000	117,000
All-Cargo	16,000	20,000	23,000	27,000
General Aviation	8,100	8,900	9,500	10,300
Military	400	300	300	300
Total Operations	339,500	379,200	405,800	441,600
Average Day Operations	930	1,040	1,112	1,210
Peak Month/Average Day	1,056	1,163	1,253	1,369

Source: *1994 Master Plan Update Technical Report No. 5 Preliminary Forecast Report*, Port of Seattle.

Note: Enplanements - Passengers boarding aircraft. Operations - total arrivals and departures.

In 1994, aircraft operations were 353,052 with 10.5 million enplaned passengers

With or without improvements at Sea-Tac Airport, aviation demand will increase as a consequence of growth in the population and income of the region.

As a result of existing high levels of poor weather delay and forecast increased demand, the following four needs (**shown in bold**) were identified:

(A) Improve The Poor Weather Airfield Operating Capability in a Manner That Accommodates Aircraft Activity with an Acceptable Level of Delay

Weather conditions and their patterns of occurrence are important considerations when evaluating the operational capability of an airfield. The safe spacing between aircraft specified by the FAA's air traffic control standards differ depending upon weather conditions (i.e., the cloud ceiling and visibility). Because of the narrow distance between the existing parallel runways at Sea-Tac, simultaneous arrivals to both runways are permitted only in good weather conditions.

When poor weather occurs at Sea-Tac, the total number of arrivals that can be accommodated is reduced from the good weather level of 60 to 24 arrivals per hour, as shown below.

Present Runway System Arrival Operating Capability at Sea-Tac Airport

Condition	Hourly Airfield Capability Maximum Arrivals
Good Weather:	
VFR1	60
Poor Weather:	
VFR2	48
IFR1	36
IFR2 & 3	24

Source: *1994 Master Plan Update Inventory*, P&D Aviation, Pg. 3-8
VFR - Visual Flight Rules,
IFR - Instrument Flight Rules

Current FAA air traffic control rules require at least a 2,500-foot separation between parallel runway centerlines for two staggered arrival streams during poor weather. Because the runways at Sea-Tac are only 800 feet apart, the existing airfield only allows a single arrival stream during poor weather (VFR2 and IFR). Based on the 10-year weather analysis performed by the Master Plan Update, poor weather (with the associated single arrival stream at Sea-Tac), occurs about 44 percent of the time.

The 1995 FAA Capacity Enhancement Update found that about 4.5 minutes of average delay is currently experienced per aircraft operation at Sea-Tac. Virtually all of the available air traffic procedural and technological improvements that are currently available, have been implemented at Sea-Tac. As a result of these improvements, delay has been reduced in recent years over earlier levels. However, arrival delay during poor weather continues to exceed the good weather delay by about 850 percent.

While Sea-Tac currently has sufficient operating capability during good weather conditions, during poor weather today, the existing runway system produces extensive arrival delays as is noted in the tables on the next page. Average delay is expected to more than triple as aircraft operations grow 23 percent (from 345,000 to 425,000). When aircraft operations exceed 525,000 annually (after year 2020), aircraft delay will have increased more than 700% over current levels. The single arrival stream during poor weather produces the greatest quantity of delay at Sea-Tac Airport. Arrival delay represents over 85% of total current delay experienced by an average flight.

Using average aircraft operating costs, delay at Sea-Tac currently costs the airlines about $42 million annually. When aircraft operations reach 425,000 annually, delay costs are expected to exceed $176 million annually.

The FAA's National Plan of Integrated Airports System (NPIAS) indicates that when average delay exceeds 9 minutes per operation, impacts occur to the national aviation system. The maximum "acceptable" delay for any single component of the National Airspace System is extremely subjective and dependent upon a number of factors unique to an individual facility. Factors which typically influence "acceptable" delay levels at an airport include the relative occurrence of poor weather conditions, individual airline cost of delay, and the effect of this airport's delay at other airports throughout the system. Since operating conditions are unique at each airport, a single measure of acceptable delay which applies to all airports has not been established. As a result, the weighted average delay level is often used as an indicator of airports which may be experiencing significant levels of delay during certain conditions, and thus, should consider delay reduction actions.

The average all-weather delay per operation is a convenient way to describe airport efficiency because it is a single number. However, describing the airport efficiency with a single number can lead to poor decision-making because the all-weather average delay does not reveal the large difference in delay that occurs between good and poor weather.

As the number of operations increase, the average delay in VFR2 and IFR weather conditions will increase exponentially, creating further discrepancy between good and poor weather delays, unless action is taken to address the poor weather airfield operating capability.

A new parallel runway would have saved the airlines $24 million annually if it had been available for use in 1994. The delays saving is expected to grow to around $59 million per year in 2000, $70 million per year in 2002 and $146 million annually when activity reaches 425,000 operations (near the year 2013). As a result, if the runway were available for use in year 2002, the delay savings would compensate for the cost of construction in a 5 year period. If completed later, the pay-back period would be sooner than 5 years.

AVERAGE ALL-WEATHER DELAY

Operations	Average Delay (minutes) Existing Airfield: Arrival	Departure	Estim. Taxi	Average Operation
345,000	7.7	1.3	0.1	4.5
425,000 *	22.2	2.6	0.2	12.4
525,000 *	63.7	11.6	0.4	37.7

ARRIVAL DELAY

Operations	Average Arrival Delay (minutes) Existing Airfield: VFR1	VFR2	IFR1	IFR2/3	IFR4	All-Weather
345,000	1.0	11.4	21.7	21.7	333.2	7.7
425,000 *	1.6	41.8	71.2	101.0	524.5	22.2
525,000 *	3.1	163.6	181.3	219.4	711.9	63.7

DELAY REDUCTION BENEFITS OF A NEW PARALLEL RUNWAY

			New Runways with the following Separation			
	Do-Nothing		2,500 ft Separation		3,000 ft Separation	
Operations	Arrival	Average	Arrival	Average	Arrival	Average
345,000	7.7	4.5	NA	NA	NA	NA
425,000 *	22.2	12.4	4.7	3.8	4.2	3.3
525,000 *	63.7	37.7	13.3	8.3	12.3	7.7

Source: FAA Capacity Enhancement Update, Data Package 12, June, 1995.

* Assumes full use of the 2.5 nm separation.

Chapter II of the Final EIS presents a detailed discussion of the alternatives to addressing existing and future poor weather delay. The following briefly summarizes the findings of the review:

Alternatives	Summary of Evaluation
1. Use of Other Modes of Transportation: - Automobile, Bus - Rail - Teleconferencing	Not considered further, as this alternative will not address the poor weather operating issues at Sea-Tac. Less than 5% of passengers using Sea-Tac are traveling to distances where surface transportation is efficient and cost effective and likely to be used.

2. Use of Other Existing Airports or Construction of a New Airport: - Use of an existing airport - Development of a new airport -- Replacement -- Supplemental	Not considered further. Regional consensus has been established through PSRC EB-94-01 that: 1) There is no sponsor or funding for a new airport; 2) Extensive studies of these alternatives indicate that there are no feasible sites; 3) If a site could be identified, market forces and planning and development requirements would prevent the airport from successfully serving regional demand until 2010 or later. The FAA and Port have independently confirmed that a new airport would not satisfy the needs addressed by this EIS.
3. Activity Alternatives: - Demand Management - System Management	Not considered further, as these actions will not eliminate the poor weather operating need as all feasible actions have been implemented.
4. Runway Development at Sea-Tac	To be considered further: Runway lengths from 7,000 feet to 8,500 feet (each length is included in Alternatives 2, 3 and 4).
5. Use of Air Traffic and Flight Technology (i.e., FMS/GPS, LDA, etc.)	Not considered further. No technologies currently exist, or are planned, to address the poor weather operating constraint at Sea-Tac.
6. Delayed or Blended Alternative (Combination of other modes, use of existing airports, and activity/ demand management)	The net result of this alternative would be a delay in the implementation of the Master Plan Update alternatives. Because there is no commitment to any individual or combination of other alternatives and because aviation activity levels are currently growing at a rate slightly higher than forecast, this alternative was not considered further.
7. Do-Nothing/No-Build	To be considered further (Alternative 1).

(B) Provide Sufficient Runway Length to Accommodate Warm Weather Operations Without Restricting Passenger Load Factors or Payloads For Aircraft Types Operating to the Pacific Rim.

The length of runway required by departing aircraft is significantly affected by temperature, especially at higher temperatures and humidity. The Master Plan Update examined runway lengths relative to cities currently served from Sea-Tac, as well as cities likely to be served in the future. This analysis showed that flight distances to the Pacific Rim are the greatest. A B747-200B with a full load requires approximately 12,500 feet of runway length, when operating with a full passenger/cargo load to fly non-stop from Sea-Tac to Hong Kong or Shanghai at 76°F.

Currently, Sea-Tac's runway lengths are: 9,425 feet, and 11,900 feet. These runway lengths require airlines to off-load payload (passengers or cargo) to takeoff during warm weather conditions when serving the most distant cities. With increased emphasis on direct service to Asian-Pacific cities, this constraint is expected to grow and potentially inhibit the Region's long-term economic growth. By the year 2020, approximately 681 departures annually (0.3% of all departures or 1.3% of passenger aircraft and 15.3% of all-cargo aircraft) will be subject to takeoff weight penalties when using Runway 16L/34R.

Non-Stop Pacific Rim Service Alternatives	Summary of Evaluation
1. Extension of Runway 16L/34R to 12,500 feet	To be considered further, as this is presently the longest runway (included in Alternatives 2, 3 and 4).
2. Extension of Runway 16R/34L to 12,500 feet	Not considered further due to the cost of addressing impacts to S. 188th.

3. Development of a new runway with a 12,500 ft length	Not considered further due to substantial cost and community disruption that would result.
4. Delayed or Blended Alternative	Not considered further , as it would not address the needs at Sea-Tac.
5. Do-Nothing/No-Build	To be considered further (Alternative 1).

This loss of weight operating capability would result in passengers and cargo not getting to their destination as desired or an increase in operations to serve the demand. In year 2000, this continued practice would result in an annual economic loss to the airlines of $1.2 million, growing to $2 million annually by 2010 and $3 million by 2020 to the airlines.

Over 90 percent of the weight restricted departures would be by all-cargo operators. Currently 10% of the cargo transported through Sea-Tac is destined for the Pacific Rim. Economists predict that the Pacific Rim will continue to experience above average economic growth in the foreseeable future. Thus, for the Puget Sound and Washington State to retain their pre-eminence in exporting area products, the ability to serve the fastest economic growing market in the world is essential.

The alternatives that would satisfy this need are shown above.

(C) Provide Runway Safety Areas (RSAs) that meet current FAA Standards

An RSA is "A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway". When the runways at Sea-Tac were originally built, they met then-current FAA design standards. However, as a result of aircraft overruns and incidents at airports in the U.S., the FAA modified Federal Aviation Regulation 139.309(a)(2) which now requires:

> "To the extent practicable, each certificate holder shall provide and maintain for each runway and taxiway which is available for air carrier use - ... (2) If construction, reconstruction, or significant expansion of the runway or taxiway began on or after January 1, 1988 a safety area which conforms to the dimensions acceptable to the Administrator at the time construction, reconstruction, or expansion began.".

The FAA previously issued a funding grant to the Port which includes the following condition "13. By acceptance of this grant, the sponsor agrees that the safety areas for Runway 16L/34R will be improved to dimensions acceptable to the FAA on the following schedule.... September 1996 safety areas to be complete". Subsequently, the Port requested that the alternatives for addressing the RSA be included in the Master Plan Update.

The RSA dimension for Sea-Tac is defined as a rectangular area that is centered about the runway that is 500 feet wide and extends 1,000 feet beyond each runway end. This area should be cleared, drained and graded, and is usually turfed. Under dry conditions, this area should be capable of supporting occasional aircraft that could overrun the runway, as well as fire fighting and snow removal equipment.

Thus, the Master Plan Update recommends that the RSAs be upgraded to current FAA design standards in accordance with grant assurances and Federal Aviation Regulation Part 139. The following alternatives could address this need:

RSA Alternatives	Summary of Evaluation
1. Displaced Thresholds/ Declared Distance Procedures	Considered as the Do-Nothing/No-Build.
2. Clearing, grading and development of areas for 1,000 feet beyond the existing pavement	Considered further.

3. Clearing, grading for 1,000 feet including the 600 ft extension to 34R	Considered further (included in Alternatives 2, 3 and 4).
4. Delayed or Blended Alternative	Not addressed further, as it would not address the RSA requirements
5. Do-Nothing/No-Build	To be considered further for declared distances (Alternative 1).

(D) Provide Efficient and Flexible Landside Facilities to Accommodate Future Aviation Demand.

Regional population and employment growth are expected to fuel growth in aviation demand regardless of the availability of facilities at Sea-Tac Airport. While enplaned passenger volumes are forecast to grow by 103 percent by 2020, air cargo tonnage is expected to grow 150 percent. This anticipated growth will place extreme demands on the existing airport facilities. Congestion currently exists on the Main Terminal roadway during peak hours. By year 2020, significant congestion could result throughout the day. Therefore, to avoid congestion and passenger inconveniences, improvements to the landside facilities will be necessary. Flexibility will be required to enable airport facilities to be accommodated by varying types of airlines (shuttle operations as well as long-haul), cargo operators as well as aircraft maintenance needs.

Currently, airport facilities at Sea-Tac provide 90 narrow-body equivalent aircraft gates (NBEG) within 12,100 linear feet of gate frontage. Based on the forecast of aviation demand, Sea-Tac Airport will require 101 NBEG gates by 2000, 111 NBEG gates by 2010 and 120 NBEG gates by the year 2020. In total, Sea-Tac will require an additional 30 passenger gates by year 2020.

Over the last decade, several airlines have examined the possibility of developing aircraft maintenance bases at various airports throughout the country. Based on these requests, and anticipated future requests, the Port initiated the necessary planning and design to assure that a base maintenance facility can be accommodated at Sea-Tac Airport. These plans have become known as the South Aviation Support Area (SASA) development plan and were assessed in a 1994 Final Environmental Impact Statement. The benefits of such a facility are the resulting high-skill jobs and economic activity which meet the Port of Seattle's mission of fostering regional economic development that will benefit the port district.

To ensure that the Region's primary aviation facility is capable of efficiently accommodating forecast air travel demand generated by area economic activity and population, the Port of Seattle proposes to incrementally expand the terminal, support facilities and other landside facilities.

The following summarizes the alternatives identified for this need.

Alternative	Summary of Evaluation
1. Use of Other Modes of Transportation - Auto and Bus - Rail - Video Conferencing	Not considered further, as less than 5% of the future passengers using Sea-Tac are traveling to distances where surface transportation is efficient and cost effective.
2. Use of Other Airports or Construction of a New Airport	Not considered further. Regional consensus has been established through PSRC EB-94-01 that: 1) there is no sponsor or funding for a new airport; 2) Extensive studies of these alternatives indicate that there are no feasible sites; 3) If a site could be identified, market forces and planning/development requirements would prevent the airport from successfully serving regional demand until 2010 or later. The FAA and Port have independently concluded that a new airport would not satisfy the needs addressed by this EIS.

3. Activity/Demand Management Alternatives	Not considered further, as these actions will not reduce demand as all feasible alternatives have been implemented.
4. Landside Development at Sea-Tac	To be considered further: Three primary alternatives to be considered further: Central Terminal Development, North Unit Terminal Development and South Unit Terminal Development (Alternatives 2, 3 and 4, respectively).
5. Use of Technology	Not considered further. No technologies currently exist to address regional aviation demand growth. No new technologies are anticipated.
6. Delayed or Blended Alternative (Combination of other modes, use of existing airports, and activity/ demand management)	The net result of this alternative would be a delay in the implementation of the Master Plan Update alternatives. Because there is no commitment to any individual or combination of other alternatives and because aviation activity levels are currently growing at a rate slightly higher than forecast, this alternative was not considered further.
7. Do-Nothing/No Build	To be considered further (Alternative 1)

(E) Alternatives Considered

The following alternatives and key improvements, as described in detail in Chapter II, were carried forward for detailed:

- **Alternative 1 - Do-Nothing/No Build** - The previously described needs would not be addressed in the Do-Nothing alternative. However, a number of other developments would occur: preparation of the South Aviation Support Area (as approved in the 1994 Final EIS and Record of Decision), completion of the Runway 34L and 34R RSA grading, development and implementation of declared distances for Runway 16R and 16L; implementation of terminal area ground access and seismic improvements, installation of a Category IIIb Instrument Landing system on Runway 16L; development of an On-Airport hotel; and implementation of the Des Moines Creek Technology Campus.
- **Alternative 2 (Central Terminal)** this alternative would include a new dependent (2,500 ft separation) parallel runway with a length of up to 8,500 feet; a 600 ft extension to Runway 34R; fill, clearing and grading of the 1,000 ft Runway Safety Areas for all runway ends; and completion of the landside and terminal development for centralized terminal facilities; and completion of the South Aviation Support Area.
- **Alternative 3 (North Unit Terminal)** this alternative would include a new dependent (2,500 ft separation) parallel runway with a length of up to 8,500 feet; a 600 ft extension to Runway 34R; fill, clearing and grading of the 1,000 ft Runway Safety Areas for all runway ends; and completion of the landside and terminal development in a north unit terminal configuration; and completion of the South Aviation Support Area.
- **Alternative 4 (South Unit Terminal)** this alternative would include a new dependent (2,500 ft separation) parallel runway with a length of up to 8,500 feet; a 600 ft extension to Runway 34R; fill, clearing and grading of the 1,000 ft Runway Safety Areas for all runway ends; and completion of the landside and terminal development in a south unit terminal configuration; and completion of the South Aviation Support Area.

Exhibits II-5 through Exhibit II-8 show these alternatives.

After review of the Draft Environmental Impact Statement, the Port of Seattle staff recommended the implementation of **Alternative 3** (the North Unit Terminal) with a proposed 8,500 foot long new parallel runway located about 2,500 feet west of Runway 16L/34R. However, to aid in public review, the document refers to a runway with a length "up to 8,500 feet" so that the impacts of a 7,000 ft., 7,500 ft., and 8,500 ft.

runway are identified. The elements of the improvements included in the Preferred Alternative are listed beginning on page II-41 of this Final EIS.

This alternative was recommended for the following reasons:

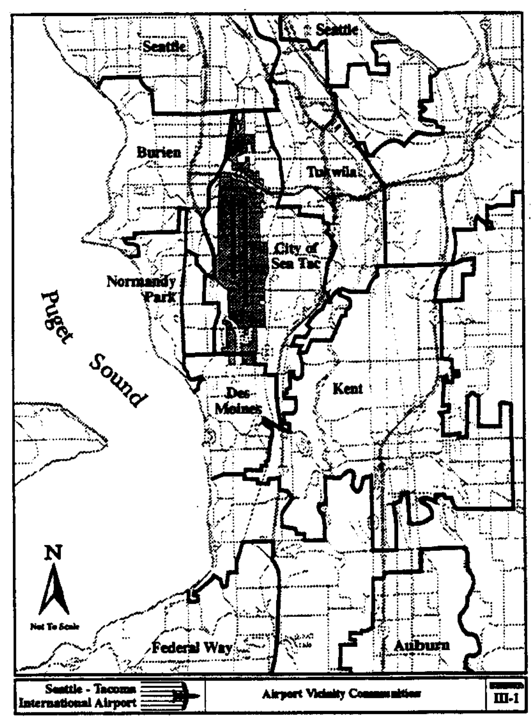
- Reduces the existing and future disparity between the poor weather and good weather operating capability, enabling dependent parallel arrival streams during poor weather conditions;
- Provides the greatest delay reduction of all alternatives considered. The reduced operating times associated with the implementation of a third parallel runway would result in a substantial cost savings to the airlines. A new parallel runway would have saved the airlines $24 million annually if it had been available for use in 1994. The delays saving is expected to grow to around $59 million per year in 2000, $70 million per year in 2002 and $146 million annually when activity reaches 425,000 operations (near the year 2013). As a result, if the runway were available for use in year 2002, the delay savings would compensate for the cost of construction in a 5 year period. If completed later, the pay-back period would be sooner than 5 years;
- The proposed new runway would accommodate 99% of the possible aircraft types for landing which currently use or are anticipated to be operating at Sea-Tac;
- Enables unrestricted departure weights for aircraft departing to the Pacific Rim countries during warm summer weather;
- Provides efficient and flexible landside facilities to accommodate future aviation demand providing the greatest levels of service to air passengers by improving curb-to-terminal and curb-to-gate access, decreased walking distances, and the lowest cost per new aircraft gate;
- Relieves the surface vehicle congestion on the existing terminal drive system;
- Minimizes disruption of commercial development along International Boulevard;
- Enables future expansion of terminal and support facilities in an incremental fashion to accommodate air travel demand as growth occurs;
- Minimizes the disruption to existing airport facilities during the implementation of the proposed improvements; and
- Minimizes aircraft push-back and taxiing conflicts as flights enter and exit the terminal area.

CHAPTER III

AFFECTED ENVIRONMENT

Communities which abut the City of SeaTac, in which the Airport is situated, are Des Moines, Tukwila, and Burien. Unincorporated portions of King County also abut the City of SeaTac. These communities, and others, may be directly or indirectly affected by operations at Sea-Tac Airport, especially by aircraft noise exposure.

The majority of Port owned Airport land is bound by International Blvd. to the east, SR 509 and 12th Avenue to the west, SR 518 to the north, and South 200th Street to the south. Sea-Tac Airport abuts the City of SeaTac on all sides and occupies more than 2,500 acres of land.



This EIS addresses impacts of the Airport and the proposed Master Plan Update improvements that would be experienced within the Puget Sound Region. Within this general geographic area, this EIS references two primary study areas:

General study area - encompassing the existing noise exposure area as defined by the existing (1994) DNL 60 and greater noise contour; and

Detailed focus area - the area which would be affected to construct alternative airport improvements. This area includes any land which might be acquired.

Where applicable, other study areas were used to disclose the existing or anticipated impacts.

Built Environment

The current pattern of land use within the general study area consists of the following uses:

- Residential: 49.5% of the study area
- Open space/agriculture: 16.7% of the study area
- Commercial/industrial: 12.6% of the study area
- Airports (Sea-Tac and Boeing Field): 11.4% of the study area
- Community and public facilities 2.7% of the study area
- Other: 7.0% of the study area

Based on the 1990 Census, the general study area contains 43,347 single-family homes, 25,702 multi-family dwelling units, and 3,006 mobile homes. Located within the boundary of the general study area are several classes of land uses that are normally considered to be sensitive to high levels of aircraft noise exposure.

Natural Resources

Because the prevailing winds are from the Pacific Ocean, the general meteorological conditions of the Puget Sound Region are typical of a marine climate. The relatively cool summers, mild climate are enhanced by the presence of Puget Sound. The Cascade Range to the east serves as a partial barrier to the temperature extremes of the continental climate of eastern Washington State.

There are two independent stream systems that drain the major portions of the airport area, Des Moines Creek and Miller Creek. The Airport covers an estimated 30 percent of the Des Moines Creek basin and five percent of the Miller Creek basin. Both Des Moines and Miller creeks are classified by the State as Class AA (extraordinary) waters, although stormwater runoff from urban development within the two drainage basins have contributed to water quality degradation and violations of some water quality standards. Degradation of water quality from stormwater runoff has had harmful effects on aquatic biota and the biological integrity of both creeks. Diversity of aquatic life has tended to shift from pollutant-intolerant forms to pollutant-tolerant forms. Additionally, major spills of aviation fuel into Des Moines Creek in the mid-1980s resulted in the mortality of most fish and aquatic life in that creek.

In the Puget Sound Region, sand and gravel units within the glacial drift form the principal aquifers. These aquifers are recharged from precipitation. Water levels within wells are generally within 100 feet of the ground surface. Perched water is also commonly encountered in the glacial deposits where silt and clay within the glacial soils act as acquitards, allowing water to accumulate in sand and gravel lenses.

A total of 55 wetlands were identified in the detailed focus area. These wetlands range in size from approximately 0.01 acres to 30.3 acres, with a combined area of nearly 150 acres. A total of 20 emergent, nine scrub-shrub, four open-water, and 22 forested wetlands were identified.

Biological Resources

Habitat in the airport vicinity consists of isolated parcels of forest, shrub, and grass with scattered wetlands. Approximately 714 acres of upland forest, 191 acres of upland shrub, 1,012 acres of upland herbaceous habitat, and 144 acres of wetlands are present within a one-mile radius from the airfield area. Fragmented stands of second growth deciduous and coniferous forest characterize much of the area. These areas provide habitat for a typical assemblage of wildlife species found in lowland Puget Sound forests.

Two federally listed or proposed threatened or endangered species, which may occasionally use the airport area, are the peregrine falcon and bald eagle. The closest bald eagle nests to the Airport are located at Angle Lake (.75 mile southeast) and Seahurst Park (two miles northwest).

Future Planned Development

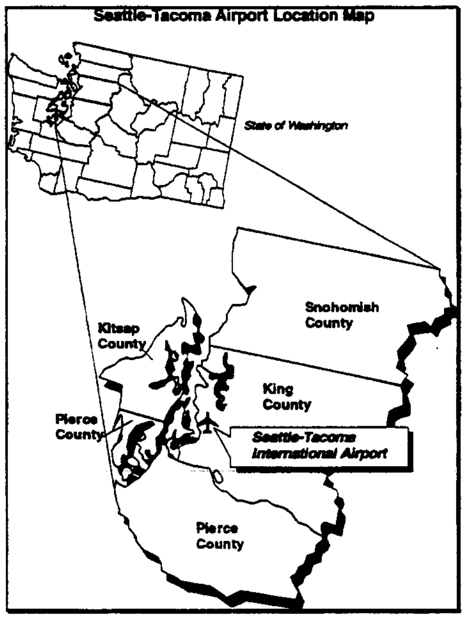
Specific planned development projects are envisioned by local and county governments in the general study area in addition to those generally described in the comprehensive land use plans. These projects are: 28th/24th Avenue South Arterial Project; State Route 509 Extension and South Access Road; Regional Transit Authority High-Capacity, Light-Rail System; On-Airport Hotel by the Port of Seattle; Des Moines Creek Technology Campus; South Aviation Support Area (SASA); Regional Justice Center; and Airport Business Center in SeaTac.

EXECUTIVE SUMMARY

FINAL ENVIRONMENTAL IMPACT STATEMENT

For the Seattle-Tacoma International Airport Master Plan Update

Seattle-Tacoma International Airport (Sea-Tac Airport) is the primary air transportation hub of Washington State and the Northwestern United States. As the primary commercial service airport for the Pacific Northwest, Sea-Tac Airport is the only airport which provides scheduled commercial air carrier service in the four-county Central Puget Sound area serving 2.8 million residents. The Region consists of: King, Pierce, Snohomish, and Kitsap counties. Sea-Tac Airport is operated by the Port of Seattle (also referred to as "The Port"), a municipal corporation of the State of Washington. Located within King County and the City of SeaTac, the Airport is 12 miles south of downtown Seattle and about 20 miles north of Tacoma.



As of August 1995, service is provided by 54 airlines. Non-stop air service is provided to 44 cities nationwide and to the international cities of Copenhagen, London, Tokyo, Hong Kong, Taipei, Seoul, Shanghai, Osaka, Vancouver and Victoria. Sea-Tac Airport is the 21st busiest airport in the country, as measured by total passengers. It is also the 8th largest international air gateway to Europe and Asia, and the 18th busiest cargo airport.

CHAPTER I

BACKGROUND AND PURPOSE AND NEED

A number of studies conducted in the late 1980s concluded that the existing two runways at Sea-Tac would not be adequate to meet regional air travel needs beyond the year 2000. As a result, the Port of Seattle and the regional planning council (now called the Puget Sound Regional Council - PSRC) co-sponsored a process, called the Flight Plan Study, to identify a long-term solution to the Puget Sound Region's air transportation needs. Based on the two and a half year effort which examined ways to accommodate demand, the 1992 Flight Plan Study recommended a multiple airport system that included a new runway at Sea-Tac Airport.

In response to the Flight Plan Study and additional study by the PSRC, the PSRC General Assembly adopted a Resolution (No. A-93-03) in April 1993 to amend the Regional Aviation System Plan. The PSRC resolution states:

> " ... That the region should pursue vigorously, as the preferred alternative, a major supplemental airport and a third runway at Sea-Tac.
>
> 1. The major supplemental airport should be located in the four-county area within a reasonable travel time from significant markets in the region.
> 2. The third runway shall be authorized by April 1, 1996:
>   a. Unless shown through an environmental assessment, which will include financial and market feasibility studies, that a supplemental site is feasible and can eliminate the need for the third runway; and
>   b. After demand management and system management programs are pursued and achieved or determined not to be feasible, based on independent evaluation; and
>   c. When noise reduction performance objectives are scheduled, pursued and achieved based on independent evaluation and based on measurement of real noise impacts.
> 3. The Regional Council requests consideration by the Federal Aviation Administration of modifying the Four-Post Plan to reduce noise impacts, and the related impacts on regional military air traffic.
> 4. Evaluation of the major supplemental airport shall be accomplished in cooperation with the state of Washington."

5. Proceed immediately to conduct site-specific studies, including an environmental impact statement on a Sea-Tac third runway.
6. Eliminate small supplemental airports, including Paine Field, as a preferred alternative."

The PSRC undertook a study of the feasibility of a major supplemental airport -- which became known as the Major Supplemental Airport (MSA) study -- in response to the recommendations of the Flight Plan Study and subsequent Resolution A-93-03. MSA Phase I consisted of an exhaustive examination of new airport sites which subsequently narrowed the site evaluation to 3 sites (Arlington, Marysville and Tanwax Lake). However, MSA Phase II was not initiated following the Executive Board Resolution EB-94-01 (dated October 27, 1994) which states:

"WHEREAS, regional studies completed by the Puget Sound Air Transportation Committee, the Washington State Air Transportation Committee, and the Puget Sound Regional Council (PSRC) have clearly identified a near term air transportation capacity problem at Sea-Tac International Airport, and concluded that the addition of a third all-weather runway at Sea-Tac would provide adequate capacity for the region through the year 2030; ....WHEREAS, **the Executive Board concludes that there are no feasible sites for a major supplemental airport within the four-county region** and that continued examination of any local site will prolong community anxiety while eroding the credibility of regional governance; and.....NOW, THEREFORE BE IT RESOLVED, that the Executive Board further clarifies that the 'Resolution A-93-03: Implementation Steps' adopted by the Executive Board allow the Executive Board to determine whether the Regional Council should go forward with additional supplemental airport studies and pursuant to that authority, **the Executive Board determines that further studies should not be undertaken.** ..." (Emphasis added)

This Environmental Impact Statement for the Master Plan Update is the second step of a phased State Environmental Policy Act (SEPA) environmental review process that began with the publication of the EIS accompanying the 1992 Flight Plan EIS. The Flight Plan EIS examined alternative sites and configurations for new or expanded airports, along with demand management techniques, rail and other ground transportation, and technological alternatives to limit the number of flight operations and encourage alternatives to air travel. The Flight Plan EIS and related materials are listed and described, and their locations are identified, in **Appendix B**.

The Master Plan Update forecast the following aviation demand:

MASTER PLAN UPDATE FORECASTS

	Actual 1993	Master Plan Update Forecast 2000	2010	2020
Enplaned Passengers:				
Domestic	8,700,000	10,800,000	13,800,000	17,200,000
International	700,000	1,100,000	1,500,000	1,900,000
Total Enplanements	9,400,000	11,900,000	15,300,000	19,100,000
Aircraft Operations:				
Air Carrier	188,000	223,000	255,000	287,000
Air Taxi/Commuter	127,000	127,000	118,000	117,000
All-Cargo	16,000	20,000	23,000	27,000
General Aviation	8,100	8,900	9,500	10,300
Military	400	300	300	300
Total Operations	339,500	379,200	405,800	441,600
Average Day Operations	930	1,040	1,112	1,210
Peak Month/Average Day	1,056	1,163	1,253	1,369

Source: *1994 Master Plan Update Technical Report No. 5 Preliminary Forecast Report*, Port of Seattle.

Note: Enplanements - Passengers boarding aircraft. Operations - total arrivals and departures.

In 1994, aircraft operations were 353,052 with 10.5 million enplaned passengers

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With or without improvements at Sea-Tac Airport, aviation demand will increase as a consequence of growth in the population and income of the region.

As a result of existing high levels of poor weather delay and forecast increased demand, the following four needs (**shown in bold**) were identified:

(A) Improve The Poor Weather Airfield Operating Capability in a Manner That Accommodates Aircraft Activity with an Acceptable Level of Delay

Weather conditions and their patterns of occurrence are important considerations when evaluating the operational capability of an airfield. The safe spacing between aircraft specified by the FAA's air traffic control standards differ depending upon weather conditions (i.e., the cloud ceiling and visibility). Because of the narrow distance between the existing parallel runways at Sea-Tac, simultaneous arrivals to both runways are permitted only in good weather conditions.

When poor weather occurs at Sea-Tac, the total number of arrivals that can be accommodated is reduced from the good weather level of 60 to 24 arrivals per hour, as shown below.

Present Runway System Arrival Operating Capability at Sea-Tac Airport

Condition	Hourly Airfield Capability Maximum Arrivals
Good Weather:	
VFR1	60
Poor Weather:	
VFR2	48
IFR1	36
IFR2 & 3	24

Source: *1994 Master Plan Update Inventory*, P&D Aviation, Pg. 3-8
VFR - Visual Flight Rules,
IFR - Instrument Flight Rules

Current FAA air traffic control rules require at least a 2,500-foot separation between parallel runway centerlines for two staggered arrival streams during poor weather. Because the runways at Sea-Tac are only 800 feet apart, the existing airfield only allows a single arrival stream during poor weather (VFR2 and IFR). Based on the 10-year weather analysis performed by the Master Plan Update, poor weather (with the associated single arrival stream at Sea-Tac), occurs about 44 percent of the time.

The 1995 FAA Capacity Enhancement Update found that about 4.5 minutes of average delay is currently experienced per aircraft operation at Sea-Tac. Virtually all of the available air traffic procedural and technological improvements that are currently available, have been implemented at Sea-Tac. As a result of these improvements, delay has been reduced in recent years over earlier levels. However, arrival delay during poor weather continues to exceed the good weather delay by about 850 percent.

While Sea-Tac currently has sufficient operating capability during good weather conditions, during poor weather today, the existing runway system produces extensive arrival delays as is noted in the tables on the next page. Average delay is expected to more than triple as aircraft operations grow 23 percent (from 345,000 to 425,000). When aircraft operations exceed 525,000 annually (after year 2020), aircraft delay will have increased more than 700% over current levels. The single arrival stream during poor weather produces the greatest quantity of delay at Sea-Tac Airport. Arrival delay represents over 85% of total current delay experienced by an average flight.

Using average aircraft operating costs, delay at Sea-Tac currently costs the airlines about $42 million annually. When aircraft operations reach 425,000 annually, delay costs are expected to exceed $176 million annually.

The FAA's National Plan of Integrated Airports System (NPIAS) indicates that when average delay exceeds 9 minutes per operation, impacts occur to the national aviation system. The maximum "acceptable" delay for any single component of the National Airspace System is extremely subjective and dependent upon a number of factors unique to an individual facility. Factors which typically influence "acceptable" delay levels at an airport include the relative occurrence of poor weather conditions, individual airline cost of delay, and the effect of this airport's delay at other airports throughout the system. Since operating conditions are unique at each airport, a single measure of acceptable delay which applies to all airports has not been established. As a result, the weighted average delay level is often used as an indicator of airports which may be experiencing significant levels of delay during certain conditions, and thus, should consider delay reduction actions.

The average all-weather delay per operation is a convenient way to describe airport efficiency because it is a single number. However, describing the airport efficiency with a single number can lead to poor decision-making because the all-weather average delay does not reveal the large difference in delay that occurs between good and poor weather.

As the number of operations increase, the average delay in VFR2 and IFR weather conditions will increase exponentially, creating further discrepancy between good and poor weather delays, unless action is taken to address the poor weather airfield operating capability.

A new parallel runway would have saved the airlines $24 million annually if it had been available for use in 1994. The delays saving is expected to grow to around $59 million per year in 2000, $70 million per year in 2002 and $146 million annually when activity reaches 425,000 operations (near the year 2013). As a result, if the runway were available for use in year 2002, the delay savings would compensate for the cost of construction in a 5 year period. If completed later, the pay-back period would be sooner than 5 years.

AVERAGE ALL-WEATHER DELAY

	Average Delay (minutes) Existing Airfield			
Operations	Arrival	Departure	Estim. Taxi	Average Operation
345,000	7.7	1.3	0.1	4.5
425,000 *	22.2	2.6	0.2	12.4
525,000 *	63.7	11.6	0.4	37.7

ARRIVAL DELAY

	Average Arrival Delay (minutes) Existing Airfield					
Operations	VFR1	VFR2	IFR1	IFR2/3	IFR4	All-Weather
345,000	1.0	11.4	21.7	21.7	333.2	7.7
425,000 *	1.6	41.8	71.2	101.0	524.5	22.2
525,000 *	3.1	163.6	181.3	219.4	711.9	63.7

DELAY REDUCTION BENEFITS OF A NEW PARALLEL RUNWAY

	Do-Nothing		New Runways with the following Separation: 2,500 ft Separation		3,000 ft Separation	
Operations	Arrival	Average	Arrival	Average	Arrival	Average
345,000	7.7	4.5	NA	NA	NA	NA
425,000 *	22.2	12.4	4.7	3.8	4.2	3.3
525,000 *	63.7	37.7	13.3	8.3	12.3	7.7

Source: FAA Capacity Enhancement Update, Data Package 12, June, 1995.

* Assumes full use of the 2.5 nm separation.

Chapter II of the Final EIS presents a detailed discussion of the alternatives to addressing existing and future poor weather delay. The following briefly summarizes the findings of the review:

Alternatives	Summary of Evaluation
1. Use of Other Modes of Transportation: - Automobile, Bus - Rail - Teleconferencing	Not considered further, as this alternative will not address the poor weather operating issues at Sea-Tac. Less than 5% of passengers using Sea-Tac are traveling to distances where surface transportation is efficient and cost effective and likely to be used.

2. Use of Other Existing Airports or Construction of a New Airport: - Use of an existing airport - Development of a new airport -- Replacement -- Supplemental	Not considered further. Regional consensus has been established through PSRC EB-94-01 that: 1) There is no sponsor or funding for a new airport; 2) Extensive studies of these alternatives indicate that there are no feasible sites; 3) If a site could be identified, market forces and planning and development requirements would prevent the airport from successfully serving regional demand until 2010 or later. The FAA and Port have independently confirmed that a new airport would not satisfy the needs addressed by this EIS.
3. Activity Alternatives: - Demand Management - System Management	Not considered further, as these actions will not eliminate the poor weather operating need as all feasible actions have been implemented.
4. Runway Development at Sea-Tac	To be considered further: Runway lengths from 7,000 feet to 8,500 feet (each length is included in Alternatives 2, 3 and 4).
5. Use of Air Traffic and Flight Technology (i.e., FMS/GPS, LDA, etc.)	Not considered further. No technologies currently exist, or are planned, to address the poor weather operating constraint at Sea-Tac.
6. Delayed or Blended Alternative (Combination of other modes, use of existing airports, and activity/ demand management)	The net result of this alternative would be a delay in the implementation of the Master Plan Update alternatives. Because there is no commitment to any individual or combination of other alternatives and because aviation activity levels are currently growing at a rate slightly higher than forecast, this alternative was not considered further.
7. Do-Nothing/No-Build	To be considered further (Alternative 1).

(B) Provide Sufficient Runway Length to Accommodate Warm Weather Operations Without Restricting Passenger Load Factors or Payloads For Aircraft Types Operating to the Pacific Rim.

The length of runway required by departing aircraft is significantly affected by temperature, especially at higher temperatures and humidity. The Master Plan Update examined runway lengths relative to cities currently served from Sea-Tac, as well as cities likely to be served in the future. This analysis showed that flight distances to the Pacific Rim are the greatest. A B747-200B with a full load requires approximately 12,500 feet of runway length, when operating with a full passenger/cargo load to fly non-stop from Sea-Tac to Hong Kong or Shanghai at 76°F.

Currently, Sea-Tac's runway lengths are: 9,425 feet, and 11,900 feet. These runway lengths require airlines to off-load payload (passengers or cargo) to takeoff during warm weather conditions when serving the most distant cities. With increased emphasis on direct service to Asian-Pacific cities, this constraint is expected to grow and potentially inhibit the Region's long-term economic growth. By the year 2020, approximately 681 departures annually (0.3% of all departures or 1.3% of passenger aircraft and 15.3% of all-cargo aircraft) will be subject to takeoff weight penalties when using Runway 16L/34R.

Non-Stop Pacific Rim Service Alternatives	Summary of Evaluation
1. Extension of Runway 16L/34R to 12,500 feet	To be considered further, as this is presently the longest runway (included in Alternatives 2, 3 and 4).
2. Extension of Runway 16R/34L to 12,500 feet	Not considered further due to the cost of addressing impacts to S. 188th.

3. Development of a new runway with a 12,500 ft length	Not considered further due to substantial cost and community disruption that would result.
4. Delayed or Blended Alternative	Not considered further , as it would not address the needs at Sea-Tac.
5. Do-Nothing/No-Build	To be considered further (Alternative 1).

This loss of weight operating capability would result in passengers and cargo not getting to their destination as desired or an increase in operations to serve the demand. In year 2000, this continued practice would result in an annual economic loss to the airlines of $1.2 million, growing to $2 million annually by 2010 and $3 million by 2020 to the airlines.

Over 90 percent of the weight restricted departures would be by all-cargo operators. Currently 10% of the cargo transported through Sea-Tac is destined for the Pacific Rim. Economists predict that the Pacific Rim will continue to experience above average economic growth in the foreseeable future. Thus, for the Puget Sound and Washington State to retain their pre-eminence in exporting area products, the ability to serve the fastest economic growing market in the world is essential.

The alternatives that would satisfy this need are shown above.

(C) Provide Runway Safety Areas (RSAs) that meet current FAA Standards

An RSA is "A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway". When the runways at Sea-Tac were originally built, they met then-current FAA design standards. However, as a result of aircraft overruns and incidents at airports in the U.S., the FAA modified Federal Aviation Regulation 139.309(a)(2) which now requires:

"To the extent practicable, each certificate holder shall provide and maintain for each runway and taxiway which is available for air carrier use - ... (2) If construction, reconstruction, or significant expansion of the runway or taxiway began on or after January 1, 1988 a safety area which conforms to the dimensions acceptable to the Administrator at the time construction, reconstruction, or expansion began.".

The FAA previously issued a funding grant to the Port which includes the following condition "13. By acceptance of this grant, the sponsor agrees that the safety areas for Runway 16L/34R will be improved to dimensions acceptable to the FAA on the following schedule.... September 1996 safety areas to be complete". Subsequently, the Port requested that the alternatives for addressing the RSA be included in the Master Plan Update.

The RSA dimension for Sea-Tac is defined as a rectangular area that is centered about the runway that is 500 feet wide and extends 1,000 feet beyond each runway end. This area should be cleared, drained and graded, and is usually turfed. Under dry conditions, this area should be capable of supporting occasional aircraft that could overrun the runway, as well as fire fighting and snow removal equipment.

Thus, the Master Plan Update recommends that the RSAs be upgraded to current FAA design standards in accordance with grant assurances and Federal Aviation Regulation Part 139. The following alternatives could address this need:

RSA Alternatives	Summary of Evaluation
1. Displaced Thresholds/ Declared Distance Procedures	Considered as the Do-Nothing/No-Build.
2. Clearing, grading and development of areas for 1,000 feet beyond the existing pavement	Considered further.

3. Clearing, grading for 1,000 feet including the 600 ft extension to 34R	Considered further (included in Alternatives 2, 3 and 4).
4. Delayed or Blended Alternative	Not addressed further, as it would not address the RSA requirements
5. Do-Nothing/No-Build	To be considered further for declared distances (Alternative 1).

(D) Provide Efficient and Flexible Landside Facilities to Accommodate Future Aviation Demand.

Regional population and employment growth are expected to fuel growth in aviation demand regardless of the availability of facilities at Sea-Tac Airport. While enplaned passenger volumes are forecast to grow by 103 percent by 2020, air cargo tonnage is expected to grow 150 percent. This anticipated growth will place extreme demands on the existing airport facilities. Congestion currently exists on the Main Terminal roadway during peak hours. By year 2020, significant congestion could result throughout the day. Therefore, to avoid congestion and passenger inconveniences, improvements to the landside facilities will be necessary. Flexibility will be required to enable airport facilities to be accommodated by varying types of airlines (shuttle operations as well as long-haul), cargo operators as well as aircraft maintenance needs.

Currently, airport facilities at Sea-Tac provide 90 narrow-body equivalent aircraft gates (NBEG) within 12,100 linear feet of gate frontage. Based on the forecast of aviation demand, Sea-Tac Airport will require 101 NBEG gates by 2000, 111 NBEG gates by 2010 and 120 NBEG gates by the year 2020. In total, Sea-Tac will require an additional 30 passenger gates by year 2020.

Over the last decade, several airlines have examined the possibility of developing aircraft maintenance bases at various airports throughout the country. Based on these requests, and anticipated future requests, the Port initiated the necessary planning and design to assure that a base maintenance facility can be accommodated at Sea-Tac Airport. These plans have become known as the South Aviation Support Area (SASA) development plan and were assessed in a 1994 Final Environmental Impact Statement. The benefits of such a facility are the resulting high-skill jobs and economic activity which meet the Port of Seattle's mission of fostering regional economic development that will benefit the port district.

To ensure that the Region's primary aviation facility is capable of efficiently accommodating forecast air travel demand generated by area economic activity and population, the Port of Seattle proposes to incrementally expand the terminal, support facilities and other landside facilities.

The following summarizes the alternatives identified for this need.

Alternative	Summary of Evaluation
1. Use of Other Modes of Transportation - Auto and Bus - Rail - Video Conferencing	Not considered further, as less than 5% of the future passengers using Sea-Tac are traveling to distances where surface transportation is efficient and cost effective.
2. Use of Other Airports or Construction of a New Airport	Not considered further. Regional consensus has been established through PSRC EB-94-01 that: 1) there is no sponsor or funding for a new airport; 2) Extensive studies of these alternatives indicate that there are no feasible sites; 3) If a site could be identified, market forces and planning/development requirements would prevent the airport from successfully serving regional demand until 2010 or later. The FAA and Port have independently concluded that a new airport would not satisfy the needs addressed by this EIS.

3. Activity/Demand Management Alternatives	Not considered further, as these actions will not reduce demand as all feasible alternatives have been implemented.
4. Landside Development at Sea-Tac	To be considered further: Three primary alternatives to be considered further: Central Terminal Development, North Unit Terminal Development and South Unit Terminal Development (Alternatives 2, 3 and 4, respectively).
5. Use of Technology	Not considered further. No technologies currently exist to address regional aviation demand growth. No new technologies are anticipated..
6. Delayed or Blended Alternative (Combination of other modes, use of existing airports, and activity/ demand management)	The net result of this alternative would be a delay in the implementation of the Master Plan Update alternatives. Because there is no commitment to any individual or combination of other alternatives and because aviation activity levels are currently growing at a rate slightly higher than forecast, this alternative was not considered further.
7. Do-Nothing/No Build	To be considered further (Alternative 1)

(E) Alternatives Considered

The following alternatives and key improvements, as described in detail in Chapter II, were carried forward for detailed:

- **Alternative 1 - Do-Nothing/No Build** - The previously described needs would not be addressed in the Do-Nothing alternative. However, a number of other developments would occur: preparation of the South Aviation Support Area (as approved in the 1994 Final EIS and Record of Decision), completion of the Runway 34L and 34R RSA grading, development and implementation of declared distances for Runway 16R and 16L; implementation of terminal area ground access and seismic improvements, installation of a Category IIIb Instrument Landing system on Runway 16L; development of an On-Airport hotel; and implementation of the Des Moines Creek Technology Campus.
- **Alternative 2 (Central Terminal)** this alternative would include a new dependent (2,500 ft separation) parallel runway with a length of up to 8,500 feet; a 600 ft extension to Runway 34R; fill, clearing and grading of the 1,000 ft Runway Safety Areas for all runway ends; and completion of the landside and terminal development for centralized terminal facilities; and completion of the South Aviation Support Area.
- **Alternative 3 (North Unit Terminal)** this alternative would include a new dependent (2,500 ft separation) parallel runway with a length of up to 8,500 feet; a 600 ft extension to Runway 34R; fill, clearing and grading of the 1,000 ft Runway Safety Areas for all runway ends; and completion of the landside and terminal development in a north unit terminal configuration; and completion of the South Aviation Support Area.
- **Alternative 4 (South Unit Terminal)** this alternative would include a new dependent (2,500 ft separation) parallel runway with a length of up to 8,500 feet; a 600 ft extension to Runway 34R; fill, clearing and grading of the 1,000 ft Runway Safety Areas for all runway ends; and completion of the landside and terminal development in a south unit terminal configuration; and completion of the South Aviation Support Area.

Exhibits II-5 through Exhibit II-8 show these alternatives.

After review of the Draft Environmental Impact Statement, the Port of Seattle staff recommended the implementation of **Alternative 3** (the North Unit Terminal) with a proposed 8,500 foot long new parallel runway located about 2,500 feet west of Runway 16L/34R. However, to aid in public review, the document refers to a runway with a length "up to 8,500 feet" so that the impacts of a 7,000 ft., 7,500 ft., and 8,500 ft.

runway are identified. The elements of the improvements included in the Preferred Alternative are listed beginning on page II-41 of this Final EIS.

This alternative was recommended for the following reasons:

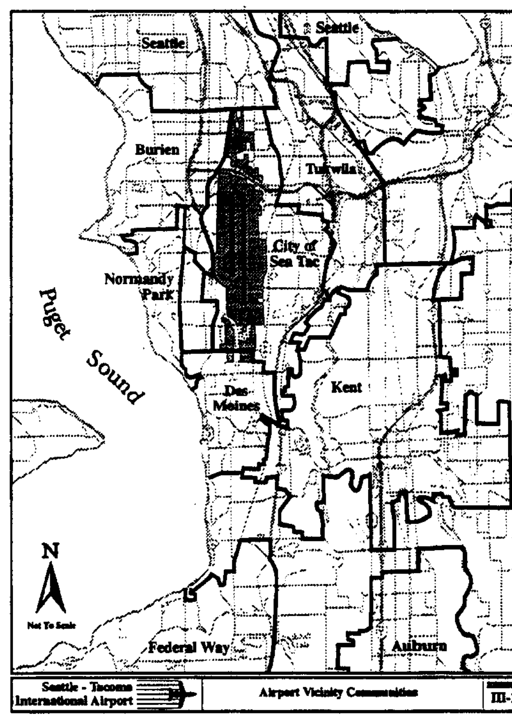
- Reduces the existing and future disparity between the poor weather and good weather operating capability, enabling dependent parallel arrival streams during poor weather conditions;
- Provides the greatest delay reduction of all alternatives considered. The reduced operating times associated with the implementation of a third parallel runway would result in a substantial cost savings to the airlines. A new parallel runway would have saved the airlines $24 million annually if it had been available for use in 1994. The delays saving is expected to grow to around $59 million per year in 2000, $70 million per year in 2002 and $146 million annually when activity reaches 425,000 operations (near the year 2013). As a result, if the runway were available for use in year 2002, the delay savings would compensate for the cost of construction in a 5 year period. If completed later, the pay-back period would be sooner than 5 years;
- The proposed new runway would accommodate 99% of the possible aircraft types for landing which currently use or are anticipated to be operating at Sea-Tac;
- Enables unrestricted departure weights for aircraft departing to the Pacific Rim countries during warm summer weather;
- Provides efficient and flexible landside facilities to accommodate future aviation demand providing the greatest levels of service to air passengers by improving curb-to-terminal and curb-to-gate access, decreased walking distances, and the lowest cost per new aircraft gate;
- Relieves the surface vehicle congestion on the existing terminal drive system;
- Minimizes disruption of commercial development along International Boulevard;
- Enables future expansion of terminal and support facilities in an incremental fashion to accommodate air travel demand as growth occurs;
- Minimizes the disruption to existing airport facilities during the implementation of the proposed improvements; and
- Minimizes aircraft push-back and taxiing conflicts as flights enter and exit the terminal area.

CHAPTER III

AFFECTED ENVIRONMENT

Communities which abut the City of SeaTac, in which the Airport is situated, are Des Moines, Tukwila, and Burien. Unincorporated portions of King County also abut the City of SeaTac. These communities, and others, may be directly or indirectly affected by operations at Sea-Tac Airport, especially by aircraft noise exposure.

The majority of Port owned Airport land is bound by International Blvd. to the east, SR 509 and 12th Avenue to the west, SR 518 to the north, and South 200th Street to the south. Sea-Tac Airport abuts the City of SeaTac on all sides and occupies more than 2,500 acres of land.



This EIS addresses impacts of the Airport and the proposed Master Plan Update improvements that would be experienced within the Puget Sound Region. Within this general geographic area, this EIS references two primary study areas:

General study area - encompassing the existing noise exposure area as defined by the existing (1994) DNL 60 and greater noise contour; and

AR 003809

Detailed focus area - the area which would be affected to construct alternative airport improvements. This area includes any land which might be acquired.

Where applicable, other study areas were used to disclose the existing or anticipated impacts.

Built Environment

The current pattern of land use within the general study area consists of the following uses:

- Residential: 49.5% of the study area
- Open space/agriculture: 16.7% of the study area
- Commercial/industrial: 12.6% of the study area
- Airports (Sea-Tac and Boeing Field): 11.4% of the study area
- Community and public facilities 2.7% of the study area
- Other: 7.0% of the study area

Based on the 1990 Census, the general study area contains 43,347 single-family homes, 25,702 multi-family dwelling units, and 3,006 mobile homes. Located within the boundary of the general study area are several classes of land uses that are normally considered to be sensitive to high levels of aircraft noise exposure.

Natural Resources

Because the prevailing winds are from the Pacific Ocean, the general meteorological conditions of the Puget Sound Region are typical of a marine climate. The relatively cool summers, mild climate are enhanced by the presence of Puget Sound. The Cascade Range to the east serves as a partial barrier to the temperature extremes of the continental climate of eastern Washington State.

There are two independent stream systems that drain the major portions of the airport area, Des Moines Creek and Miller Creek. The Airport covers an estimated 30 percent of the Des Moines Creek basin and five percent of the Miller Creek basin. Both Des Moines and Miller creeks are classified by the State as Class AA (extraordinary) waters, although stormwater runoff from urban development within the two drainage basins have contributed to water quality degradation and violations of some water quality standards. Degradation of water quality from stormwater runoff has had harmful effects on aquatic biota and the biological integrity of both creeks. Diversity of aquatic life has tended to shift from pollutant-intolerant forms to pollutant-tolerant forms. Additionally, major spills of aviation fuel into Des Moines Creek in the mid-1980s resulted in the mortality of most fish and aquatic life in that creek.

In the Puget Sound Region, sand and gravel units within the glacial drift form the principal aquifers. These aquifers are recharged from precipitation. Water levels within wells are generally within 100 feet of the ground surface. Perched water is also commonly encountered in the glacial deposits where silt and clay within the glacial soils act as acquitards, allowing water to accumulate in sand and gravel lenses.

A total of 55 wetlands were identified in the detailed focus area. These wetlands range in size from approximately 0.01 acres to 30.3 acres, with a combined area of nearly 150 acres. A total of 20 emergent, nine scrub-shrub, four open-water, and 22 forested wetlands were identified.

Biological Resources

Habitat in the airport vicinity consists of isolated parcels of forest, shrub, and grass with scattered wetlands. Approximately 714 acres of upland forest, 191 acres of upland shrub, 1,012 acres of upland herbaceous habitat, and 144 acres of wetlands are present within a one-mile radius from the airfield area. Fragmented stands of second growth deciduous and coniferous forest characterize much of the area. These areas provide habitat for a typical assemblage of wildlife species found in lowland Puget Sound forests.

Two federally listed or proposed threatened or endangered species, which may occasionally use the airport area, are the peregrine falcon and bald eagle. The closest bald eagle nests to the Airport are located at Angle Lake (.75 mile southeast) and Seahurst Park (two miles northwest).

Future Planned Development

Specific planned development projects are envisioned by local and county governments in the general study area in addition to those generally described in the comprehensive land use plans. These projects are: 28th/24th Avenue South Arterial Project; State Route 509 Extension and South Access Road; Regional Transit Authority High-Capacity, Light-Rail System; On-Airport Hotel by the Port of Seattle; Des Moines Creek Technology Campus; South Aviation Support Area (SASA); Regional Justice Center; and Airport Business Center in SeaTac.

CHAPTER IV

ENVIRONMENTAL CONSEQUENCES OF THE ALTERNATIVES

The following summarizes the environmental impacts of the four Master Plan Update alternatives.

1. NOISE

The percentage of people, housing units, and area affected by sound levels of DNL 65 and greater is expected to decline in the future in comparison to current and past noise exposure, regardless of future development at Sea-Tac Airport. This decline in impacts is expected due to the Port's noise reduction program and the Federal mandate to phase-out Stage 2 aircraft no later than the year 2000.

Aircraft Noise
(DNL 65 and Greater)

	Population	Housing	Sq. Mi.
1994	31,800	13,620	9.31
2000			
Altern. 1	8,970	3,870	3.40
Altern. 2	9,890	4,020	2.87
Altern. 3	9,890	4,020	2.86
Altern. 4	9,890	4,020	2.86
2010			
Altern. 1	9,450	4,060	3.54
Altern. 2	9,870	4,190	2.97
Altern. 3	9,860	4,190	2.98
Altern. 4	9,860	4,190	2.98
2020			
Altern. 1	10,800	4,610	3.97
Altern. 2	11,270	4,760	3.31
Altern. 3	11,240	4,740	3.34
Altern. 4	11,270	4,760	3.34

Note: Alternative 1 = Do-Nothing, Alternative 2, 3 & 4 are "With Project". All "With Project" alternatives include a new dependent (2,500 ft separation) parallel runway with a length up to 8,500 feet. Area is non-airport land.

The differences between the noise impacts of the three "With Project" alternatives are very small, as is shown in the Aircraft Noise table above. Because the new dependent parallel runway is proposed to reduce poor weather delay, which is predominantly arrival related, the runway is expected to be used primarily for arrivals. About 12.1 percent of arrivals in a south flow would occur on the new runway, with about 2.6 percent of departures.

The development of a new parallel runway would be expected to increase dwelling unit impacts 6.1 percent over the Do-Nothing/No-Build alternative. However, in all instances, these future impacts would be less than the current noise exposure. A 7,000-ft long new runway would result in slightly less noise impacts in comparison to the longer 8,500-foot. However, a 7,500-foot long runway, with a north threshold staggered south, could result in fewer impacts than the shorter 7,000-foot long runway. **Exhibit IV.1-1** shows the existing (1994) noise exposure while **Exhibit IV.1-13** shows the year 2020 impacts of the Preferred Alternative (Alternative 3). The future "With Project" departure flight tracks are shown in **Exhibit C-16**.

While this analysis has focused on the areas exposed to DNL 65 and greater sound levels, for residents that are disturbed by noise less than DNL 65, these impacts could continue and change slightly. As is shown by the assessment of noise impacts caused by aircraft flying at altitudes between 3,000 feet and 18,000 feet (provided in **Appendix C**), these impacts are not expected to be significant.

The proposed Master Plan Update alternatives would affect the volume of traffic using area roadways. As is shown, the proposed new parallel runway would not affect area roadway noise. The terminal and landside development within the Master Plan Update alternatives would alter the use of roads, and result in increased noise at some residential/incompatible locations and decreased noise at other locations. The roadway noise analysis indicates that the greatest change in peak hour roadway noise would occur with the development of the SR-509 Extension and South Access Road (a Do-Nothing and "With Project" action that is expected to be undertaken by the Region).

2. LAND USE

Compared to existing conditions, under the Do-Nothing alternative (Alternative 1) there would be a reduction of approximately 66 percent in population affected by noise levels of 65 DNL or greater in the year 2020. This decrease is primarily due to the replacement of the noisier Stage 2 aircraft with quieter Stage 3 aircraft.

Noise impacts for all Master Plan Update Alternatives will be less in all forecasts years relative to existing and historical impacts. Compared to the Do-Nothing alternative for the same years, each of the "With Project" alternatives (with a dependent separated new 8,500-foot runway) would affect about 5 percent more people in the year 2020 with noise levels of 65 DNL or greater. Fewer schools (1) and churches (3) would be affected under the year 2020 "With Project" alternatives compared to the Do-Nothing alternative.

This section of Chapter IV summarizes the municipal comprehensive plans and the compatibility of the Master Plan Update with these plans. Existing land use is shown in **Exhibit IV.2-1** and **Exhibit IV.2-2** shows the locations of the noise sensitive facilities in the area.

3. CULTURAL, ARCHAEOLOGICAL AND HISTORICAL RESOURCES

Impacts to archaeological, cultural, and historical resources, both on and off-airport, can be caused by airport development and airport activity. Subject to continued coordination under the Section 106 process, it was concluded that there are a number of historic and archaeological sites in the Airport area, but none would be adversely affected by the proposed Master Plan Update alternatives.

4. DEPARTMENT OF TRANSPORTATION SECTION 4(F) LANDS

The U.S. Department of Transportation Act of 1966, Section 4(f), provides for the protection of certain publicly owned resources: public parks; recreational areas; wildlife and waterfowl refuges of federal, state, or local significance; and land that holds historic site of federal, state, or local significance. The parks and recreational facilities in the airport area, but no DOT Section 4(f) or LAWCON Section 6(f) resources would be directly or indirectly impacted by any of the Master Plan Update alternatives.

5. PRIME AND UNIQUE FARMLAND

Throughout the 20th century, the nation's prime and unique farmland has decreased dramatically because of urban development throughout the country. The Farmland Protection Policy Act of 1981 was enacted to minimize the extent to which federal programs contribute to unnecessary and irreversible conversion of farmland to non-agricultural uses. No prime or unique farmlands were identified within the acquisition or construction areas of any "With Project" alternative. Thus, no such farmlands would be adversely affected.

6. SOCIAL IMPACTS

The Master Plan Update alternatives were evaluated for their impact on adjacent residential communities, and businesses. Social impacts considered in this section include the following: residential and business displacement, and disruption of existing communities and planned development.

Assuming a development of a new runway length up to 8,500 feet, the following number of properties could be acquired under the "With Project" alternatives to complete construction, to clear the runway protection zones (RPZs), and to mitigate adverse environmental impacts:

	Number to be Acquired		
8,500-ft Dependent	Single Family	Condos/ Apartments	Business
Runway related:			
Alternative 1	0	0	0
Alt. 2, 3, & 4	388	260	105
Non-Runway related:			
Alternative 1	3	0	0
Alternative 2 & 3	3	0	0
Alternative 4	3	0	12

If a 7,000-foot new parallel runway were constructed, 348 single-family residences, 26 apartment or condominium units, and 96 businesses would be acquired. A 7,500-foot runway would require the acquisition of 361 single-family residences, 26 apartments or condominiums units, and 104 businesses. All acquisition would comply with the Uniform Relocation Act.

7. HUMAN HEALTH IMPACTS

The EIS assesses the human health related issues associated with:

- noise,
- air quality,
- water quality,
- radio transmissions and light emissions, and
- aircraft incidents/accidents.

The Airport present environment has the potential to affect human health, although the potential is difficult to assess and characterize because many research studies indicate conflicting reports of human health impacts.

In general, adverse environmental impacts are expected to decrease in the future as improved technology results in lower air, noise, and water pollutant emissions. The proposed Master Plan Update alternatives are expected to increase noise and stormwater flows slightly over the Do-Nothing alternative. However, the impacts of the future "With Project" alternatives are expected to be less than the current conditions.

8. INDUCED SOCIO-ECONOMIC IMPACT

As major passenger and cargo transportation facility, Sea-Tac Airport directly and indirectly contributes to the economic structure of the Puget Sound Region. Induced socio-economic benefits are generated in the Region by changes in employment opportunities, payroll generation, business expenditures for goods and services, and tax revenue. The existing and forecast Do-Nothing induced socio-economic impacts are shown on the next page.

All of the Master Plan Update alternatives would create jobs in construction. Further elaboration of these impacts is provided in Section 23 "Construction Impacts." Construction-related jobs would be approximately 8,200 for the Do-Nothing (Alternative 1 and about 45,500 for the "With Project" alternatives.

	Airport Activity Related Impacts Alternative 1, 2, 3, and 4		
	1993	2010	2020
Total Jobs	205,690	335,344	418,632
Personal Income (Millions)	2,585.6	4,215.4	5,262.4
Earnings/Dir Jobs (Millions)	15,910	25,938.7	32,380.9
Business Revenue (Millions)	6,355.7	10,361.9	12,935.5
State & Local Taxes (Millions)	406.6	662.9	827.9

The activity-related, induced socio-economic impacts would be the same for all Master Plan Update alternatives. However, the acquisition effects would differ. The following summarize the impacts of the "With Project" alternatives compared to the Do-Nothing (Alternative 1):

	Impacts Due to:		
	Alt 2	Alt 3	Alt 4
Annual Loss in Property Tax (Thousands)	$227.5	$227.5	$291.9
Annual Lost Taxable Sales Transactions (Millions)	$2.2	$2.2	$15.6
Jobs Displaced	627	627	822

Impacts are less if displaced businesses relocated within the area. Assumes the 8,500 ft new dependent parallel runway. and that commercial property in the RPZ is acquired.

A new 8,500 foot parallel runway would displace businesses and numerous residences through property acquisitions, reducing the existing property and sales tax revenue and employment. The property tax and sales impacts to an individual community are less than five percent. This would occur primarily in the City of SeaTac and, to a lesser extent, in the City of Burien. The only acquisition of property landside development the is the South Unit Terminal (Alternative 4), which would acquire 12 properties on the northwest corner of International Blvd. and South 188th Street.

Reductions in tax revenues would be offset long term by positive net gains in future tax receipts as property is more intensely developed in the Airport vicinity. Local sales tax revenues will be generated by people directly employed at Sea-Tac Airport and induced revenues by airport activity (e.g., taxable spending on goods and services by people employed at the Airport, air cargo businesses, hotel and commercial uses).

9. AIR QUALITY

The majority of the pollutant emissions in the Puget Sound Region--75 percent--is generated by motor vehicles (i.e., cars, trucks, buses, taxis, motorcycles). Aircraft operating at Sea-Tac contribute less than one percent of the carbon monoxide emissions, nitrogen oxides, and volatile organic compounds for all mobile sources within the Puget Sound Region. Whether a new runway is built or not, air pollutant emissions from roadway vehicles and aircraft would be expected to increase in the Region as population increases.

Key findings of this analysis are:

- *Air Pollutant Inventory:* Airport-related pollutant emissions from Sea-Tac are less than the levels established by the State Implementation Plan for reducing air pollutants. They would continue to be less than forecast, with or without airport improvements.

- *Area Dispersion Analysis*: The dispersion analysis performed for the airport area indicates that exceedances of the Ambient Air Quality Standards would occur with or without Airport improvements.

  Development of the proposed third parallel runway would not worsen air pollution in the Airport area. In fact, use of a third runway would result in a reduction in pollutant concentrations at most locations.

- *Roadway Intersection Analysis*: Pollutant concentrations at several highly congested intersections on International Boulevard (SR 99) currently exceed the 8-hour carbon monoxide standard. The addition of the proposed North Unit Terminal would result in changes in traffic volumes and patterns which would increase pollutant levels above already high levels. However, proposed mitigation would alleviate the increased pollutant concentrations.

The proposed Master Plan Update improvements at Sea-Tac conforms to the requirements for the Puget Sound Region and to the State of Washington's plan for "eliminating or reducing the severity and number of violations of the national ambient air quality standards and achieving expeditious attainment of such standards."

10. WATER QUALITY AND HYDROLOGY

Changing the Airport's landscape, as would happen with the proposed Master Plan Update alternatives, could affect the hydrology of the airport area as well as the downstream systems. Alternatives 2, 3, and 4 ("With Project") would include earthwork and the addition of impervious land surface area. This decreases the amount of rainfall infiltrating the soil and increases stormwater runoff flow rates and volumes. **Exhibit IV.10-4** shows the locations of proposed airport improvements relative to the watersheds.

Preliminary estimates indicated that 61 acre-feet of new on-site detention storage volume would be required for the proposed developed areas that drain to Miller Creek, and 31 acre-feet of storage for areas draining to Des Moines Creek. These detention volumes would attenuate peak runoff rates from the Airport to provide protection from downstream flooding for storms having up to a 100-year return period. New impervious areas would increase annual runoff volumes to Miller Creek by 6 to 8 percent and volumes to Des Moines Creek by 1 to 2 percent. Most of the additional volume would flow through the downstream systems at rates that have low erosion potential. Higher runoff volumes could be partially offset by stormwater infiltration where on-site soils are suitable.

Although pollutant loading will increase somewhat because of greater amounts of stormwater runoff associated with the "With Project" alternatives, compliance with mitigation requirements is expected to prevent significant pollution or degradation of surface and groundwater resources.

11. WETLANDS

Wetland investigations of the airport area identified almost 150 acres of wetland. The Master Plan Update alternatives at Sea-Tac Airport would affect areas of these wetlands through placement of fill material, grading, removal of existing vegetation, and changes in hydrologic regimes as a result of increased impervious surface area and stormwater management system restructuring. **Exhibit IV.11-2** shows the locations of the wetlands.

The elements of the wetlands affected by each of the "With Project" alternatives are palustrine emergent, scrub-shrub, open water, and forested systems. The wetlands disrupted from the "With Project" alternatives will be determined by how much earth is excavated from the on-site borrow locations. Utilization of Borrow Area 8 (North Borrow Area) would result in direct impacts occurring to 16-acres of wetland in six different systems. Due to the large quantity of wetlands at this site, excavation in this area will be avoided.

Alternative	Wetland Impacts
Alt 1 (Do-Nothing)	1.7 acres
Alt 2 (Central Terminal with):	
8,500 ft runway	10.37 acres
7,500 ft runway	9.43 acres
7,000 ft runway	9.62 acres
Alt 3 (North Terminal with):	
8,500 ft	10.37 acres
7,500 ft	9.43 acres
7,000 ft	9.62 acres
Alt 4 (South Terminal with):	
8,500 ft	10.37 acres
7,500 ft	9.43 acres
7,000 ft	9.62 acres

Source: Shapiro & Associates. 1995

Development that poses a significant threat to wetlands would require permits or approvals from the following agencies: U.S. Army Corps of Engineers, Washington State Department of Ecology, and Washington Department of Fisheries and Wildlife. In addition to these permits or approvals, compensatory mitigation would be required.

12. FLOODPLAINS

Construction and operation of the proposed Master Plan Update alternatives could significantly reduce the 100-year floodplain area and flood storage capacity, increase volumes of stormwater runoff and peak flows, and increase flooding potential in downstream areas on both Miller and Des Moines Creeks. **Exhibit IV.12-2** shows the locations of the floodplains. Because mitigation is required to prevent reductions of 100-year floodplain area and flood storage capacity, the proposed Master Plan Update alternatives are unlikely to result in significant encroachment on the 100-year floodplain or loss of flood storage capacity. In addition, flow modeling results using detention requirements for the new development show that the proposed alternatives will not increase peak flows or potential flooding in downstream areas of Miller or Des Moines Creek.

13. COASTAL ZONE MANAGEMENT AND COASTAL BARRIERS

The Airport Master Plan alternatives will conform to all applicable Coastal Zone Management Program policies. The Port will certify that the Master Plan Update improvements conform to all applicable Coastal Zone Management and Shoreline Management policies.

14. WILD AND SCENIC RIVERS

The proposed Master Plan Update alternative will not affect wild or scenic rivers.

15. SURFACE TRANSPORTATION

Continued regional population growth will impact the surface transportation system in the vicinity of Sea-Tac Airport regardless of the improvements undertaken at the Airport. Two surface transportation analyses were performed, as are described in detail in Appendix O:

- an equivalent level of analysis of all Master Plan Update alternatives based on preliminary regional surface travel levels, and;
- a refined analysis of the Preferred Alternative (Alternative 3), reflecting the Region's adopted metropolitan transportation plan regional surface travel levels.

The refined analysis of the Preferred Alternative showed the following:

- Total Airport surface traffic is expected to increase from approximately 75,030 vehicles per average day in 1994, to approximately 139,035 vehicles per average day in 2020 for the Do-Nothing Alternative, or to approximately 129,055 vehicles per average day in 2020 for the Preferred Alternative. The differences between the Do-Nothing Alternative traffic volumes and the Preferred Alternative traffic volumes are associated with the off-site parking mode choice assumptions.
- The transportation improvement project that would have the greatest impact on conditions in the Airport area is the construction of the State Route 509 Extension and South Access.
  - ◆ The Preferred Alternative (With State Route 509) impacts the surface transportation system at five intersections and one freeway ramp in comparison with the Do-Nothing Alternative.
  - ◆ The Preferred Alternative (Without State Route 509) impacts the surface transportation system at ten intersections and one freeway ramp in comparison with the Do-Nothing Alternative.

16. PLANTS AND ANIMALS (BIOTIC COMMUNITIES)

Approximately 40 percent of the detailed study area is occupied by Sea-Tac Airport and is characterized by frequently mowed grassland bisected by service roads and taxiways. This area provides little wildlife habitat value. Wildlife habitat surrounding the airfield consists of fragmented habitat, which is composed of forest, shrub, and grassland with scattered wetlands. These areas are subject to a variety of airport-related disturbances as well as increasing residential, commercial, and industrial development. Each of the "With Project" alternatives would remove approximately the same amounts of vegetation (about 712 acres total). Of the total, the majority is managed grassland (about 303 acres) About 269 acres of forest, 78 acres of shrub, 52 acres of unmanaged grassland, and 10 acres of wetlands would be removed under each "With Project" alternative.

Various physical, biological, and chemical factors affect fisheries and aquatic biota. Urbanization in the Miller and Des Moines Creek

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basins has altered some of these factors with resulting changes in the aquatic ecosystem. Hydrologic regime and channel morphology have been altered, habitat complexity and quality have been reduced, and water quality has been degraded. These alterations have reduced the diversity and abundance of fish and aquatic biota in Miller and Des Moines Creeks.

Construction and operation of the dependent parallel runway would have some adverse affects on fishery and aquatic resources of Miller and Des Moines Creeks and Puget Sound. About 3,700 feet of Miller Creek and its tributaries would require realignment and relocation to complete the runway. About 200 feet of Des Moines Creek would require relocation due to the 600 ft extension of Runway 34R. About 2,200 feet of open channel on Des Moines Creek would require relocation due to the South Aviation Support Area (SASA). The 200-foot section of Des Moines Creek that would be affected by the extension of Runway 34R is within the area that would be realigned as mitigation for SASA. Proposed mitigation would reduce potential impacts on the hydrology, water quality, and aquatic habitat and biota the two creeks and Puget Sound.

17. ENDANGERED SPECIES OF FLORA AND FAUNA

Section 7 of the Endangered Species Act of 1973 (as amended) requires an analysis of the effects of major construction projects on federally listed or proposed threatened or endangered species that may use a project area. Records suggest the potential for use of the area of the proposed Master Plan Update alternatives by bald eagles, peregrine falcons, marbled murrelets, pileated woodpeckers, and great blue herons, as well as several other candidate species. A Biological Assessment was conducted for all Federally listed and candidate species in consultation with the US Fish and Wildlife Service. No significant impacts on threatened and endangered species are expected as a result of the proposed Master Plan Update Alternatives.

18. PUBLIC SERVICES AND UTILITIES

Public services and utilities would require minor changes based on the residences, businesses, and facilities displaced by development. Major utilities that would be relocated or protected in-place are the Southwest Suburban Sewer District, Miller Creek Interceptor, Seattle Water Department trunk line, Puget Power third electrical service metering point, and US West trunk lines entering at S. 176th Street. A variety of existing utility services, both on the Airport and off the Airport, would be abandoned. The extent of the off-airport abandonments depends on the area ultimately acquired to complete the Master Plan Update development.

19. EARTH

Project construction and operation (including clearing, grading, excavation, and fill placement) are evaluated and potential mitigation measures identified. Source of fill materials, depth of fill placement, and methods of placement and compaction also are addressed. Actions that would occur in sensitive hazard areas are identified and described.

The Master Plan Update alternatives would require the movement of the following quantities of earth:

Alternative	Million Cubic Yards of Fill
Alternative 1 (Do-Nothing)	2.4
Alternative 2	23
Alternative 3	23
Alternative 4	23
	23

Note: Alternatives 2, 3 and 4 assume a new parallel runway with a length up to 8,500 feet, located 2,500 ft west of Runway 16L/34R. - The Do-Nothing includes the development of the South Aviation Support (SASA) and Des Moines Creek Technology Campus.

Of the 23 million cubic yards of fill needed, about 17.25 million cubic yards would be needed for an 8,500-foot new parallel runway. The 7,500-foot and 7,000-foot new parallel runway options are estimated to require 13.52 and 16.77 million cubic yards of fill, respectively. Preliminary investigations indicate that all of the required fill could be obtained from a combination of Port of Seattle-owned property and off-site borrow sources.

Two seismic hazard areas have been identified by the City of SeaTac on the site of the proposed new parallel runway. They are small areas of shallow, loose sediment that likely would liquefy during a seismic event. During construction this sediment would be removed and replaced with compacted fill.

Erosion of exposed soils in areas of excavation, fill, and stockpile would occur during construction. The amount of erosion would depend on the design and implementation of an Erosion and Sedimentation Control Plan.

20. SOLID WASTE

Solid waste is composed of solid and semi-solid waste, including such things as garbage, rubbish, metal, paper, plastic, and wood. Based on the analysis of solid waste conditions, and the impacts of the Master Plan Update alternatives, no significant impacts on solid waste generation and disposal are expected.

21. HAZARDOUS WASTE

Operations at the Airport by the Port and airport tenants involve the storage and use of hazardous materials and the generation of hazardous wastes. Fifty-one potential or known hazardous substance sites exist on the Airport property and in the vicinity of the Sea-Tac Airport. Eleven of those sites are located in the area where a new parallel runway would be completed, and one is located in the proposed SASA Area. Sites located west of the Airport, and those located on Port of Seattle (POS) property, have the potential to be most affected by the Master Plan Update alternatives.

Potential hazards during construction phases (of all alternatives) could include the exposure of contaminated soils during excavation, release of hazardous substances during UST removal and building demolition, and spills of construction-related hazardous materials (e.g., fuels, lubricants, paints, and asphalt).

Mitigation for potential construction-related hazards include developing a Spill Prevention, Control, and Countermeasures Plan (SPCCP) outlining procedures for transport, storage, and handling of hazardous materials, and a Hazardous Substances Management and Contingency Plan outlining procedures for removal, storage, transportation, and disposal of hazardous wastes. All federal, state, and applicable local rules and guidelines for handling and disposal of hazardous substances would be followed.

22. ENERGY SUPPLY AND NATURAL RESOURCES

Energy and natural resources in the form of electricity, natural gas, aviation fuel, diesel fuel, and gasoline are consumed through the operation of the airport facilities, aircraft, and attendant equipment. Demand for Airport services, would increase demand on the sources of energy at the Airport. The proposed "With Project" alternatives (Alternative 2, 3 and 4) are expected to increase in annual energy usage seven to nine percent over the Do-Nothing (Alternative 1). All suppliers of these natural resources have indicated the capability of serving the increased demand.

23. CONSTRUCTION

Construction impacts are short-term and temporary. Construction impacts considered in this section include:

- noise,
- air,
- surface transportation,
- social impacts,
- socio-economic, and
- water quality.

At this time detailed design and construction plans have not been prepared. Therefore, it is not possible to identify the specific types of construction equipment and frequency of usage that could occur with any of the Master Plan Update alternatives. Depending upon the amount of fill excavated from on-site borrow areas, the impacts to wetlands could vary substantially as would construction related surface traffic, noise and air pollution. Provisions of FAA Advisory Circular 150/5370-10, "Standards for Specifying Construction of Airports," will be incorporated into construction specifications.

24. AESTHETICS AND URBAN DESIGN

The proposed "With Project" will change the visual character of the area. Adherence to applicable design and landscaping standards can ensure that this impact would not be adverse, rather enhance the views and aesthetic characteristics around the Airport perimeter.

CHAPTER V

MITIGATION MEASURES FOR PROBABLE, UNAVOIDABLE, ADVERSE ENVIRONMENTAL

The following measures could be implemented to lessen the impact of the "With Project" alternatives:

1. NOISE, LAND USE AND SOCIAL IMPACTS

Through the implementation of the Noise Remedy Program, the Port of Seattle has conducted an extensive noise and land use compatibility effort. As a result of this noise and land use compatibility program, a notable portion of the existing and future noise exposed area has been subject to sound insulation and, for the more severely noise affected areas, acquired and relocated. Therefore, the noise exposure that would result from any of the "With Project" alternatives would effect a small number of residents compared to the Do-Nothing. **Exhibit IV.2-3** shows the year 2020 noise exposure relative to the Noise Remedy Program boundaries.

To facilitate continued noise reduction, the noise and land use mitigation now in effect should be continued:

- Noise Budget - limiting the total noise energy carriers may generate at the Airport.
- Nighttime Limitations Program - limiting the hours of operation for Stage 2 aircraft.
- Ground Noise Control - reducing the noise of ground events such as powerback operations, run-ups, and reverse thrust on landing.
- Flight Corridorization - maintenance of runway heading flight tracks by departing jets until reaching altitudes above 4,000 feet.
- Flight Track and Noise Monitoring - maintenance of noise levels records flight track location information for identification of deviations and communication with public and users.

Several land use mitigation strategies will be undertaken:

Mitigating Significant Noise Impacts: The following five noise sensitive facilities would experience significant increased noise impacts (i.e. an increase of 1.5 DNL or more) in the year 2020 in comparison to the Do-Nothing:

- Sea-Tac Occupational Skills Center;
- Woodside Elementary:
- Sunny Terrace Elementary;
- Brunelle Residence;
- Bryan House.

The Port will coordinate with the owners of these properties and sound insulate the noise sensitive uses subject to FAA sound insulation guidelines.

Provide Directional Soundproofing: Residences that were insulated prior to 1992 may need additional directional soundproofing to mitigate noise generated from new flight paths from the operation of the new runway. Many residences evaluated for noise impacts prior to 1992 were not evaluated to consider the additional noise impacts that the proposed runway would generate. The Port of Seattle estimates that some 60 and 70 houses that were evaluated and/or insulated prior to 1992. The Port will audit these facilities, and subject to FAA sound insulation criteria, sound insulate the remaining portions of the home that do not achieve the applicable noise level reduction guidelines.

Acquisition in the Approach Transitional Area - In recognition of the fact that the standard Runway Protection Zone (RPZ) dimensions do not always provide sufficient noise and safety buffer to the satisfaction of nearby residents, the FAA will cost-participate with airport operators to acquire "up to 1,250 feet laterally from the runway centerline, and extending 5,000 feet beyond each end of the primary surface.[1/] The FAA Memorandum provides funding eligibility for a box up to 5,000-foot long and 2,500-foot wide, centered on the runway and beginning 200 feet from the physical end of the runway. Based on the configuration of current airport land, local streets, and residential development patterns, the approach and transitional area selected for use as a mitigation area includes the standard Runway Protection Zone and a rectangular extension of the RPZ outward another 2,500 feet. The limit of coverage of the proposed approach and transitional areas are shown in **Exhibit IV.6-3.**

In the northern approach and transitional area, 82 single-family residential parcels, 2 apartment buildings (with 28 units), and 2 mobile home parks, with 96 units, would be acquired. To the south, 71 single-family residential parcels and 6 apartment buildings (with 32 units) would be acquired. Only residential properties in the approach and transitional area would be acquired – commercial land uses, which make up most of the area to the south, would not be acquired and would remain in place on both runway ends. Based on the current assessed value of these 309 residential homes and multi-family buildings located in the approach and transitional area, it is estimated that the cost of acquisition and relocation would be approximately $35 million.

1/ FAA Memorandum, Action: Land Acquisition - eligible Runway Protection, Object Free Area and Approach and Transitional Zones, dated April 30, 1991.

As the probable impact of low flying aircraft would not be experienced until the opening of the proposed new parallel runway, this option will receive further consideration during the forthcoming Sea-Tac Airport FAR Part 150 Update, which the Port anticipates undertaking during 1996. It is anticipated that during the Part 150 Update, the Port would further explore this action with the specific residents within the Approach Transition Area, and, if the residents so desire, establish a program including relocation objectives, timing and funding priorities.

(2) <u>**Water Quality**</u>

The following stormwater management mitigation will be undertaken unless basin planning determines that other actions would mitigate the impacts of the proposed improvements:

- Provide stormwater detention for construction and operation of new on-site development.
- Stormwater quality treatment would be provided with a combination of wet vaults and biofiltration swales.
- Design stormwater facility outlets to reduce channel scouring, sedimentation and erosion, and improve water quality. Where possible, flow dispersion and outlets compatible with stream mitigation should be incorporated into engineering designs.
- To mitigate potential reductions in shallow groundwater recharge and incremental reductions in base flows in the creeks, infiltration facilities would be constructed where feasible.
- Maintain existing and proposed new stormwater facilities.
- The potential for using constructed aquifers within the runway fill, as described in **Appendix Q-C**, should be further investigated.
- Tyee pond would be relocated and enlarged as part of the SASA.

Various mitigation requirements, as stipulated by federal, state, and applicable local laws, policies, and design standards, would be applicable to construction and operation of the proposed new parallel runway and landside development at the Airport. These requirements would be components of the proposed design and are expected to reduce potential impacts on surface water and groundwater quality.

Effective erosion and sedimentation control could be achieved by using a system of erosion controls (e.g., mulching, silt fencing, sediment basins, and check dams) that are properly applied, installed, and maintained.

Use of BMPs at construction sites, such as spill containment areas, phasing of construction activities (to minimize the amount of disturbed and exposed areas), and conducting activities during the dry season (April through September), also should prevent or reduce potential impacts on surface water and groundwater quality.

Temporary and permanent terraces are recommended for fillslopes and cutslopes wherever possible because they reduce sheet and rill erosion. Terraces reduce slope length, reducing potential rill development and surface erosion. Terraces also increase deposition, reducing transport of eroded materials from construction sites.

The Port of Seattle's National Pollutant Discharge Elimination System (NPDES) permit requires the Port to prepare several plans and to carry out several studies to identify pollutants coming from the Airport, and to prevent and control potential operational impacts on surface and groundwater resources from industrial wastewater system (IWS) and storm drainage system (SDS) discharges.

- Specific plans required as part of compliance with the NPDES permit include:
  - a stormwater pollution prevention plan (SWPPP);
  - a spill prevention, control and countermeasures plan (SPCCP);
  - a construction erosion and sediment control plan for each project exposing more than 5 acres of ground;
  - a sludge characterization and treatment disposal plan; and
  - a solid waste disposal plan.

- Specific studies required as part of compliance with the NPDES permit include:
  - an engineering and treatability study of the IWS
  - a vehicle washwater study
  - annual stormwater monitoring reports
  - whole effluent (both IWS and stormwater) toxicity studies
  - a marine sediment monitoring study.
- Major elements of the SWPPP include:
  - monitoring of base flow and stormwater runoff from the Airport outfalls;
  - identification and implementation of operational BMPs and applicable source control BMPs that do not require capital improvements (by December 31, 1995);
  - identification and implementation of BMPs requiring capital improvements (by June 30, 1997);
  - development of a list of pollutants that would be present in stormwater and estimation of annual quantities of these pollutants in stormwater discharges;
  - inspection of SDS periodically to ensure they are functioning properly and that there are no illegal discharges (i.e., to the SDS); and
  - modification of the existing plan whenever there is an alteration of airfield facilities or their design, construction, operation or maintenance, which causes the SWPPP to be less effective in controlling pollutants.

The Stipulated Settlement Agreement and Agreed Order of Dismissal, which dismissed Ms. Brasher's, Normandy Park Community Club's, and the City of Des Moines' appeal of the Port's NPDES permit contained the following provisions. Components of the stipulated NPDES permit appeal settlement agreement expected to mitigate potential operational impacts on water quality include:[2]

- Creating a Monitoring Team, including representatives appointed by the appellants;
- Conducting at least two additional sampling events of permitted stormwater outfalls in 1995;
- Contributing funds to the Des Moines Creek Basin planning and visioning process;
- Developing a short-term monitoring plan in cooperation with the Monitoring Team to sample Miller Creek basin outfalls and the outfall from Lake Reba examining glycol, BOD TSS, flow, ammonia, and turbidity and develop appropriate responses, as necessary, for any identified water-quality problems.

Additional mitigation for potential operational impacts to surface water quality would be considered depending on the results of the stream monitoring study[3] and the effects of Airport stormwater runoff on Miller and Des Moines Creeks. Monitoring of selected stations upstream and downstream of Airport outfalls to Miller and Des Moines Creeks is planned for this winter (95/96). Potential additional mitigation that would be considered includes use of alternative, FAA-approved runway anti-icing chemicals (e.g., calcium magnesium acetate and sodium formate) or diversion of runway runoff to the IWS during anti-icing events. The latter option is being evaluated as part of ongoing IWS engineering study, which includes capital improvements to increase the treatment efficiency and capacity of the IWS treatment plant.

Basin planning is another method for investigating mitigation of water quality impacts on Miller and Des Moines Creeks and Puget Sound from Airport and urban runoff. Although the Airport affects relatively small proportions of both the Miller and Des Moines Creek drainage basins (approximately 5 and 30 percent, respectively), activities on these areas could significantly affect these drainages. The Port of Seattle is actively participating in basin planning activities in the Miller and Des

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[2] *Stipulated Settlement Agreement No. 94-157*, Washington Pollution Control Hearings Board, 1995.

[3] *Stormwater Receiving Environment Monitoring Plan*, Port of Seattle, August, 1995.

Moines Creek basins with local jurisdictions, including King County and the cities of Des Moines, Normandy Park, SeaTac, and Burien.

(3) **Wetlands and Floodplains**

The Port of Seattle has initiated the wetland permitting process with the Seattle District of the Corps. The Corps is a cooperating agency in the preparation of this EIS. Additional coordination is anticipated with the Washington State Department of Ecology. It is anticipated that permits would be issued after approval of the Final Environmental Impact Statement/Record of Decision for the Master Plan Update actions and that no adverse impacts would occur on wetlands as a result of the Master Plan Update prior to issuance of the appropriate permits.

Significant unavoidable adverse impacts will occur to wetlands as a result of implementation of the proposed improvements. These impacts include filling, grading, changes of hydrology, and removal of vegetation. The Port of Seattle will avoid adverse impacts where possible (e.g., use of off-site fill to avoid wetland impact in Borrow Area 8), will minimize impact by using Best Management Practices (BMP) during construction and operation of the proposed improvements. However, as is noted in Chapter IV, Section 23 "Construction Impacts', the filling of on-site borrow sources could further minimize wetland impacts. However, if the minimum use of on-site material occurs, maximum off-site truck trips will result as well as possible increased cost of construction.

After extensive study, the Port of Seattle has selected a preferred wetland mitigation site in the lower Green River Valley. Mitigation for impacts on wetlands at the Airport, within the watershed where the impacts may occur, is not feasible for three reasons: (1) the majority of the area surrounding the Airport is developed, and not enough land area exists in the watershed to create compensatory mitigation wetlands, (2) much of the undeveloped land in the watersheds is existing wetland, or land unsuitable for wetland mitigation due to topographic (moderate to steeply sloping) or hydrologic (lack of sufficient water) conditions, and (3) the FAA guidelines strongly recommend[4/] that airports do not have "wildlife attractions" within 10,000 feet of the edge of any active jet runway. For these reasons, the Port proposes to conduct wetland mitigation outside of the watershed where these constraints do not exist.

After investigating over 100 individual parcels, the Port has selected a site located within the City of Auburn for the development of the compensatory wetland mitigation. This site, located in Section 31, Township 22N, Range 5E, Willamette Meridian in the Green River watershed, is a 69 acre parcel of land slightly south of S. 277th Street and east of Auburn Way. The undeveloped parcel has been farmed in the recent past, and currently supports a mix of upland pasture grasses and forbs that are common to abandoned agricultural land in the Puget Sound Region. Approximately 4.3 acres of reed canarygrass-dominated wetland was delineated at the site. The site is bound by a variety of land uses including agriculture to the north and south; undeveloped land, multi-family housing and a drive-in theater to the west; and the Green River, patches of riparian forest, and undeveloped slopes to the east. A narrow strip of land along the western banks of the Green River is held by King County. In December 1995, the Port of Seattle gained ownership of the property following a bankruptcy proceeding by the previous owners.

The Port of Seattle has coordinated with the Corps of Engineers concerning the proposed mitigation site and the plan included in this Final EIS. **Appendix P** contains a detailed mitigation plan for the wetland mitigation.

Floodplain encroachment and flooding impacts in the Miller and Des Moines Creek basins resulting from the proposed improvements would be unlikely because of required mitigation. Mitigation will include adherence to floodplain development standards and floodway management requirements of the FAA and Washington State Department of Ecology. Compensatory mitigation is required by state law for any proposed filling of 100-year floodplain so as to achieve no net loss in flood storage capacity and to prevent an increased risk of loss of human life or property damage.[5/]

4/ "Wildlife Attractions On or Near Airports," *FAA Draft Advisory Circular 150/5200-*, no date.

5/ *Environmentally Sensitive Areas - Flood Hazard Areas, Chapter 15.30210-250, City of SeaTac Municipal Code.*

Compensatory mitigation for floodplain impacts near the northwest corner of the proposed new parallel runway has been incorporated into the stream relocation design (**Appendix P**). The stream mitigation design, which was developed in cooperation with several resources agencies, including the U.S. Army Corps of Engineers, would create an equivalent amount of floodplain storage - so no net loss of flood storage capacity or increased risk of loss of human life or property damage would result.

As this Environmental Impact Statement demonstrates, no other practicable alternative exists other than completion of one of the proposed Master Plan Update alternatives. Significant floodplain encroachment would be unlikely as a result of the "With Project" alternatives due to strict mitigation requirements which would be adhered to under any of the alternatives.

Storm flow modeling based on conceptual stormwater detention facilities and using these design storms indicates no increase in peak flow rates and little risk of flooding from the proposed Master Plan Update alternatives. Preliminary compensatory floodplain replacement designs for floodplain encroachment in the Miller Creek basin for the 8,500-ft runway length, demonstrating no net loss of flood storage capacity, are presented in **Appendix P.**

(4) <u>Air Quality</u>

The proposed landside improvements included in the "With Project" alternatives--improved terminal facilities and public and employee parking--would result in changing vehicular traffic movement and patterns in the immediate airport area. For the Preferred Alternative, (Alternative 3), the majority of employee parking within the terminal area shifts to a new lot located north of SR 518, reducing congestion and pollutant concentrations.

The analysis contained in this document represents a worst case evaluation. Thus, the Port of Seattle will conduct an air monitoring program at two roadway intersections to determine if such exceedances would occur. If such exceedances are found, the Port of Seattle will undertake appropriate action such as those identified below.

(A) <u>Mitigation for International Blvd. and South 170th Street</u>

The Preferred Alternative increases pollutant concentrations over the Do-Nothing alternative at this intersection. This is due primarily to changes in how airport-related traffic would access the Airport in the future. The mitigation measures include the addition of an additional northbound left-turn lane (2 total); the construction of high capacity right-turn lanes in the southbound and eastbound directions; and the construction of a westbound right-turn lane. These improvements would occur by 2010 when relief would be needed to substantially decrease the time vehicles idle at this intersection. By 2020, an additional lane along International Boulevard (SR 99) would also be added

(B) <u>Mitigation for International Blvd. and South 160th Street</u>

The Preferred Alternative increases pollutant concentrations over the Do-Nothing alternative at this intersection. Pollutant concentrations at this intersection are only marginally higher by the year 2020. Mitigation measures proposed would include adding an additional southbound left-turn lane (2 total); and improvements to the westbound right-turn lane. These improvements would occur by 2010. An additional lane along International Boulevard (SR 99) would be needed by 2020 to provide additional relief at this intersection.

(C) <u>Additional Initiatives For Reducing Air Pollutants within the Airport Area</u>

The Port of Seattle continues to support the air quality initiatives which have been enacted in the Puget Sound Region to improve air quality. The Port of Seattle is also committed to reducing emissions from various sources at the Airport. On-going considerations have focused on reducing the number of vehicles accessing the airport by providing alternatives to single-occupancy vehicle access to and from the Airport. Other actions have addressed motor vehicle idling along the terminal curbfront. Airport staff rigorously monitor access and idling by taxi's, limousines, and buses within the terminal area.

The Port of Seattle has supported a trip reduction strategy which has several components: employee shuttle bus service to remote public and employee parking to reduce vehicle trips in the terminal area; regional light-rail transit system; limiting passenger drop-off and pickup, and providing short-term parking alternatives.

Additional actions that could further reduce air pollutant concentrations at Sea-Tac:

- Financial disincentives for single occupancy driving to the Airport
  - Raise short-term parking rates
  - Implement toll system on the airport roadway with lower fees for High Occupancy Vehicles (HOV).
- Convenience disincentives/incentives:
  - Development of remote Park'n'Fly operations
  - Require private autos to use third floor plaza instead of terminal curbfront
  - Require use of alternative fuels by courtesy vehicles
- Improved airport access roads that attract users off the area arterials (i.e., South Access Road).

(5) <u>**Surface Transportation**</u>

Mitigation is proposed for each adverse impact that would occur with each "With Project" alternative (Alternatives 2, 3, and 4). An adverse impact is defined as a significant degradation in level of service (reducing the level of service) compared to the Do-Nothing alternative. In all cases the proposed mitigation measures will be sufficient to alleviate the significant adverse impact caused by proposed Airport improvements.

Because of the uncertainty of the proposed extension of SR 509 and South Access, as well as the public acceptance and use of high and higher occupancy vehicles and the impact of regional traffic on airport area roadways, the Port will continue to participate in cooperative planning with State and local officials to address its respective share of surface transportation impacts. Mitigation actions that are expected to be addressed in continued mitigation planning include the following associated with the Preferred Alternative:

<u>**North Unit Terminal Alternative (With State Route 509)**</u>

The following mitigation possibilities have been identified:

- International Boulevard (State Route 99) and South 160th Street - For the year 2010 only minor improvements to the intersection are necessary (dual southbound left-turn lanes, improvements to the westbound right-turn lane). These improvements are not sufficient for the year 2020 traffic levels due to the significant amount of regional traffic on International Boulevard (State Route 99). For the year 2020, the International Boulevard (State Route 99) corridor would need to be improved to provide additional capacity (i.e. seven lanes plus HOV treatments). The Port of Seattle would be responsible for a pro-rata contribution towards the proposed improvements at this intersection.
- International Boulevard (State Route 99) and South 170th Street - For the year 2010 only minor improvements to the intersection are necessary (dual northbound left-turn lanes, high-capacity right-turn lanes in the southbound and eastbound directions, westbound right-turn lane. These improvements would not be sufficient for the year 2020 due to the significant amount of regional traffic on International Boulevard (State Route 99). For the year 2020, the International Boulevard (State Route 99) corridor would need to be improved to provide additional capacity (i.e. seven lanes plus HOV treatments). The Port of Seattle would be responsible for a pro-rata contribution towards the proposed improvements at this intersection.
- Air Cargo Road and Southbound Airport Expressway Ramps; Air Cargo Road and South 170th Street; Northbound Airport Expressway Ramps and South 170th Street - These three intersections would require signalization by the year 2010. However, the construction of the North Unit Terminal would eliminate these three intersections by the year 2010. Therefore, temporary signals should be installed when the signal warrants are satisfied in order to provide adequate intersection control until the North Unit Terminal is constructed. The Port of Seattle would only be responsible for a pro-rata contribution towards the installation of the temporary signals due to the significant amount of

regional pass-through traffic utilizing the Airport Expressway at this interchange area.

- Northbound Interstate 405 On-Ramp from Southbound Interstate 5 - Eastbound State Route 518/ Northbound Interstate 405 should be widened to two lanes through the interchange. This additional lane could then be dropped at the State Route 181 Off-Ramp located down-stream. The Port of Seattle would only be responsible for a pro-rata contribution towards the proposed improvements at this interchange.

__North Unit Terminal Alternative (Without State Route 509)__

- International Boulevard (State Route 99) and South 160th Street - The impacts and possible mitigation measures are the same for this scenario as with SR 509. The Port of Seattle would be responsible for a pro-rata contribution towards the proposed improvements at this intersection.
- International Boulevard (State Route 99) and South 170th Street - The impacts and possible mitigation measures are the same for this scenario as with SR 509. The Port of Seattle would be responsible for a pro-rata contribution towards the proposed improvements at this intersection.
- International Boulevard (State Route 99) and South 188th Street - This intersection would require the construction of an urban interchange to meet the City of SeaTac's adopted level of service standard. With this type of improvement it would also be possible to incorporate a fly-over ramp design for the Airport South Access. The Port of Seattle would be responsible for a pro-rata contribution towards the proposed improvements at this intersection.
- International Boulevard (State Route 99) and South 200th Street - These include the following: providing additional capacity along the International Boulevard (State Route 99) corridor (i.e. seven lanes plus HOV treatments); providing additional capacity along the South 200th Street corridor (i.e. seven lanes); dual left-turn lanes in the southbound, eastbound, and westbound directions; and a westbound right-turn lane. The Port of Seattle would be responsible for a pro-rata contribution towards the proposed improvements at this intersection.
- 28th/24th Avenue South and South 200th Street - Only minor improvements to this intersection would be required (dual westbound left-turn lanes, eastbound right-turn lane, re-striping the northbound approach to provide one left-turn, one through, and two right-turn lanes). The Port of Seattle would be responsible for a pro-rata contribution towards the proposed improvements at this intersection.
- Military Road South and South 200th Street/Southbound Interstate 5 Ramps - Only minor improvements to this intersection would be required (dual northbound left-turn lanes, two eastbound through lanes). The Port of Seattle would be responsible for a pro-rata contribution towards the proposed improvements at this intersection.
- Military Road South and Northbound Interstate 5 Ramps - Only minor improvements to this intersection would be required (widening the eastbound approach to provide one left-turn and one right-turn lane, and providing a southbound right-turn phase overlap). The Port of Seattle would be responsible for a pro-rata contribution towards the proposed improvements at this intersection.
- Air Cargo Road and Southbound Airport Expressway Ramps; Air Cargo Road and South 170th Street; Northbound Airport Expressway Ramps and South 170th Street - These three intersections would require signalization by the year 2010 without SR 509. However, the construction of the North Unit Terminal would eliminate these three intersections by the year 2010. Therefore, temporary signals should be installed when the signal warrants are satisfied in order to provide adequate intersection control until the North Unit Terminal is constructed. The Port of Seattle would only be responsible for a pro-rata contribution towards the installation of the temporary signals due to the significant amount of regional pass-

through traffic utilizing the Airport Expressway at this interchange area.

- Northbound Interstate 405 On-Ramp from Southbound Interstate 5 - The impacts and proposed mitigation measures are the same for this scenario as with SR 509. The Port of Seattle would be responsible for a pro-rata contribution towards the proposed improvements at this interchange.

(6) **Earth**

An Erosion and Sedimentation Control Plan, including measures specific to site conditions, will be designed and implemented to minimize erosion and sedimentation levels. The plan would include elements for site stabilization, slope and drainageway protection, sediment retention, and dust control on haul routes and borrow sites.

As stated in Chapter IV, Section 2 "Land Use, the application and implementation of City of SeaTac regulatory provisions to the Master Plan Update improvements is currently the subject of negotiation through interlocal processes between the Port and City. If applicable, as determined from the result of the interlocal negotiation process between the Port of Seattle and the City of SeaTac (not expected prior to issuance of the Final EIS), the City of SeaTac Environmentally Sensitive Areas Ordinances allow alterations to seismic hazard areas only if (1) site-specific subsurface investigations show the site is not a seismic hazard or (2) mitigation is implemented that renders the proposed development as safe as if it were not located in a seismic hazard area.[6] Two seismic hazards occur on the site of the new parallel runway in relatively small areas of loose, shallow sediment. During runway construction, this sediment would be removed and replaced with compacted fill. If future subsurface investigations verify the occurrence of seismic hazards on Borrow Source Areas 1, 5, and 8, special measures to maintain cut slope stability during excavation in these areas may be required.

A landscaping plan will be developed for areas of excavation and construction. For the borrow source areas, the landscaping plan could include recontouring, seeding, and planting of trees and shrubs. Potential mitigation measures for aesthetic impacts of the proposed new runway are included in Chapter IV, Section 24 "Aesthetics and Urban Design" of this Final EIS.

(7) **Construction Impacts**

Although no surface transportation congestion mitigation is required, the following measures are identified to minimize construction related surface transportation impacts:

1. Develop a Construction and Earthwork Management Plan. The Plan would designate preferred haul routes and specific conditions such as hours of operations, traffic control changes, and route mitigation. Depending upon the selected contractor(s) haul routes, such controls could include:
   - Provisions that restrict truck traffic during AM and PM peak periods.
   - Contract provisions which would require the contractor to cover all loads to reduce debris and dust loss from the transport activities and to provide for street cleaning and pavement repairs during the construction process.
2. Consider acquiring material rights to the Maury Island sites. Use of Site #14 and the Maury Island King County Park (consistent with the development of the park and if permits can be obtained) would limit the affected routes to SR 509, which could handle additional truck traffic throughout the day without significant impacts on levels of service.

Because of the social disruption that would occur in the general vicinity of the proposed new runway construction, a construction mitigation acquisition will be implemented. This acquisition includes about 70 residential and commercial properties located east of Des Moines Memorial Drive between SR 509 and SR 518.

To minimize the fugitive dust transport, unpaved roads and inactive portions of the construction site will be watered (achieving a 50 percent reduction in dust) or chemically stabilized (achieving an 80 percent reduction) during dry periods.

[6] *Environmentally Sensitive Areas Ordinance*, City of SeaTac, 1994.

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CHAPTER IV, SECTION 10

WATER QUALITY AND HYDROLOGY

Changing the Airport's landscape, as would happen with the proposed Master Plan Update alternatives, could affect the hydrology of the Airport area as well as the downstream systems. Alternatives 2, 3, and 4 (the "With Project" alternatives) would include earthwork and the addition of impervious land surface area. These factors would decrease the amount of rainfall infiltrating the soil and increase stormwater runoff flow rates and volumes. Unmitigated, these changes in hydrology could cause downstream flooding, channel erosion, and degraded in-stream habitat. Detailed hydrologic modeling of the Airport and its surrounding watersheds was performed to quantify the magnitude of downstream impacts and to determine appropriate mitigation strategies.

Preliminary estimates indicated that 61 acre-feet of new on-site detention storage volume would be required for proposed developed areas draining to Miller Creek, and 31 acre-feet of storage would be required for areas draining to Des Moines Creek. These detention volumes would attenuate peak runoff rates from the Airport to provide protection from downstream flooding for storms having up to a 100-year return period. New impervious areas would increase annual runoff volumes to lower Miller Creek by 6 to 8 percent and volumes to Des Moines Creek by 1 to 2 percent. Most of the additional volume would flow through the downstream systems at rates that have low erosion potential. Higher runoff volumes could be partially offset by stormwater infiltration where on-site soils are suitable. Stormwater infiltration also would recharge shallow groundwater. In both creeks, low and median flow rates would be largely unaffected throughout the year, and high flows would increase slightly, most likely with no adverse impacts on stream channel characteristics.

Although Miller and Des Moines Creeks occasionally violate Class AA (extraordinary) water quality standards for selected parameters during storm flow conditions, water quality generally appears to be good. Some shallow and perched groundwater has been contaminated by leaking fuel distribution systems and underground storage tanks at the Airport. Other shallow, perched groundwater is assumed to be good quality. Deeper, regional groundwater resources used as drinking water are excellent quality and have no history of detectable levels of pollution.

Although pollutant loading would increase somewhat because of greater amounts of stormwater runoff associated with the "With Project" alternatives, compliance with mitigation requirements would be expected to prevent significant pollution or degradation of surface and groundwater resources.

(1) METHODOLOGY

The objectives of this analysis were to characterize existing hydrologic conditions in downstream systems, to evaluate hydrologic impacts, and to determine appropriate mitigation. HSP-F[1/] Version 10.0, a continuous simulation hydrologic model, was used to model the hydrology of the Airport, Miller Creek, and Des Moines Creek.[2/] Data included in this document were generated as part of the modeling analysis contained in **Appendix G.**

The HSP-F model for Miller Creek was based on an earlier HSP-F model of the entire watershed developed for King County to use to evaluate the Lake Reba Detention facility for stormwater control.[3/] Flood frequency estimates from this earlier model were subsequently used in FEMA floodplain studies for Miller Creek.[4/] For this analysis, the previously developed HSP-F model was upgraded with stream channel characteristics data from the FEMA studies and calibrated with five years of stream flow data (July 1989 to June 1994) collected by King County Surface Water Management Division from gages at the Lake

1/ *User Manual for Release 10, Hydrologic Simulation Program - FORTRAN (HSP-F), Environmental Protection Agency, 1993.*

2/ *HSP-F Hydrologic Modeling Analysis For Sea-Tac Airport Master Plan Update EIS,* Montgomery Water Group, 1995. (currently in Preliminary Draft version)

3/ *Miller Creek Regional Stormwater Detention Facilities Design Hydrologic Modeling,* Northwest Hydraulics Consultants, 1990.

4/ *Miller Creek, Normandy Park, Washington, Limited Map Maintenance Study,* Northwest Hydraulics Consultants, 1991.

Reba Detention facility and lower Miller Creek (as shown in **Exhibit IV.10-1**).

The HSP-F model for Des Moines Creek was based on recent hydrologic studies including a hydrologic model developed for the 1994 SASA EIS and another model used to design Tyee Pond.[5] Data from the *Des Moines Creek Watershed Plan*[6] also were used in developing the HSP-F model. The Des Moines Creek model was extended downstream to South 208th Street and calibrated with five years of stream flow data (October 1989 to July 1994) collected by King County Surface Water Management Division at the inlet to Tyee Pond (**Exhibit IV.10-1**).

Hydrologic simulations were based on 47 years of hourly precipitation records collected at the Airport from 1947 through 1994. The simulations focused on the operational impacts of the proposed Master Plan Update alternatives.

Representative locations along Miller Creek and Des Moines Creek were selected to evaluate the alternatives. Three locations were evaluated along Miller Creek, including below the Lake Reba Detention facility (Location A in **Exhibit IV.10-1**), at First Avenue S. (Location B), and near the mouth of the creek (Location C). Two locations were evaluated along Des Moines Creek, including below the confluence of the east and west branches (Location D) and at South 208th Street (Location E). Both Miller Creek and Des Moines Creek were simulated for a 47-year period. At each location, hydrologic parameters including flood frequencies, annual flow duration, annual runoff volumes, and flow exceedance characteristics as is listed in **Table IV.10-1** were summarized and evaluated.

A flood frequency analysis for existing conditions was done to characterize the peak flow rates in the creeks, which then served as a basis for determining the adequacy of the prescribed stormwater management facilities in attenuating peak flow rates under Alternative 2, 3, or 4. For the flood frequency analysis, various return periods for the peak flows were considered, including 100-year, 10-year, 2-year, and 1.11-year periods. Peak flows for each of these return periods have a probability of occurring, during any given year, of 1 percent, 10 percent, 50 percent, and 90 percent, respectively. The 100-year and 10-year return periods are conventionally used to evaluate flooding potential, while 2-year and 1.11-year return periods are most commonly used to evaluate stream channel erosion and sedimentation potential. Comparing flow durations and annual runoff volumes of Alternatives 2 through 4 against those of Alternative 1 provided an indication of stream channel erosion potential. Differences in annual runoff volumes among the alternatives also were calculated to evaluate changes in recharge to shallow groundwater.

Determining flow exceedance characteristics for the alternatives allowed a comparison of average flow rates during different seasons of the year when habitat requirements for aquatic species may vary. For purposes of this analysis, low, median, and high flow rates were evaluated during different seasons of the year representing 90, 50, and 10 percent flow exceedance levels, respectively.

Analysis of water resources in the Miller and Des Moines Creek basins was based on review of existing data. Potential impacts of each alternative on surface and groundwater resources were assessed by comparing estimates of pollutant loads in stormwater runoff for each alternative with existing water quality, state water quality standards, and other relevant water quality criteria, and known pollutant characteristics (e.g., fate, transport, and toxicity). In addition, required and practicable mitigation measures are discussed.

(2) EXISTING CONDITIONS

The following paragraphs summarize the existing surface water and ground water quality.

(A) Hydrology

Miller Creek watershed has a total basin area of 5,183 acres as is listed in **Table IV.10-2**. The watershed has about 1,224 acres of effective impervious land area with 60 impervious acres at the Airport. Des Moines Creek watershed has a total basin area of 3,585 acres. Des Moines Creek watershed has about 1,202 acres of effective impervious area with 369 impervious acres at the Airport.

The primary land uses in the watersheds are residential and commercial. Approximately

[5] *South Aviation Support Area Final Environmental Impact Statement*, Port of Seattle, 1994

[6] *TR-20 Model Files for Des Moines Creek Pond C (Tyee Pond)*, King County Surface Water Management Division, 1989.

62 percent of the land use in the Miller Creek basin is residential, 14 percent is commercial (non-Airport), and 4 percent is Airport. Approximately 29 percent of the land use in the Des Moines Creek basin is residential, 23 percent is commercial (non-Airport), and 27 percent is Airport. Both Miller Creek and Des Moines Creek watersheds are urbanized and exhibit "flashy" stream flow characteristics associated with developed basins. Storm flow rates measured in the creeks at the established gage stations, as well as those modeled, generally showed rapid flow rate increases in response to rainfall and rapid decreases at the cessation of storms. Between 1987 and 1991, King County Surface Water Management Division received drainage and flooding complaints in the Miller Creek watershed, some of which were flooding and erosion problems along Miller Creek.[7]

Flood frequencies under existing conditions were computed by using 47 years of hydrologic simulation for Locations A, B, and C along Miller Creek and Locations D and E along Des Moines Creek (as shown in **Exhibit IV.10-1**). The 100-year flow rates in Miller Creek, for instance, ranged from 171 cubic feet per second (cfs) below the Lake Reba Detention facility to 468 cfs at the mouth (**Table IV.10-4**). The 2-year flow rates ranged from 80 cfs below the Lake Reba Detention facility to 173 cfs at the mouth. The 100-year flow rates in Des Moines Creek were estimated to be 232 cfs below the confluences of the east and west branches and 280 cfs at South 208th Street, while the 2-year flow rates at these locations were 103 cfs and 112 cfs, respectively (**Table IV.10-5**).

Average seasonal flow rates were computed for existing conditions to illustrate the range that occurs throughout the year. Low, median, and high flow rates were calculated for Location B along Miller Creek and for Location D along Des Moines Creek (**Exhibits IV.10-2** and **IV.10-3**). Stream flow rates are highest from October through April, coinciding with the wet season. Flows in the streams typically reach their lowest rates between May and September. Similar seasonal flow characteristics were found at Locations A, C, and E and are listed in **Appendix G**.

(B) Surface Water Quality

Surface water resources within the vicinity of the Airport are shown in **Exhibit IV.10-4**. Portions of three drainage basins are within the vicinity of the Airport: the Lower Green River basin, the Miller Creek basin, and the Des Moines Creek basin. Presently, minimal runoff from the Airport drains to the Lower Green River basin. Approximately 19% of the existing Airport surface area is in the Miller Creek basin, and approximately 81% is in the Des Moines Creek basin, with portions from each basin going to the Industrial Wastewater System (IWS).

The Miller and Des Moines Creek basins exhibit similar drainage patterns, topographic characteristics, and land uses. Drainage from both basins flows to Puget Sound. Several tributaries, lakes, and wetlands are associated with each of these drainages. The Seattle-Tacoma International Airport covers an estimated 5 percent of the Miller Creek basin and 30 percent of the Des Moines Creek basin.

Miller Creek and Des Moines Creek and their tributaries are classified by the Washington Department of Ecology as Class AA (extraordinary) waters.[8] Surface waters are classified on the basis of both present and potential water uses. Classes range from Class AA (extraordinary) to Class C (fair). Although Miller and Des Moines Creeks are classified as Class AA (extraordinary) waters, they presently fail to meet some of the state water quality standards listed in **Table IV.10-6**.

Water quality degradation in Miller and Des Moines Creeks and their tributaries is characteristic of pollutants commonly found in urban stormwater runoff. Such pollutants, including nutrients, organics (e.g., oil and grease), metals, fecal coliform bacteria, and suspended solids, have contributed to occasional violations of Class AA water quality standards and federal water quality criteria in these basins. Miller and Des Moines Creek storm flow monitoring data

[7] *Drainage Complaints Information for Miller/Salmon/Seola Basin Planning Area, King County Surface Water Management Division, 1992.*

[8] *Washington Administrative Code - Water Quality Standards for the Surface Waters of the State of Washington.* WAC 173-201A, November 25, 1992.

indicate that state Class AA water quality standards are occasionally violated for pH, dissolved oxygen, and ammonia (as shown in **Table IV.10-3**). In addition, these data indicate that fecal coliform bacteria numbers frequently exceed state water quality standards. Potential sources of fecal coliform bacteria include failing septic systems in residential areas near Miller and Des Moines Creeks. Total phosphorus levels observed in storm flow samples often exceed the U.S. Environmental Protection Agency total phosphorus criterion of 100 µg/L, which is recommended to prevent nuisance algal growths in streams.[9] Except for occasional contributions of glycol and ammonia following deicing events and elevated copper and zinc, pollutant concentrations observed in airport stormwater runoff are comparable to storm flow monitoring data results collected from locations upstream and downstream of the Airport in both basins. These data appear to indicate that pollutant sources in both basins are widespread and not limited to the Airport. Runoff from portions of state highways 509, 518 and 99 within these drainage basins are likely major contributors to elevated levels of metals and suspended solids in Miller and Des Moines Creeks.[10]

National and local (Bellevue, Washington) studies of urban runoff have shown that copper, lead, and zinc are generally the most common and abundant metals in urban runoff.[11] The U.S. Environmental Protection Agency has determined that most metals in stormwater runoff are associated with or bound to suspended solids and, thus, generally are not available to aquatic life as potential toxicants. Approximately 40 percent or more of the total copper and zinc in stormwater runoff may be in dissolved forms.[12] Therefore they can be taken up by aquatic life through water, plants, and other animals ingested. Copper, zinc, and lead are generally the metals of most concern in urban stormwater runoff.

Urban and Airport stormwater runoff contribute to elevated levels of pollutants in Miller and Des Moines Creeks during storms. Many of these pollutants (e.g., organics and metals) are bound to suspended solids that pass rapidly through the systems and are deposited in the sediments of receiving waters, including Puget Sound. Consequently, concentrations of these solids-bound pollutants in streams quickly diminish as storm events pass and base flow conditions return.[13]

Existing pollutant loading contributions to Miller and Des Moines Creeks have been estimated for the Airport, the remainder of the basins, and the total basin. The relative pollutant contribution from Airport stormwater runoff was compared to total pollutant loading in each basin. Pollutant loadings for seven pollutants (TSS, BOD, TP, copper, lead, zinc, and oil and grease) in Airport stormwater runoff have been estimated based on water quality monitoring data. Pollutant loadings from the Airport may be over-estimated as stormwater samples were collected on the front end of storm events when pollutants concentrations appeared to be higher compared to the remainder of the storm flow event[14].

Annual pollutant loadings were estimated for these pollutants for the remainder of the Miller and Des Moines Creek basins by multiplying a range of established low and high loading rates for different land uses (e.g., open space, commercial, residential) by the appropriate land use areas. Total pollutant loadings were then calculated by adding Airport contributions to the remainder

9/ *Toward a Cleaner Aquatic Environment.* K.M. MacKenthun, U.S. Environmental Protection Agency, Washington, D.C. 1973 (As cited by U.S. EPA 1986)

10/ Personal communication with David Masters, King County Surface Water Management Division, March 22, 1995

11/ *Toxicants in Urban Runoff.* Galvin, D.V. and R.K. Moore, Municipality of Metropolitan Seattle, Seattle, WA. 1982. *Bellevue Urban Runoff Program Summary Report.* Pitt, R. and P Bissonnette, City of Bellevue, Storm and Surface Water Utility, Bellevue, WA. 1984. *Effects of Seattle Area Highway Stormwater Runoff on Aquatic Biota.* Highway Runoff Water Quality Report No. 11. Portele, G.J., B.W. Mar, R.R. Horner, and E.B. Welch, Department of Civil Engineering, University of Washington, Seattle, WA. 1982. *Results of the Nationwide Urban Runoff Program, Volume 1 - final Report.* Water Planning Division, U.S. Environmental Protection Agency, Washington, D.C. 1983.

12/ *Results of the Nationwide Urban Runoff Program, Volume 1 - final Report.* Water Planning Division, U.S. Environmental Protection Agency, Washington, D.C. 1983.

13/ *Toxicants in Urban Runoff.* Galvin, D.V. Pages 176-210 in R. Seabloom and G. Plews, eds. Proceedings of the Northwest Nonpoint Source Pollution Conference. Washington Department of Social and Health Services, Olympia, WA. 1987.

14/ *Seattle Tacoma International Airport Stormwater Pollution Prevention Plan,* Port of Seattle, June,1995.

of these basins (**Table IV.10-7**). All pollutant loading rates used were based on data collected in Pacific Northwest region (i.e., Portland, Seattle, King County) studies. Therefore, it is expected that actual pollutant loading rates would be accurately represented by the estimated loadings and actual loading rates would likely fall somewhere in between the low and high loading estimates. Based on estimated loading rates, the Airport contributes about 2 to 39% of the total TSS, BOD, TP, copper, lead, zinc, and oil and grease pollutant loads in the Des Moines Creek basin and between less than 1 and 4% of the total loading for these pollutants in the Miller Creek basin.

The percent contribution of Airport stormwater runoff to total annual pollutant loading varies for the different parameters, depending on the loading rate used for estimating loadings from the remainder of the Miller and Des Moines Creek basins. Using the lower loading rates for the different land uses, the Airport contributes a higher percentage of the total pollutant loading. Using the higher loading rates, the Airport contributes a lower percentage of the total pollutant loading. The relative contributions of these pollutants to the total pollutant loadings in each basin is generally lower than the percent of each basin that the Airport covers (i.e., 30% of the Des Moines Creek basin and 5% of the Miller Creek basin). The only exception being that the Airport could contribute as much as 39% of the total copper loading in the Des Moines Creek basin based on estimated total copper loadings using the lower loading rate for the appropriate land uses in the remainder of the basin. A majority of the total pollutant loads for these seven pollutants comes from stormwater runoff from other urbanized areas within each basin. Estimated contributions from the Airport to the total pollutant loadings for these pollutants supports the statements that Airport runoff is generally comparable or cleaner than stormwater runoff from other urban areas in these basins for these pollutants and that sources of pollutants to the creeks are widespread in these basins.

The *Annual Stormwater Monitoring Summary Report* [15/] also indicates that Airport stormwater runoff is generally cleaner or comparable to urban runoff for TSS, BOD, TP, total copper, total lead, total zinc, and oil and grease. It should be noted; however, that based on limited Airport stormwater monitoring for dissolved metals (i.e., copper, lead, and zinc), a majority of the copper and zinc appears to be in dissolved ionic forms. Therefore, the Airport may contribute to a higher percentage of the total dissolved copper and zinc pollutant loadings in Miller and Des Moines Creeks. This is important because dissolved metals are more toxic to aquatic biota. The stream monitoring study of Miller and Des Moines Creeks being conducted by the Port of Seattle this winter (1995-1996) at selected locations upstream and downstream of Airport stormwater discharges of the receiving waters is expected to determine toxicity of Airport stormwater runoff and creek water quality.

Other pollutants sometimes found in Airport stormwater runoff include ethylene and propylene glycol, potassium acetate, and ammonia. Ethylene and propylene glycol are presently used in the deicing of aircraft, and urea and potassium acetate are used to de-ice runways and taxiways at Sea-Tac Airport. In general, deicing of large numbers of aircraft occurs infrequently; however, deicing of some aircraft (MD-80) occurs frequently. Anti-icing of runways and taxiways occurs infrequently during snow storms or when water is present on runways and taxiways and temperatures are at or below freezing. As a result, relatively small quantities of these substances are used annually during Airport operations compared to other large airports. In 1991, an estimated 115,000 gallons of deicing fluid were used at Sea-Tac Airport[16/]. *All* of the aircraft deicing areas drain to the Industrial Wastewater System (IWS). Runways and taxiways drain to a separate storm drainage system. Some glycols and ammonia (from degradation of urea) have been observed in stormwater runoff.

Most of the glycols from aircraft deicing are collected and conveyed to the IWS and treated by the IWS treatment plant before being discharged to a sewer line that carries effluent to the Midway Sewer Treatment

15/ *Annual Stormwater Monitoring Summary Report*, Port of Seattle, August 1995.

16/ *Draft Sea-Tac Airport Comprehensive Stormwater and Industrial Wastewater Plan: Task 4 Report- De-icing Fluids Handling Practices*, prepared by KCM, Inc. for the Port of Seattle, 1994.

Plant. Glycols have been observed in four of seven monitored stormwater outfalls. Glycol concentrations monitored in Airport stormwater runoff are generally two orders of magnitude below levels reported to have acute toxic effects on salmonids. Levels of glycols in Airport stormwater runoff samples have ranged from below analytical limits of detection (<5 mg/L) to 479 mg/L[17]. Although unlikely, glycol levels in stormwater runoff, which contribute to biochemical oxygen demand, may contribute to reductions in dissolved oxygen and chronic effects on aquatic biota (e.g., reduced growth or increased susceptibility to disease).

Ammonia (from the degradation of urea used in runway anti-icing) levels observed in Airport stormwater runoff occasionally exceed both Class AA acute and chronic toxicity standards. Ammonia levels (from degradation of urea) in stormwater runoff samples have ranged from below limits of detection (<0.01 mg/L) to 13.1 mg/L. Elevated levels of glycols and ammonia in Airport stormwater runoff may contribute to adverse impacts on the biota of receiving waters.

Some heavy metals, particularly copper, lead, and zinc appear to violate both chronic and acute toxicity standards for aquatic life. Because metals data are reported as total metals and state water quality standards are based on dissolved ionic forms, it is uncertain whether or not chronic and acute toxicity standards for these metals are occasionally violated. State water quality standards (not shown in **Table IV.10-2**) govern dissolved metals and vary depending on receiving water hardness.

Water quality data available for Miller and Des Moines Creeks indicate that water quality has been degraded by urbanization and pollutant loading from urban stormwater runoff. Although Miller and Des Moines Creek monitoring data show that pollutants in storm flow and base flow occasionally violate selected Class AA water quality standards, water quality generally appears to be good, as indicated by the presence of resident and anadromous salmonid populations (e.g., trout and salmon). Salmonids, which require cold, clean water, generally are indicators of good water quality. Even though base flow water quality may be considerably better than storm flow water quality, limited base flow data for conventional parameters on Miller Creek indicate that temperature, dissolved oxygen, and pH infrequently violate state water quality standards.[18] These base flow data also indicate that numbers of fecal coliform bacteria frequently exceed the Class AA water quality standard. Violations of these parameters are not necessarily an indication of the presence of toxic concentrations of pollutants or poor water quality. Although no base flow data are available for Des Moines Creek, it appears likely that Des Moines Creek base flow water quality is similar to that of Miller Creek, since no permitted industrial discharges are present and because Des Moines Creek has similar drainage area, watershed, and land use characteristics.

Historically, fuels spills from the Airport have had a significant adverse impact on water quality in Des Moines Creek. Three fuel spills to Des Moines Creek have been reported since 1973. Each of these spills resulted in the mortality of fish and aquatic life in Des Moines Creek.[19] In 1973, an uncertain quantity of fuel was spilled into Des Moines Creek. The cause of this first spill was not reported. The 1985 and 1986 spills, which occurred at the Olympic tank farm and the Northwest tank farm, respectively, were caused by problems with the stormwater drainage and containment systems at those facilities. The spill at the Olympic tank farm occurred when a valve on a stormwater discharge line was inadvertently left open, permitting the spilled fuel to discharge to Des Moines Creek. All stormwater is now retained within the spill containment berms and pumped to the Industrial Wastewater System. Spills at the Northwest tank farm resulted from a mechanical failure. Spill containment systems at the Northwest tank farm have

17/ *Stormwater Pollution Prevention Plan*, Port of Seattle, June, 1995.

18/ Personal communications with Tim Yokers, Process Supervisor, Southwest Suburban Sewer District, on August 11, 1994.

19/ *South Aviation Support Area Final Environmental Impact Statement.* Port of Seattle, Seattle, WA, 1994.

been improved to contain potential future spills.[20]

The IWS is a separate conveyance system that collects and conveys wastewater from airport operations in the cargo, hangar, and gate areas, including deicing wastewater, to three IWS lagoons and a dissolved air flotation treatment facility in the southwest corner of the Airport. Collected wastewater, which includes glycols, is treated at the IWS treatment plant to meet NPDES permit effluent limits before being discharged to an 18-inch line that goes to the Midway Sewer Treatment Plant and then to a deep water outfall in Puget Sound. The Port of Seattle is presently in negotiations to settle a notice of intent to sue for alleged violations of the NPDES permit discharge limits for the IWS effluent.

(C) Groundwater Quality

The Airport lies on the Des Moines Drift Plain, which is the topographic area between Puget Sound and the Duwamish Valley. Three distinct groundwater aquifers (shallow, intermediate, and deep) have been identified in the Des Moines Drift Plain. Shallow, intermediate, and deep groundwater are separated by low-permeability silt and clay layers within the drift plain. In addition, in some locations groundwater is perched in depressions located on top of relatively impervious glacial till material and beneath the thin mantle of Alderwood and Everett gravelly sandy loam soils common in this region (see Chapter IV, Section 19). Perched groundwater is often found within 5 to 15 feet of the ground surface during the wetter months (October through March) but generally recede during drier months. Perched groundwater may appear on the surface as hillslope seeps, but is not likely a significant contributor to base flow conditions in Puget Lowland streams such as Miller and Des Moines Creeks. Perched groundwater zones are discontinuous. Although no comprehensive surveys or mapping of shallow, perched groundwater has been done in the vicinity of the Airport, the presence of Alderwood and Everett series soils and seeps around Miller and Des Moines Creeks and associated wetlands is an indicator of their presence. The availability of perched groundwater is typically too limited for use as a drinking water supply. There is no known use of this groundwater as a source of drinking water in the Airport vicinity, and its quality is unknown though assumed to be generally good. Some specific areas of perched shallow groundwater beneath the Airport is contaminated by aviation fuel.[21]

In addition to perched groundwater, shallow, intermediate, and deeper regional aquifers underlie the Airport. Based on recent geotechnical investigations in potential borrow site areas to the north and south of the Airport, an uppermost aquifer is located about 30-100 feet beneath the surface at an elevation of about 300 feet above sea level. This upper level aquifer (also called advance outwash or shallow aquifer), which has been contaminated in five locations from leaking jet fuel, and rental car fuel distribution systems at the Airport, is not used for domestic water supply. In addition, available site data indicates that impacts on the aquifer tend to be localized and contamination has not moved far or been identified at significant distances away from the sites. Contaminated soil and groundwater at these sites is in various stages of characterization and clean-up by the responsible parties.

There are several stages to management of groundwater contamination: discovery and reporting; identification and characterization of the sources, types, and extent of contamination; evaluation and selection of remedial responses; implementation of remedial responses (i.e., clean-up); and monitoring and sampling to confirm clean-up has been successful[22]. Characterization of some localized groundwater contamination has been completed and clean-up is ongoing. At some locations, contamination is in the process of being characterized and appropriate remediation will be developed as necessary to protect environmental and human health. In some cases, long-term monitoring may be an appropriate management strategy if there is no immediate threat to human or environmental health.

[20] *Stormwater Pollution Prevention Plan.* Port of Seattle, Seattle, WA. June, 1995.

[21] Personal communication with Roger Nye, Toxics Clean-up Program, Washington State Department of Ecology. Personal communication on August 18, 1994.

[22] Letter from Mr. Roger Nye, Washington Department of Ecology Toxics Clean-up Program, dated February 27, 1995 to Mr. Ronald Park, Assistant Planner, City of Des Moines.

Sources of contamination (e.g., leaking underground storage tanks and fuel distribution systems) typically are corrected immediately upon detection.

Management of groundwater contamination at the Airport is being conducted according to all applicable environmental regulations, including the Washington Model Toxics Control Act (MTCA). The Washington Department of Ecology (Ecology) is responsible for implementing MTCA, including listing areas or sites of known contamination and delisting sites as clean-up activities are completed. Ecology's Toxics Clean-up Program has confirmed that some areas of contamination have been cleaned-up. All Ecology Toxics Clean-up Program files, including a list of known areas of groundwater contamination and the status of completed and activities at the Airport (i.e., records) are available to the public by appointment at the Washington Department of Ecology Northwest Regional Office in Bellevue.

The intermediate or, Highline Aquifer (also called the Third Coarse Grained Deposit (Qc(3)) is located at an elevation between about 227 and 108 feet above mean sea level, which is over 100 feet beneath the surface of the Airport. The Seattle Water Department (SWD) has three operating wells in the Highline Aquifer. **Exhibit IV.10-4** shows the locations of these production wells. The Highline Water District (HWD), formally Water District 75, operates two wells in a deep aquifer (also called Fourth Coarse Grained Deposit (Qc(4)), which is located at about sea level. The two HWD wells serve as a source of drinking water for over 39,000 customers[23/]. The Des Moines well and the Angle Lake well (HWD wells) are located about a mile southwest and south of the Airport, respectively. The Des Moines well is located near Borrow Source Area 3 (Chapter IV, Section 19 Earth, includes a discussion of Borrow Source Areas). All three SWD wells are located north of SR 518 and the Airport. Two SWD wells, Riverton Heights Wells #1 and #2, are located near Borrow Source Area 5. The third SWD well, Boulevard Park is located further north.

The three SWD wells are part of a well field in the Highline Aquifer developed as part of an artificial recharge and recovery demonstration program. Treated Cedar River water is injected into the wells from the fall to spring, stored temporarily, and later withdrawn during peak summer demand periods between summer and early fall.

According to well logs, the static surface water level of the Highline Aquifer is approximately 80 to 200 feet beneath the ground surface. Overlying aquitards of glacial till and clay, which have very low and low permeabilities, protect the integrity of the Highline Aquifer by restricting downward movement of contaminants through these layers. For these reasons, the U.S. EPA considers the Highline Aquifer to have a low susceptibility to contamination from contaminants originating from the ground surface.[24/] There is no threat of contamination to SWD wells from existing contamination at the Airport because the wells are located up gradient and/or cross gradient of existing contamination and the direction of groundwater flow. These wells would become more susceptible to contamination if excavation of potential fill source materials at Borrow Source Area 5 remove aquitards (e.g., glacial till) providing a potential pathway for contaminants originating on the ground surface to reach the underlying aquifer. However, even with removal of these material, their up gradient/cross gradient location continue to protect them from contamination associated with the Airport.

Highline Water District wells also are protected from existing contamination by overlying aquitards. As indicated previously, additional studies are being conducted to better determine detailed groundwater movement patterns in the vicinity of the Airport. Both the Des Moines well and the Angle Lake well are over a mile south or southwest of the nearest area of localized contamination near the Alaska Airlines hangar and are considered, given current data, to be up gradient and/ or cross gradient of the Airport.

Most of the contamination at the Airport is jet fuel, which has relatively low water

23/ *Groundwater Contamination Susceptibility Assessment*, Highline Water District, SeaTac, WA, 1994.

24/ *Final Report Highline Well Field Aquifer Storage and Recovery Project*, Seattle Water Department, 1994.

solubility and generally binds to soil particles. Gasoline, which is also present, contains hydrocarbon constituents that while more mobile than jet fuel, also have relatively low water solubilities and a tendency to adsorb to sand, silt, and clay particles. Geologic materials present between existing contamination and Highline Water District wells would restrict movement of contaminated groundwater from perched groundwater and the upper aquifer to the deep Aquifer. In addition, there is no indication from groundwater monitoring well data that contamination is moving toward either of these wells. Migration potential of contaminants is low due to the low hydraulic conductivities, ranging from about 0.3 to 0.00003 feet per day[25], low flow rates and high pollutant adsorption and retention capacity of geologic materials (i.e., till and clay units) between localized areas of contamination and the wells. Therefore, it is unlikely that potable water would become contaminated or be ingested and existing localized areas of groundwater contamination do not represent a potential threat to human or environmental health. In addition, groundwater management activities being conducted in compliance with MTCA regulations are being designed to clean up any potential threats to human or environmental health.

Although neither the Highline Aquifer nor the deep aquifer is a sole-source aquifer, wellhead protection plans are being prepared to protect these wells from pollution within the 10-year time of travel zone, which is the area within about a half-mile radius of each well. Deep Aquifer water quality is excellent. There have been no violations of drinking water standards or detectable volatile organic carbons in these wells.[26] In conjunction with the federal Wellhead Protection Program, Highline Water District and the Seattle Water Department are in the process of preparing wellhead protection plans. The plans include identification and evaluation of potential sources of groundwater pollution adjacent to these wells and specific measures for preventing groundwater contamination. To comply with existing laws, an approved wellhead protection plan must be in place by mid-1996.[27] Groundwater contamination susceptibility assessments have been completed for these wells, the first step in the wellhead protection planning process.

Based on previous geotechnical studies and ongoing groundwater monitoring in the vicinity of groundwater contamination, uppermost groundwater beneath the Airport is located in perched zones that are laterally discontinuous and likely do not discharge to Miller or Des Moines Creeks. Flow of groundwater in the shallow aquifer (advance outwash aquifer) generally appears to be toward the west. The shallow aquifer discharges to Miller and Des Moines Creeks where the creeks intersect advance outwash deposits. Groundwater contamination areas are located near the terminals on the east side of the Airport. Groundwater flow rates are generally slow (a few feet per year). Because localized areas of contaminated groundwater are isolated and small, geologic deposit conductivity rates are low, and contamination is being monitored and cleaned up, it is unlikely that contaminated groundwater would reach Miller or Des Moines Creeks.

A more detailed recent geohydrology study at the Airport completed by the Port of Seattle characterizes subsurface geology, aquifers, and aquitards, groundwater occurrence, movement, and recharge and discharge relationships in the vicinity of the Airport (**Appendix Q-A** of the Final EIS). This study confirms that:

- There are four zones of groundwater occurrence: perched zone; upper or shallow aquifer (Vashon Advance Outwash (QVA)), Intermediate or Highline Aquifer (Third Coarse Grained Deposit (Qc(3)), and Deep Aquifer (Fourth Coarse Grained Deposit (Qc(4));
- Ground water is occasionally perched on top of glacial till, within fill, or in isolated lenses of sand within glacial till deposits.
- Perched groundwaters beneath the Airport are generally seasonal, laterally discontinuous, and likely do not

[25] *Geology of Seattle Washington*, Bulletin of the Association of Engineering Geologists, 28(3):239-302, 1991.

[26] Personal communication with Jay Gibson, Planning and Construction Manager, Water District No. 75 on November 15, 1994.

[27] Letter from Scott Haskins, Acting Superintendent of Water, Seattle Water Department, December 21, 1994 to Michael Cheyne, Port of Seattle.

discharge to Miller or Des Moines Creeks.

- Perched groundwater is generally separated from the uppermost aquifer (advance outwash) by an aquitard of glacial till (10-50 feet thick); this aquitard restricts the downward movement of contamination from localized areas of perched groundwater to the upper aquifer.
- The upper aquifer is generally located in advance outwash deposits and generally flows west; discharge from this aquifer to Miller and Des Moines Creeks occurs in areas where the creeks intersect these deposits.
- A 50-to-100 foot thick aquitard of very low permeability silt and clay material (Lawton Clay) generally exists between the upper and intermediate or Highline Aquifer; this aquitard restricts the movement of pollutants from isolated areas of contamination in the upper aquifer to the intermediate aquifer; the Lawton Clay aquitard appears to be discontinuous to the south near Borrow Source Area 1.
- Downward movement of contaminants through clay and till aquitards is restricted by the very low hydraulic conductivity and high absorption capacity of the silt and clay particles in these deposits.
- Removal of the glacial till aquitard at borrow source areas would increase the susceptibility of the upper aquifer to contamination from substances originating on the ground surface; in addition, removal of the glacial till aquitard would expose underlying advance outwash deposits and increase upper aquifer recharge area and recharge volumes; these increases could be reduced in the future if new developments create impervious surfaces in these areas.
- Construction of the parallel third runway would reduce the upper aquifer recharge area, but an overall net increase in upper aquifer recharge area and volumes would result from activities in borrow source areas.

(3) FUTURE CONDITIONS

Potential construction and operational impacts are evaluated for five different construction phases scheduled for completion by the years 2000, 2010, and 2020.

(A) Do-Nothing (Alternative 1)

Hydrology in Miller Creek and Des Moines Creek would not change appreciably in future years under Alternative 1 (Do-Nothing). Opportunities for new development in the upper reaches of the basin are limited and would be subject to increasingly more stringent stormwater detention standards. While annual stormwater volumes would increase with additional development, flood frequencies would remain about the same. Efforts such as improving the efficiency of existing regional stormwater detention facilities and constructing new facilities could improve stream flow conditions by further attenuating peak flow rates, thereby reducing flooding, erosion, and sedimentation. These issues would be addressed as part of future basin planning activities jointly conducted by King County Surface Water Management Division, the Port of Seattle, and the cities of Burien, Des Moines, and SeaTac.

Construction would not have the potential to affect surface water and groundwater quality if a proposed new parallel runway and associated terminal options were not constructed. Because of various conditions of the Port of Seattle National Pollutant Discharge Elimination System Permit (NPDES) that would be implemented regardless of whether the proposed Master Plan Update alternatives are completed, the quality of Airport stormwater runoff and water from the Industrial Wastewater System (IWS), which discharges to the Midway Sewage Treatment Plant outfall could improve. Because pollutant sources in both the Miller and Des Moines Creek basins and Puget Sound appear to be widespread and because the Airport likely contributes only a fraction of the total pollutants to these waters, the potential for improvement of these receiving waters is unlikely to be significant.

In the case of SR 509/South Access, the roadway alignment could include at least 3 miles of roadway length in the Des Moines Creek watershed and 0.7 miles in the Miller

Creek watershed.[28] The SR 509 roadway alignment would impact several wetlands and cross Des Moines Creek in up to three different locations. Coordinating mitigation associated with the Master Plan Update improvements with the mitigation for this roadway, in instances where these project areas impact a common resource, would increase the effectiveness of the mitigation and minimize the likelihood of significant cumulative impacts.

(B) <u>"With Project" Alternatives (Alternative 2, 3 and 4)</u>

Under the "With Project" alternatives, approximately 97 acres of new impervious surface area and 264 acres of fill area would drain to Miller Creek. Approximately 95 acres of new impervious surface area and 282 acres of fill area would drain to Des Moines Creek.

Stormwater leaving the Airport area would be detained according to Washington State Department of Ecology standards. To meet these standards, preliminary hydrologic modeling indicated that approximately 61 acre-feet of new stormwater detention volume would be needed on-site in the Miller Creek watershed, and 31 acre-feet would be needed on-site in the Des Moines Creek watershed.

A conceptual layout of the stormwater management facilities and discharge locations is shown in **Exhibit IV.10-5**. Hydrologic simulations indicate the peak flow rates in Miller Creek would be slightly lower in comparison to Alternative 1 for the flood frequencies listed in **Table IV.10-4**. At Location B, for instance, the 100-year peak flow rate was predicted to decrease from 293 cfs under Alternative 1 to 292 cfs under Alternatives 2, 3, or 4. Peak flow rates for return periods of 1.11 years and 2 years were estimated to be lower for Alternatives 2, 3, or 4 compared to those of Alternative 1 (shown in **Table IV.10-7A**). In Des Moines Creek, in-stream peak flow rates for Alternative 2, 3, or 4 were predicted to be the same for the 100-year return period compared to those of Alternative 1 (see **Table IV.10-8**). For the 1.11-year, 2-year, and 10-year return periods, flow rates predicted for Alternatives 2, 3, and 4 were less than those for Alternative 1. On-site detention, combined with diverting 66 acres of impervious surface area at SASA from the stormwater system to the industrial waste system,[29] caused the lower peak flow rates in Des Moines Creek for these return periods. Regulating peak flow rates to the 10-year return period rate and more frequently occurring flows would decrease future flooding and erosion potential in Des Moines Creek.

By adding impervious and compacted fill areas to the watersheds, the "With Project" alternatives would increase the annual runoff volumes in Miller Creek and Des Moines Creek. Annual runoff volumes would be increased by 6 to 11 percent at various locations in Miller Creek and 1 to 2 percent in Des Moines Creek (**Table IV.10-9**). However, 91 to 93 percent of the incremental volume in Miller Creek would occur at rates less than the 1.11-year return period flow rate, and 97 percent would occur at rates less than the 2-year return period flow rate. Approximately 92 to 96 percent of the incremental volume in Des Moines Creek would occur at rates less than the 1.11-year return period flow rate, and 97 to 99 percent would occur at rates less than the 2-year return period flow rate. The 1.11-year and 2-year return period flow rates are generally considered to be responsible for defining the shape of stream channels; therefore, most of the additional volume added to the creeks would pass downstream at rates having low erosion potential.

Flow exceedance characteristics were determined for both Miller Creek (**Exhibit IV.10-6**) and Des Moines Creek (**Exhibit IV.10-7**) for different seasons of the year. Low and median flows for both creeks were largely unaffected during the summer months (May-September) and only slightly affected during the winter months (October-April). In Miller Creek, high flows increased on average by 0.2 cfs during the summer months and 1.4 cfs during the winter months when comparing Alternative 1 (Do-Nothing) to the "With Project" (Alternatives 2, 3 and 4). In Des Moines Creek, high flows increased on average by 0.1 cfs during the summer months and increased on average by 0.6 cfs during the winter months when comparing

[28] *SR 509/South Access Road Discipline Draft Report - Water Quality,* Shapiro and Associates, Inc., 1994.

[29] *South Aviation Support Area Final Environmental Impact Statement,* Port of Seattle, 1994.

Alternative 1 to Alternatives 2 through 4. The magnitude of changes in flow was similar at Locations A, C, and E. These relatively small changes in flow rates would not appreciably alter the existing character of these stream channels.

Two variations in the design of Alternatives 2 through 4 include runway lengths of 7,000 feet and 7,500 feet instead of an 8,500-foot length. The 7,000-foot and 7,500-foot runway lengths would create approximately 18 percent and 12 percent less impervious area, respectively, compared to the 8,500-foot runway length. A corresponding reduction in the magnitude of peak runoff rates entering the stormwater management facilities would result. Since flow rates leaving the facilities are limited by stormwater release rate criteria[30] the peak flow rates at the outlets would be about the same for each of Alternatives 2 through 4, regardless of runway length. Smaller amounts of detention volume would be required for the 7,000-foot and 7,500-foot runway lengths to attenuate peak flow rates to Department of Ecology criteria. In comparison to the 8,500-foot length, the 7,000-foot and 7,500-foot runway lengths would result in more infiltration and less annual runoff volume.

Potential construction impacts on surface water quality generally would be primarily related to short-term increases in total suspended solids from erosion and sedimentation. Such impacts would be mitigated by implementation of an approved stormwater pollution prevention plan and erosion and sedimentation control plan, which are required conditions of the Port of Seattle NPDES permit for the Airport. These plans would be required before construction could begin and would include specific performance standards and contingency plans.

Another potential construction impact on water quality involves a range of pollutants used during construction (e.g., fuels, lubricants, and other petroleum products, and construction waste such as concrete wash water). Pollution could result from accidental spills of these substances, from leaking storage containers, from refueling, and from construction equipment maintenance activities. Because spilled petroleum products and other substances generally are bound to soil particles, spilled substances are unlikely to reach or contaminate surface water or groundwater. Potential transport also is related to the distance of a spill site from surface and groundwater resources, the size of the spill, construction site characteristics (e.g., soils and topography), and contractor preparedness. Impacts from potential spills can be mitigated by implementation of best management practices (e.g., construction waste handling plans and fueling and vehicle maintenance plans) and strict contractual requirements of contractors.

Potential increases in suspended solids or other pollutants (e.g., spilled petroleum products) from construction sites are directly related to the size of the construction area, the amount of exposed soil, topography, proximity to water bodies, and the effectiveness of erosion and sediment control plans. Phase 1 construction activities scheduled for completion by the year 2000 have the greatest potential to affect surface and groundwater quality because construction areas total 193 acres (for an 8,500-foot runway). Phase 1 construction activities include construction of the new parallel runway, realignment of South 156th Way and South 154th Street, and construction of other airport infrastructure. Unless mitigated effectively through compliance with grading and drainage design standards, runway construction, which involves clearing, grading, and filling of 249 acres, would contribute significant quantities of sediment to Miller Creek and Des Moines Creek and temporary increases in suspended sediment levels. Without effective mitigation, Phase 1 construction of the 7,500-foot runway or 7,000-foot runway option also would result in temporary increases in suspended solids in Miller and Des Moines Creeks. Because of the smaller areas affected, the 7,500-foot and 7,000-foot runway options would have incrementally lower risks of temporarily increasing the concentration of total suspended solids in these creeks.

Construction activities scheduled for completion by the year 2010 (Phases 2 and 3) are limited to airport infrastructures required to support airport operations, including

[30] *Stormwater Management Manual for the Puget Sound Basin*, Washington State Department of Ecology, 1990.

expansion of existing parking, creation of a new parking garage, and expansion of the north and south satellites. All of these proposed construction activities (involving about 80 acres) are within the Des Moines Creek drainage basin. Increased erosion and sedimentation during construction of landside options would contribute to temporary increases in total suspended solid levels. Potential impacts on water quality are not expected, however, since implementation of erosion and sedimentation control plans (which are required before construction begins) would effectively control erosion through prevention or collection of eroded material in nearby catch basins. If Best Management Practices (BMPs) are not effectively implemented, Phase 2 and 3 construction activities could result in temporary increases in suspended sediment levels in Des Moines Creek.

Activities scheduled for completion by the year 2020 (Phases 4 and 5) involve about 40 acres or about 22% of the total area affected by Phases 1 through 3. Activities include construction of new taxiways, additional expansion of the north and south satellites, additional expansion of existing parking facilities, and new aircraft maintenance facilities within the South Aviation Support Area (SASA). Proposed landside construction activities, which generally would redevelop previously developed areas, are within the Des Moines Creek drainage basin. If erosion and sedimentation control and construction waste management plans are effectively implemented, significant temporary increases in suspended sediment levels or other pollutants in Des Moines Creek from Phases 4 and 5 construction activities are unlikely.

Potential increases in total suspended solids (TSS) in Miller and Des Moines Creeks from sheet and rill erosion of fillslopes and cutslopes have been estimated (Please see Chapter IV, Section 23 for a more detailed discussion on erosion and sedimentation estimates). Sediment yielded from fillslopes and borrow source areas and actual amount of sediment reaching the creeks would be expected to be reduced by removal of suspended solids by stormwater management facilities (i.e., wet vaults, wet ponds, and biofiltration swales). The primary mechanism for delivery of sediment from these sites to Miller and Des Moines creeks is in stormwater runoff as suspended solids. It is assumed that all sediment yielded from fillslopes and cutslopes would be delivered to stormwater management facilities and proposed conceptual stormwater runoff control wet vaults, wet ponds, and biofiltration swales would remove at least 80% of suspended solids in stormwater runoff. Therefore, 20% of the estimated sediment yields would be delivered to Miller and Des Moines Creeks as TSS.

During and up to 1 year after construction, it is estimated there would be an increase in TSS loading of between about 28 to 71 tons per year to Miller Creek and between about 24 to 60 tons per year to Des Moines Creek, depending on the effectiveness of erosion controls. Based on estimated existing sediment loadings (as TSS) for Miller Creek and Des Moines Creek, these represent estimated increases of about 11 to 27% (Miller) and 14 to 36% (Des Moines) during and immediately after construction. As vegetation becomes established the first year after completion of construction, average annual increased sediment loading would be expected to decrease exponentially to about 10 tons per year on Miller Creek and 7 tons per year on Des Moines Creek; these represent an increase of about 4% compared to existing total loading for both creeks. These estimated increased loadings may be higher than actual loadings, as some of the eroded material would be expected to be deposited at the base of slopes and would not be delivered to stormwater runoff facilities or Miller and Des Moines Creeks. Actual increases in sediment loading to the creeks depends on the effectiveness of the erosion and sediment control measures implemented as part of an approved erosion and sediment control plan. Numbers could be higher if untreated stormwater runoff from construction and borrow source areas reaches Miller and Des Moines Creeks.

In addition to potential impacts to surface water, activities at borrow source areas could affect groundwater resources by altering geology and changing groundwater recharge, movement, and discharge patterns. In general, precipitation percolates through shallow mantles of soil to underlying glacial till (except at borrow source area 3 where till is generally absent), contributing to seasonally perched groundwater, groundwater recharge, and groundwater discharge to Miller and Des Moines Creeks (along slopes near the creeks). Removal of glacial till layers at most borrow source areas would expose underlying advance or recessional outwash deposits increasing potential recharge and susceptibility to contamination of the uppermost aquifer, which is located in advance outwash deposits. Removal of glacial till layers and exposure of more permeable advance and recessional outwash could result in proportional reductions in perched groundwater or increases in upper aquifer (advance outwash aquifer) recharge. Potential impacts on perched groundwater and upper aquifer recharge, discharge, and movement patterns depends on the geology at these sites, proposed grading plans and future site development. Please see Chapter IV, Section 23 "Construction Impacts" of the Final EIS for a more detailed discussion of potential impacts to surface and groundwater.

Potential operational impacts on surface and groundwater quality are related primarily to the amount of new impervious surface area and increased stormwater runoff. Airport stormwater outfalls to Miller and Des Moines Creeks are shown in **Exhibit IV.10-8.** About 193 acres of new impervious surface would be created upon completion of Phase 1 (i.e., Year 2000). Drainage from the new runway and taxiways would be detained on-site and then conveyed to both Des Moines Creek and Miller Creek. Although proposed stormwater management facilities would remove some pollutants from airport runoff, Miller and Des Moines Creeks would receive increased loadings of organics, metals, fecal coliform bacteria, and nutrients during storms. Increases in the loadings of these pollutants in these creeks during storms would contribute to violations of Class AA water quality standards for dissolved oxygen, copper, lead, zinc, and ammonia. These increases would adversely affect the beneficial uses of these streams and could result in acute and chronic effects on aquatic biota (i.e., impairment of the propagation of aquatic biota).

Concentrations of glycols detected in Airport stormwater runoff are several orders of magnitude below levels reported to have acute effects on salmonids.[31] Increases in the quantities of glycols or runway anti-icers (i.e., urea and potassium acetate) in stormwater runoff could contribute on adverse effects on aquatic biota in Miller and Des Moines Creeks.

Operational activities related to Phases 2, 3, 4, and 5 would not have significant adverse effects on water quality. Completion of these phases, which consist almost entirely of redevelopment of previously developed areas, would not significantly increase impervious surface areas, stormwater runoff, or pollutant loading to Miller and Des Moines Creeks.

Under Phases 2 through 5, pollution of surface water and groundwater could result from airport operations via the use or leakage of hazardous materials (e.g., fuels and other petroleum products) stored in large quantities at the Airport. Causes of past fuel spills to Des Moines Creek have been remedied through containment and recovery measures now in place. Future spills of fuel and other substances used at the Airport are unlikely to reach Des Moines Creek because tenants are required to prepare and implement spill prevention, control, and countermeasures plans. In addition, the Port of Seattle also is required to prepare a Spill Prevention, Control and Countermeasures Plan as part of the NPDES Permit issued and enforced by the Washington Department of Ecology. The permit contains a series of general and specific conditions designed to prevent and control delivery of pollutants to Miller and Des Moines Creeks and Puget Sound.

Chapter IV, Section 16 "Plants and Animals" includes a discussion of the portions of Miller Creek and Des Moines Creek, and their tributaries which would be directly affected and require relocation as a part of the Master Plan Update improvements.

(C) Preferred Alternative (Alternative 3)

As was described earlier, approximately 97 acres of impervious surface area and 262 acres of fill area would drain to Miller Creek with the Preferred Alternative (Alternative 3). Approximately 95 acres of impervious

[31] *Seattle-Tacoma International Airport De-Icer/Anti-Icer Study.* Prepared by Woodward-Clyde Consultants for the Port of Seattle 1993.

surface area and 282 acres of fill area would drain to Des Moines Creek. To meet the Washington State Ecology standards, approximately 61 acre-feet of new stormwater detention volume would be needed on-site in the Miller Creek watershed, and 31 acre-feet would be needed on-site in the Des Moines Creek watershed.

Hydrologic simulations indicate the peak flow rates in Miller Creek would be slightly lower in comparison to the Do-Nothing for the flood frequencies assessed. At Location B, for instance, the 100-year peak flow rate would decrease from 293 cfs under Alternative 1 to 292 cfs under with the Preferred Alternative. Peak flow rates for return periods of 1.11 years and 2 years were estimated to be lower compared to those of Alternative 1. In Des Moines Creek, in-stream peak flow rates would be the same for the 100-year return period compared to those of Alternative 1. For the 1.11 year, 2-year, and 10-year return periods, flow rates would be less than those for Alternative 1. On-site detention, combined with diverting 66 acres of impervious surface area at SASA from the stormwater system to the industrial wastewater system,[32/] would cause the lower peak flow rates in Des Moines Creek for these return periods. Regulating peak flow rates to the 10-year return period rate and more frequently occurring flows would decrease future flooding and erosion potential in Des Moines Creek.

By adding impervious and compacted fill areas to the watersheds, the annual runoff volumes would increase in Miller Creek and Des Moines Creek. Annual runoff volumes would be increased by 6 to 8 percent at various locations in Miller Creek and 1 to 2 percent in Des Moines Creek. However, 91 to 93 percent of the incremental volume in Miller Creek would occur at rates less than the 1.11-year return period flow rate, and 97 percent would occur at rates less than the 2-year return period flow rate. Approximately 92 to 96 percent of the incremental volume in Des Moines Creek would occur at rates less than the 1.11-year return period flow rate, and 92 to 97 percent would occur at rates less than the 2-year return period flow rate.

Flow exceedance characteristics were determined for both Miller Creek and Des Moines Creek for different seasons of the year. Low and median flows for both creeks would be largely unaffected during the summer months (May-September) and only slightly affected during the winter months (October-April). In Miller Creek, high flows would increase on average by 0.2 cfs during the summer months and 1.4 cfs during the winter months when comparing Alternative 1 (Do-Nothing) to the Preferred Alternative. In Des Moines Creek, high flows would increase on the average by 0.1 cfs during the summer months and increase on average by 0.6 cfs during the winter months when comparing Alternative 1 to the Preferred Alternative. The magnitude of changes in flow would be similar at Locations A, C, and E. These relatively small changes in flow rates would not appreciably alter the existing character of these stream channels.

Potential construction impacts on surface water quality generally would be primarily related to short-term increases in total suspended solids from erosion and sedimentation. Such impacts would be mitigated by implementation of an approved stormwater pollution prevention plan and erosion and sedimentation control plan, which are required conditions of the Port of Seattle NPDES permit for the Airport. These plans would be required before construction could begin and would include specific performance standards and contingency plans.

Another potential construction impact on water quality involves a range of pollutants used during construction (e.g., fuels, lubricants, and other petroleum products, and construction waste such as concrete wash water). Pollution could result from accidental spills of these substances, from leaking storage containers, from refueling, and from construction equipment maintenance activities. Because spilled petroleum products and other substances generally are bound to soil particles, spilled substances are unlikely to reach or contaminate surface water or groundwater. Potential transport also is related to the distance of a spill site from surface and groundwater resources, the size of the spill, construction site characteristics (e.g., soils and topography), and contractor preparedness. Impacts from potential spills can be mitigated by implementation of best management practices (e.g., construction

[32/] *South Aviation Support Area Final Environmental Impact Statement,* Port of Seattle, 1994.

waste handling plans and fueling and vehicle maintenance plans) and strict contractual requirements of contractors.

Potential increases in suspended solids or other pollutants (e.g., spilled petroleum products) from construction sites are directly related to the size of the construction area, the amount of exposed soil, topography, proximity to water bodies, and the effectiveness of erosion and sediment control plans.

Operational activities related to Phases 2, 3, 4, and 5 would not have significant adverse effects on water quality. Completion of these phases, which consist almost entirely of redevelopment of previously developed areas, would not significantly increase impervious surface areas, stormwater runoff, or pollutant loading to Miller and Des Moines Creeks.

Under Phases 2 through 5, pollution of surface water and groundwater could result from airport operations via the use or leakage of hazardous materials (e.g., fuels and other petroleum products) stored in large quantities at the Airport. Causes of past fuel spills to Des Moines Creek have been remedied through containment and recovery measures now in place. Future spills of fuel and other substances used at the Airport are unlikely to reach Des Moines Creek because tenants are required to prepare and implement spill prevention, control, and countermeasures plans. In addition, the Port of Seattle also is required to prepare a Spill Prevention, Control and Countermeasures Plan as part of the NPDES Permit issued and enforced by the Washington Department of Ecology. The permit contains a series of general and specific conditions designed to prevent and control delivery of pollutants to Miller and Des Moines Creeks and Puget Sound.

Chapter IV, Section 16 "Plants and Animals" includes a discussion of the portions of Miller Creek and Des Moines Creek, and their tributaries which would be directly affected and require relocation as a part of the Master Plan Update improvements.

(4) CUMULATIVE IMPACTS

Hydrology in Miller Creek and Des Moines Creek could be affected by future development and large-scale projects in the watersheds. In the Des Moines Creek watershed, proposed non-Master Plan Update projects and other urban development would add impervious surface area in the watersheds and reduce infiltration. As with all new development, these projects would be required to provide stormwater management facilities designed to Ecology standards. As currently planned, impacts from each project would be mitigated on a project-by-project basis.

Although it is anticipated that construction and operational impacts on water quality would be mitigated through implementation of NPDES permit requirements, detention requirements, and compliance with state water quality standards, construction and operation of the proposed Master Plan Update alternatives and other projects in the vicinity could contribute to cumulative adverse effects on surface water and groundwater resources. Implementation of an erosion and sedimentation control plan would reduce temporary increases in total suspended solids but may not eliminate them. Similarly, the potential for pollutant loading would be reduced but not eliminated by the required stormwater management facilities (e.g., detention facilities, wet ponds, biofiltration swales). The proposed project in combination with other proposed development in these drainage basins would result in increased pollutant loading to receiving waters and adverse cumulative effects on water quality.

These other projects also could contribute to cumulative effects on groundwater. Conversion of forests and other vegetated areas to impervious surfaces contributes to reduced infiltration and groundwater recharge. Reductions in pervious areas would reduce recharge to perched groundwater and aquifers. Assuming that shallow groundwater discharges are a component of base flows in Miller and Des Moines Creeks, incremental reductions in groundwater discharge could reduce base flows in these creeks.

(5) MITIGATION

The following stormwater management mitigation would be required unless basin plans determine that other criteria would be acceptable:

- Provide stormwater detention for construction and operation of new on-site development. Detention criteria would be based upon Department of Ecology standards limiting 2-year peak flow rates from the developed portions of the site to 50 percent of the existing 2-year rate, limiting the developed 10-year flow rate to the existing 10-year rate, and limiting the developed 100-year flow rate to the existing 100-year rate. Stormwater detention volumes would be provided with either underground storage vaults, as shown in **Exhibit IV.10-5**, or with regional storage ponds. Detention requirements of Ecology's *Stormwater Management Manual for the Puget Sound Basin* are more stringent than those of the *King County Surface Water Design Manual*, the latter of which have been adopted by the City of SeaTac. The *King County Surface Water Design Manual* is presently being revised and the revised version is expected to contain design standards that are comparable to or more stringent than Ecology's manual.

- Stormwater quality treatment would be provided with a combination of wet vaults and biofiltration swales.
- Design stormwater facility outlets to reduce channel scouring, sedimentation and erosion, and improve water quality. Where possible, flow dispersion and outlets compatible with the proposed stream mitigation (Appendix P) should be incorporated into engineering designs.
- To mitigate potential reductions in shallow groundwater recharge and incremental reductions in base flows in these creeks, infiltration facilities would be constructed where feasible. One location has been identified as suitable for shallow infiltration facilities an area in the northeast corner of the Airport.[33].
- Existing and proposed new stormwater facilities should be maintained according to procedures specified in the operations manuals of the facilities.
- The potential for using constructed aquifers within the runway fill, as described in **Appendix Q-C**, should be further investigated.
- Tyee pond would be relocated and enlarged as part of the SASA project. The relocated and enlarged pond would be a three-celled system with 40 to 45-acre feet storage capacity located north of the main SASA footprint. The first two cells would be densely vegetated emergent wetland cells for enhanced biofiltration and water quality improvement and the third cell would be off-line, providing detention for large storm events[34].

Various mitigation requirements, as stipulated by federal, state, and applicable local laws, policies, and design standards, would be applicable to construction and operation of the proposed new parallel runway and landside development at the Airport. These requirements would be components of the proposed design and are expected to reduce potential impacts on surface water and groundwater quality. For example, potential temporary increases in suspended solids levels in Miller and Des Moines Creeks or their tributaries from construction activities would be reduced by implementation of an effective erosion and sedimentation control plan, which is required before construction could begin.

Effective erosion and sedimentation control could be achieved by using a system of erosion controls (e.g., mulching, silt fencing, sediment basins, and check dams) that are properly applied, installed, and maintained. In a study of construction sites in King County between January 1988 and April 1989, the most common reasons for ineffective erosion control plans included failure to install Best Management Practice (BMP) erosion controls, improper installation of erosion controls, and failure to maintain erosion controls.[35] The Port of Seattle may need to include specific provisions in its agreements with contractors to ensure that erosion control measures are properly installed and maintained during construction activities (e.g., performance bonds).

Use of BMPs at construction sites, such as spill containment areas, phasing of construction activities (to minimize the amount of disturbed and exposed areas), and conducting activities during the dry season (April through September), also should prevent or reduce potential impacts on surface water and groundwater quality. According to the NPDES permit (Permit No. WA-002465-1) issued by the Washington State Department of Ecology, the Port of Seattle is

[33] Draft Technical Memorandum dated June 28, 1995 from Dan Cambell, Hong West & Associates, Inc. to Jim Peterson and John Genkshow, HDR Engineering, Inc.

[34] *South Aviation Suppport Area Final Environmental Impact Statement*, Port of Seattle, 1994.

[35] *Erosion and Sediment Control: An Evaluation of Implementation of Best Management Practices on Construction Sites in King County, Washington January 1988-April 1989.* Prepared by C. Tiffany, G. Minton, and R. Friedman-Thomas for the King County Conservation District, Renton, WA. King County. 1990.

responsible for developing and implementing a construction erosion and sedimentation control plan to prevent and control the potential for water quality impacts on surface water from all construction activities at the Airport.

Temporary and permanent terraces are recommended for fillslopes and cutslopes wherever possible because they reduce sheet and rill erosion. Terraces reduce slope length, reducing potential rill development and surface erosion. Terraces also increase deposition, reducing transport of eroded materials from construction sites. Other BMPs and mitigation that could be used to reduce potential increases in TSS from construction activities include graveling of access roads, use of wheel wash facilities, and covering of loads. Prohibiting fuel storage, refueling, or maintenance of construction equipment at borrow source areas or implementing best management practices, such as installing proper temporary fuel storage and spill containment or designated maintenance areas would eliminate or reduce spills and contamination potential.

Several required and numerous optional practices are used to mitigate the potential for operational impacts on surface water and groundwater quality. The Port of Seattle's National Pollutant Discharge Elimination System (NPDES) permit requires the Port to prepare several plans and to carry out several studies to identify pollutants coming from the Airport, and to prevent and control potential operational impacts on surface and groundwater resources from industrial wastewater system (IWS) and storm drainage system (SDS) discharges.

- Specific plans required as part of compliance with the NPDES permit include:
  - a stormwater pollution prevention plan (SWPPP);
  - a spill prevention, control and countermeasures plan (SPCCP);
  - a construction erosion and sediment control plan for each project exposing more than 5 acres of ground;
  - a pond sludge characterization and treatment disposal plan; and
  - a solid waste disposal plan.
- Specific studies required as part of compliance with the NPDES permit include:
  - an engineering and treatability study of the IWS
  - a vehicle washwater study
  - annual stormwater monitoring reports
  - whole effluent (both IWS and stormwater) toxicity studies
  - a marine sediment monitoring study.
- Major elements of the SWPPP include:
  - monitoring of base flow and stormwater runoff from the Airport outfalls;
  - identification and implementation of operational BMPs and applicable source control BMPs that do not require capital improvements (by December 31, 1995);
  - identification and implementation of BMPs requiring capital improvements (by June 30, 1997);
  - development of a list of pollutants that would be present in stormwater and estimation of annual quantities of these pollutants in stormwater discharges;
  - inspection of SDS periodically to ensure they are functioning properly and that there are no illegal discharges (i.e., to the SDS); and
  - modification of the existing plan whenever there is an alteration of airfield facilities or their design, construction, operation or maintenance, which causes the SWPPP to be less effective in controlling pollutants.

In addition, the Port of Seattle is conducting a stream study of Miller and Des Moines Creeks to determine the effects of Airport stormwater discharges on aquatic biota. Implementation of these plans and mitigation measures is expected to identify potential existing water quality problems caused by airport operations and to control and reduce the potential pollutant loading to Miller and Des Moines Creeks and Puget Sound from the Airport.

The Port of Seattle has completed or is in the process of completing a number of operational BMPs and capital improvements that are expected to reduce the amount of pollutants in stormwater runoff. The Port of Seattle has implemented a strategy to reduce anti-icing fluids.[36/] This strategy minimizes the amount of potassium acetate and urea required to anti-ice runways and taxiways and the frequency of anti-icer use by:

- Using remote sensors to provide temperature and moisture data on runway and taxiway

[36/] *Stormwater Pollution Prevention Plan*, Port of Seattle, June 30, 1995.

surface conditions to determine when chemicals need to be applied;

- Applying chemicals before ice forms, which requires less chemical compared to deicing;
- Applying chemicals at specified rates using applicators with metering systems.

This procedure is expected to reduce the amount of potassium acetate and ammonia in stormwater runoff and in Miller and Des Moines Creeks.

In accordance with the SWPPP, the Port of Seattle has completed or is in the process of completing a number of mitigation actions. Operational, source control, and capital improvement BMPs completed and implemented as part of the SWPPP are expected to reduce the amounts of fecal coliform bacteria, potassium acetate, glycols, ammonia, and other pollutants in stormwater runoff from reaching Airport stormwater outfalls and Miller and Des Moines Creeks. Recent capital improvements correcting specific identified problems include:[37/,38/]

- Installation of an elevated berm to contain washwater from solid waste containers and prevent drainage of fecal coliform bacteria to Outfall 002.
- Connection of areas in the C and D Concourse to the IWS.

The Port of Seattle continues to monitor stormwater quality. The results of ongoing base flow and stormwater runoff water quality monitoring are used to determine the need for additional BMPs and capital improvements to the SDS. The Port of Seattle develops BMPs and structural improvements in coordination with Ecology, as necessary, to mitigate operational impacts on water quality and aquatic biota in Miller and Des Moines Creeks. These are reflected, in part, by periodic revisions to the SWPPP.

A number of capital improvements to the IWS are scheduled to be completed on or before June 30, 1997, including :

- Connecting the Port Maintenance Shop Yard and a portion of the U.S. Postal Service aircraft parking area near the North Satellite, which presently drain to the SDS and Outfall 002, to the IWS;
- Connecting a suspected glycol source: an area north of the South Satellite to the IWS;
- Connecting the aviation industrial activity area now draining to Outfall 007, which is suspected of contributing to elevated ammonia and BOD with stormwater runoff, to the IWS; and
- Connecting snow storage areas, which have been identified as probable sources of glycols, to the IWS.

These improvements are expected to reduce the amounts of anti-icing and deicing chemicals (e.g., potassium acetate, ammonia, and glycols) reaching SDS outfalls and Miller and Des Moines Creeks.

The Stipulated Settlement Agreement and Agreed Order of Dismissal, which dismissed Ms. Brasher's, Normandy Park Community Club's, and the City of Des Moines' appeal of the Port's NPDES permit contained the following provisions:[39/]

- Creating a Monitoring Team, including representatives appointed by the appellants;
- Conducting at least two additional sampling events of permitted stormwater outfalls in 1995;
- Contributing funds to the Des Moines Creek Basin planning and visioning process;
- Developing a short-term monitoring plan in cooperation with the Monitoring Team to sample Miller Creek basin outfalls and the outfall from Lake Reba examining glycol, BOD TSS, flow, ammonia, and turbidity and develop appropriate responses, as necessary, for any identified water-quality problems.

Additional mitigation for potential operational impacts to surface water quality would be considered depending on the results of the stream monitoring study[40/] and the effects of Airport stormwater runoff on Miller and Des Moines Creeks. Monitoring of selected stations upstream and downstream of Airport outfalls to Miller and

37/ *Stormwater Pollution Prevention Plan*, Port of Seattle, June 30, 1995.

38/ *Annual Stormwater Monitoring Report Summary*, Port of Seattle, August 30, 1995.

39/ *Stipulated Settlement Agreement No. 94-157*, Washington Pollution Control Hearings Board, 1995.

40/ *Stormwater Receiving Environment Monitoring Plan*, Port of Seattle, August, 1995.

Des Moines Creeks is planned for this winter (95/96). Potential additional mitigation that would be considered includes use of alternative, FAA-approved runway anti-icing chemicals (e.g., calcium magnesium acetate and sodium formate) or diversion of runway runoff to the IWS during anti-icing events. The latter option is being evaluated as part of ongoing IWS engineering study, which includes capital improvements to increase the treatment efficiency and capacity of the IWS treatment plant.

Basin planning is another method for investigating mitigation of water quality impacts on Miller and Des Moines Creeks and Puget Sound from Airport and urban runoff. Although the Airport affects relatively small proportions of both the Miller and Des Moines Creek drainage basins (approximately 5 and 30 percent, respectively), activities on these areas could significantly affect these drainages. The Port of Seattle is actively participating in basin planning activities in the Miller and Des Moines Creek basins with local jurisdictions, including King County and the cities of Des Moines, Normandy Park, Sea-Tac, and Burien.

(6) WATER CERTIFICATION

49 USC 47106(c)(1)(B) requires that Airport Improvement Program applications for airport projects involving the location of a new runway may not be approved unless the Chief Executive Officer of the state in which the project is located, or the appropriate state official certifies in writing that there is "reasonable assurance" that the project will be located, designed, constructed, and operated in compliance with applicable air and water quality standards. Therefore, certification from Washington State's Governor's Office is required indicating that the proposed project will comply with all applicable water quality standards. Certification is issued in the form of a Governor's Water Quality Certificate.

It is anticipated that the Governor's Certificate will be issued before completion of the Record of Decision.

TABLE IV.10-1

Seattle-Tacoma International Airport
Environmental Impact Statement

SUMMARY OF HYDROLOGIC PARAMETERS EVALUATED

Parameter	Relevance of Parameter
Flood Frequencies	Flood frequencies for Alternative 1 establish baseline conditions and allow evaluation of the performance of stormwater detention facilities under Alternatives 2 through 4. Flood frequencies are useful for evaluating flooding and erosion potential.
Flow Duration	Increases in flow duration may indicate potential for increased stream channel erosion.
Annual Runoff Volume	Increases in runoff volumes relative to Alternative 1 may indicate increased stream channel erosion potential and reductions in shallow groundwater recharge.
Flow Exceedance	Flow exceedance parameter allows seasonal evaluation of low (90 percent exceedance), median (50 percent exceedance), and high flow (10 percent exceedance) conditions, which could be related to aquatic habitat requirements.

TABLE IV.10-2

Seattle-Tacoma International Airport
Environmental Impact Statement

DESCRIPTION OF WATERSHEDS

Category	Watershed	
	Miller Creek[41]	Des Moines Creek[42]
Existing Watershed		
Total Area (Acres)	5,183	3,585
Impervious Area (Acres)	1,224	1,202
Existing Land Uses in the Watershed (Acres)		
Residential	3,238	1,052
Commercial	727	815
Airport	193	983
Open (parks, cemeteries, etc.)	720	735
Forest/Wetland	305	*
Airport - **Alternative 1 (Do-Nothing)**		
Total Area (Acres)	193	983
Impervious Area Draining to Industrial Waste System (Acres)	50	204
Impervious Area Draining to Storm System (Acres)	60	369
Airport - **Alternatives 2, 3, and 4 ("With Project")**		
Total Area (Acres)	519	1,187
Impervious Area Draining to Industrial Waste System (Acres)	50	270
Impervious Area Draining to Storm System(Acres)	157	464

* Forested and wetland area for Des Moines Creek are included among the other land use categories.

Source: Northwest Hydraulics, 1990; Shapiro & Associates, Gambrell Urban, 1994.

[41] *Miller Creek Regional Stormwater Detention Facilities Design Hydrologic Modeling,* Northwest Hydraulics Consultants, 1990.

[42] Shapiro and Associates, and Gambrell Urban, 1994.

TABLE IV.10-3
WATER QUALITY PARAMETERS FOR AIRPORT STORMWATER RUNOFF COMPARED WITH STORMFLOW WATER QUALITY DATA FOR MILLER AND DES MOINES CREEKS (AVERAGE (RANGE))

Parameter	TP	SRP	N02+N03 - N	NH3	HARD	FC	pH	FOG	TURB	TSS	Cu	Pb	Zn	DO	T	Source
Upper Miller Cr. (Above SR 518)	0.103 (0.081-0.138)	0.024 (0.006-0.046)	0.319 (0.080-0.959)	ND	18 (8-40)	(640-3400)	ND	1.1 (0.8-1.4)	16 (6-28)	23 (4-51)	0.022 (0.012-0.043)	0.023 (6.006-0.055)	0.054 (0.007 - 0.080)	ND	ND	King County, 1994
Lake Reba Inlet Streams	0.099 (0.030-0.217)	0.020 (0.010-0.029)	0.375 (0.154-0.715)	0.401[a] (0.126-0.675)	38 (23-53)	(420-7200)	6.73[a]	1.1 (1.0-1.6)	11 (6-16)	41 (4-147)	0.019 (0.006-0.097)	0.011 (0.001-0.040)	0.060 (0.036-0.090)	ND	ND	King County, 1994
Downstream from Lake Reba	0.106 (0.083-0.134)	0.033 (0.007-0.059)	0.541 (0.344-0.847)	ND	34 (18-51)	(720-2480)	ND	1.4 (1.0-1.8)	7 (5-12)	22 (10-49)	0.006 (0.004-0.008)	0.004 (0.001-0.007)	0.049 (0.035-0.069)	ND	ND	King County, 1994
Walker Creek	0.132 (0.061-0.200)	0.048 (0.011-0.101)	0.766 (0.469-1.130)	ND	63 (46-90)	(620-1920)	ND	1.2[b]	12 (3-31)	39 (9-108)	0.009 (0.002-0.013)	0.007 (0.002-0.013)	0.034 (0.022-0.053)	ND	ND	King County, 1994
Trib.0354 (Lake Burien)	(0.093 (0.070-0.109)	0.025 (0.017-0.040)	0.192 (0.083-0.265)	ND	12[a] (9-15)	(500-3400)	ND	0.9[b]	20 (19-20)	23 (18-29)	0.008[a] (0.004-0.012)	0.013[a] (0.007-0.020)	0.037[a] (0.021-0.052)	ND	ND	King County, 1994
Lower Miller Cr. (below Marine View Dr.)	0.107 (0.063-0.247)	0.036 (0.006-0.065)	0.852 (0.569-1.240)	ND	64 (33-97)	(320-1240)	ND	1.4 (1.0-1.7)	14 (2-41)	64 (5-291)	0.003 (0.002-0.005)	0.001 (0.001-0.002)	0.017 (0.013-0.023)	ND	ND	King County, 1994
Miller Cr. @ WWTP	ND	ND	ND	ND	ND	(28-3600)	7.4 (6.1-8)	ND	ND	ND	ND	ND	ND	11.1 (8.3-12.2)	12 (6-21)	Yokers, 1994
Sea-Tac Storm water Runoff Discharge to Miller Cr.	0.096[a] (0.091-0.100)	ND	ND	(<0.01-27)	86 (27-158)	(3->4000)	6.66 (6.4-6.85)	2.2 (1.1-3.3)	6.4 (4.1-10)	10 (2-22)	0.040 (0.023-0.064)	0.005 (0.001-0.008)	0.280 (0.022-1.030)	ND	ND	Port of Seattle, 1995
Sea-Tac Storm water Runoff discharge to Des Moines Cr.	0.086[a] (0.078-0.093)	ND	ND	(0.01-8.69)	75 (36-99)	(10-132)	6.77 (5.76-7.14)	3.4 (1.1-8.3)	6 (1-11)	4 (3-6)	0.040 (0.020-0.084)	0.004 (0.001-0.008)	0.100 (0.009-0.234)	ND	ND	Port of Seattle, 1995
Des Moines Cr. at South 192nd Street	0.267	ND	0.317	0.802	ND	31,00[f]	6.7	1.3	22.3	28.55	0.020	0.013	0.157	7.2	8.9	Port of Seattle, 1993
Des Moines Cr. @ Tyee Pond	0.248	ND	2.361	0.319	ND	5,700[f]	7.42	0.67	8.70	8.93	0.017	0.005	0.061	6.54	10.9	Port of Seattle, 1993
Des Moines Cr. @ South 200th St.	0.208	ND	1.123	0.167	ND	4,500[f]	7.52	0.64	5.36	4.54	0.009	0.004	0.045	7.14	10.9	Port of Seattle, 1993

Unbracketed numbers - Applicable water quality standards
(xx-xx) - Range of Actual Data

TP	- total phosphorus (mg/L)	TURB	- turbidity (nephalometric turbidity units or NTU)
SRP	- Soluble reactive phosphorus (mg/L)	TSS	- total suspended solids (mg/L)
N02+N03-N	- nitrite plus nitrate nitrogen (mg/L)	Cu	- total copper (mg/L)
NH3	- ammonia nitrogen (mg/L)	Pb	- total lead (mg/L)
HARD	- Hardness ($CaCO_3$ mg/L)	Zn	- total zinc (mg/L)
FC	- fecal coliform bacteria (#/100 mL)	T	- temperature (_C)
FOG	- freon extracted oil and grease (mg/L)	DO	- dissolved oxygen (mg/L)

NOTES:
- a arithmetic mean value of two samples
- b only one sample with FOG above the limits of detection (1.0 mg/L or 0.25)
- c 86% of samples collected between January and July 1994 (25 of 29) contained more than 100 organisms per 100 mL.
- d September and October 1994 stormwater monitoring data for outfalls 006-008 (refer to Exhibit IV.10-8).
- e September and October 1994 stormwater monitoring data for outfalls 002-005 and 009-010 (refer to Exhibit IV.10-8)
- f Geometric mean of 4 samples
- ND No data

Sources: King County, 1994. Unpublished storm flow monitoring data received from Kate Rhoads, King County Surface Water Management. Yokers, Jim, 1994, Southwest Suburban Sewer District. Personal communication, unpublished data. Port of Seattle, 1995. Monthly Stormwater Discharge Monitoring Reports. Port of Seattle, 1993. *Stormwater and Industrial Wastewater Quality at Seattle-Tacoma International Airport.* Port of Seattle. Port of Seattle, 1995, *Annual Stormwater Monitoring Summary Report.*

TABLE IV.10-4

Seattle-Tacoma International Airport
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EXISTING FLOOD FREQUENCIES FOR LOCATIONS ALONG MILLER CREEK

Return Period (Years)	Probability (%)	Alternative 1 (Do-Nothing) Flow Rates (cfs)		
		Stream Location		
		A	B	C
100	1	171	293	468
10	10	125	185	293
2	50	80	109	173
1.11	90	47	64	104

Location A is below the Lake Reba Detention facility (Exhibit IV.10-1).
Location B is at First Avenue South.
Location C is near the mouth of the creek.
Source: Montgomery Water Group, 1995.

TABLE IV.10-5

Seattle-Tacoma International Airport
Environmental Impact Statement

EXISTING FLOOD FREQUENCIES FOR LOCATIONS ALONG DES MOINES CREEK

Return Period (Years)	Probability (%)	Alternative 1 (Do-Nothing) Flow Rates (cfs)	
		Stream Location	
		D	E
100	1	232	280
10	10	154	178
2	50	103	112
1.11	90	74	76

Location D is below the confluence of the east and west branches (Exhibit IV.10-1).
Location E is at South 208th Street.
Source: Montgomery Water Group, 1995.

TABLE IV.10-6

Seattle-Tacoma International Airport
Environmental Impact Statement

WASHINGTON STATE DEPARTMENT OF ECOLOGY CLASS AA FRESHWATER WATER QUALITY STANDARDS

Parameter	Standard
Fecal coliform bacteria	Shall not exceed a geometric mean of 50 colonies per 100 mL, and shall have not more than 10 percent of the samples used to calculate the geometric mean exceeding 100 colonies per 100 mL.
Dissolved oxygen	Shall exceed 9.5 mg/L.
Total dissolved gas	Shall not exceed 110 percent of saturation at any point of sample collection.
Temperature	Shall not exceed 16°C due to human activities. Temperature increases from point source discharges shall not, at any time, exceed t = 23/(T + 5), where t = the permissive temperature increase measured at the mixing zone boundary and T = highest ambient temperature outside the mixing zone in the vicinity of the discharge. Incremental increases resulting from non-point source activities shall not exceed 2.8°C.
pH	Shall be within the range of 6.5 to 8.5 with a human-caused variation within a range of less than 0.2 units.
Turbidity	Shall not exceed 5 NTU over background when the background turbidity is 50 NTU or less, or have more than 10 percent increase in turbidity when background turbidity is more than 50 NTU.
Toxic, radioactive, or deleterious material concentrations	Shall be below those that may adversely affect characteristic water uses, cause acute or chronic conditions in the most sensitive aquatic biota, or adversely affect public health.
Aesthetic values	Shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

Source: WAC 173-201A. November 25, 1992.

TABLE IV.10-7

Seattle-Tacoma International Airport
Environmental Impact Statement

LOW AND HIGH ESTIMATES OF STORMWATER RUNOFF POLLUTANT LOADING CONTRIBUTIONS (pounds/year)

for seven pollutants from the Seattle-Tacoma International Airport to Miller and Des Moines Creeks compared to the total pollutant loads for these basins.

	Airport[1/]	Remainder of Basin[2/]		Total Basin Loading[3/]		% from Airport	
		Low	High	Low	High	Low	High
Des Moines Creek							
Parameter[4/]							
TSS	22,764	311,106	1.221.353	333,870	1,244,117	6.8	1.8
BOD	23,614	73,129	123.558	96,743	147,172	24.4	16.0
TP	212	986	4,187	1,198	4,399	17.7	4.8
Tot. Cu	103	161	285	264	388	39.0	26.6
Tot. Pb	15	413	553	428	568	3.5	2.6
Tot. Zn	232	1,129	1,547	1,361	1,779	17.0	13.0
O&G	5,954	32,363	32,363	38,317	38,317	15.5	15.5
Miller Creek							
Parameter							
TSS	2,995	522,300	2,669,300	525,295	2,672,295	0.6	0.1
BOD	3,058	139,775	209,900	142,833	212,958	2.1	1.4
TP	54	2,052	8,969	2,106	9,023	2.6	0.6
Tot. Cu	11	243	448	254	459	4.3	2.4
Tot. Pb	3	635	857	638	860	0.5	0.3
Tot. Zn	54	2,024	2,638	2,078	2,692	2.6	2.0
O&G	1,179	61,110	61,110	62,289	62,289	1.9	1.9

1/ Annual airport pollutant loads taken from the *Seattle-Tacoma International Airport Stormwater Pollution Prevention Plan*, Port of Seattle, June, 1995.

2/ Pollutant loads for basin, excluding the Airport.

3/ A range of low and high pollutant loading rates for different land uses (e.g., residential, commercial, open space) based on data from the Pacific Northwest was obtained from the literature. Total annual pollutant loadings were calculated by multiplying the loading rates by the appropriate land use areas within each basin (Table IV.10-2)

4/ TSS - total suspended solids; BOD - biochemical oxygen demand; TP - total phosphorus; Tot. Cu - total copper; Tot. Pb - total lead; Tot. Zn - total zinc; O&G - oil and grease.

TABLE IV.10-7A
FLOOD FREQUENCIES AND RATES FOR LOCATIONS ALONG MILLER CREEK FOR ALTERNATIVE 1 AND ALTERNATIVES 2, 3 AND 4.

Return Period (Years)	Probability (%)	Alternative 1 Flow Rates (cfs)			Alternatives 2-4 Flow Rates (cfs)		
		Stream Location			Stream Location		
		A	B	C	A	B	C
100	1	171	293	468	166	292	454
10	10	125	185	293	119	181	285
2	50	80	109	173	76	105	170
1.11	90	47	64	104	46	63	103

Location A is below the Lake Reba Detention facility (Exhibit IV.10-1). Location B is at First Avenue South. Location C is near the mouth of the creek.

TABLE IV.10-8
FLOOD FREQUENCIES AND RATES FOR LOCATIONS ALONG DES MOINES CREEK FOR ALTERNATIVE 1 AND ALTERNATIVES 2,3 AND 4.

Return Period (Years)	Probability (%)	Alternative 1 Flow Rates (cfs)		Alternatives 2-4 Flow Rates (cfs)	
		Stream Location		Stream Location	
		D	E	D	E
100	1	232	280	232	280
10	10	154	178	149	173
2	50	103	112	96	108
1.11	90	74	76	68	74

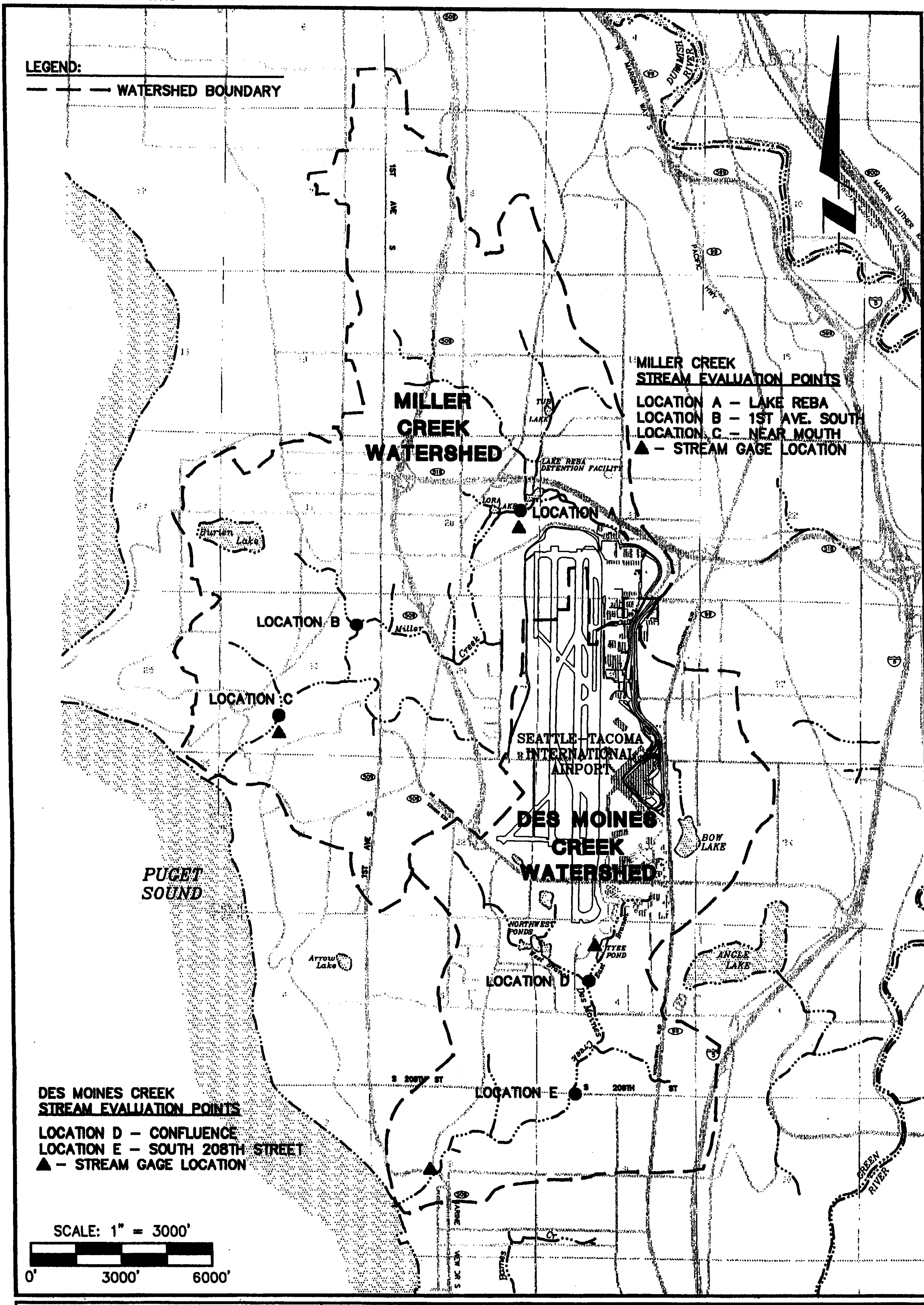
Location D is below the confluence of the east and west branches (Exhibit IV.10-1).
Location E is at South 208th St.

TABLE IV.10-9
ANNUAL RUNOFF VOLUMES TO MILLER CREEK AND DES MOINES CREEK

	Miller Creek Stream Location			Des Moines Creek Stream Location	
	A	B	C	D	E
Annual Runoff Volume (acre-feet)					
Alternative 1	1,680	2,880	5,054	3,525	4,184
Alternatives 2-4	1,781	3,124	5,361	3,586	4,223
Change in Annual Runoff Volume					
(acre-feet)	101	244	307	61	39
(%)	6	8	6	2	1
Percent of Volume Increase Flowing at < $Q_{1.11}$[1]	93	91	92	96	95
Percent of Volume Increase Flowing at < $Q_{2.00}$[2]	97	97	97	99	98

[1] $Q_{1.11}$ is the in-stream peak flow rate for a 1.11-year return period.
[2] $Q_{2.00}$ is the in-stream peak flow rate for a 2-year return period.
Source: Montgomery Water Group, 1995.

CAD CONTROL BLOCK REF: EXHIBIT1.DWG
DATE: 4-4-95 TIME: 17:15

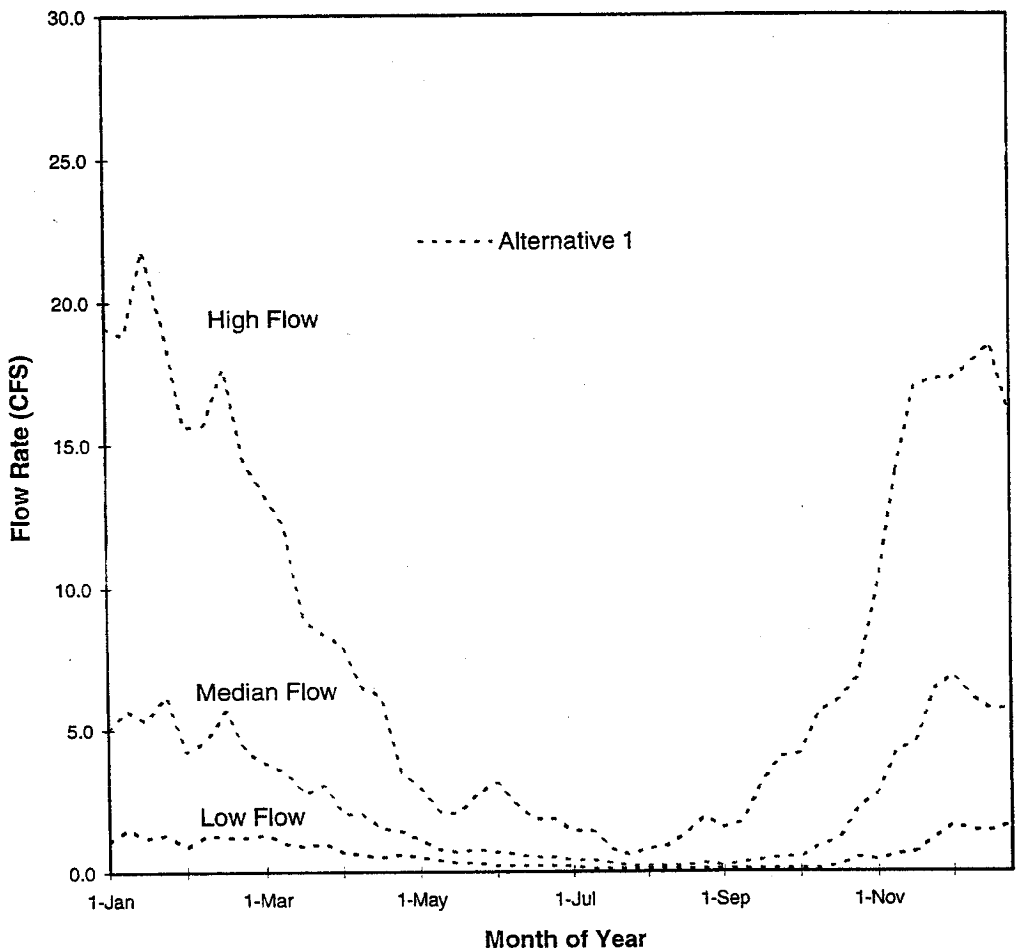


Seattle - Tacoma International Airport

Miller Creek And Des Moines Creek Watersheds

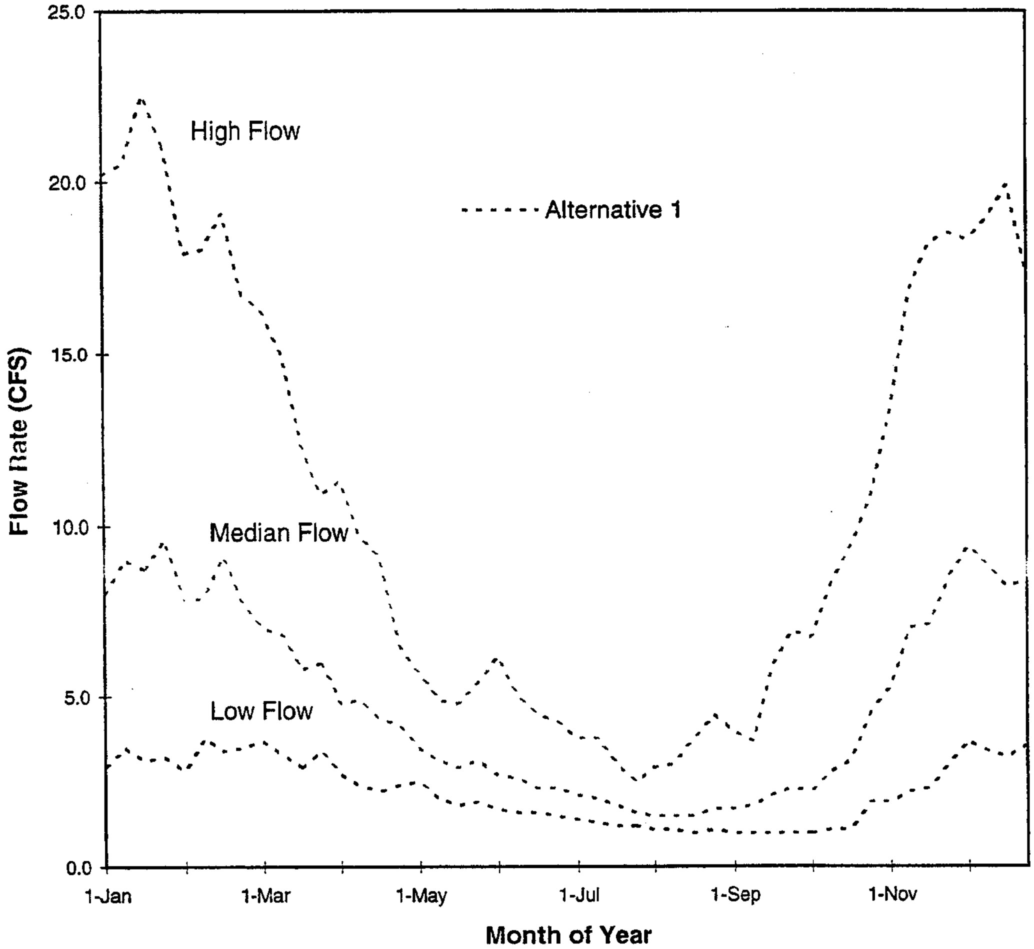
EXHIBIT: IV.10-1

Exhibit IV.10-2. Average low, median, and high flow rates for Alternative 1 at Location B along Miller Creek.



Source: Montgomery Water Group, 1995.

Exhibit IV.10-3. Average low, median, and high flow rates for Alternative 1 at Location D along Des Moines Creek.



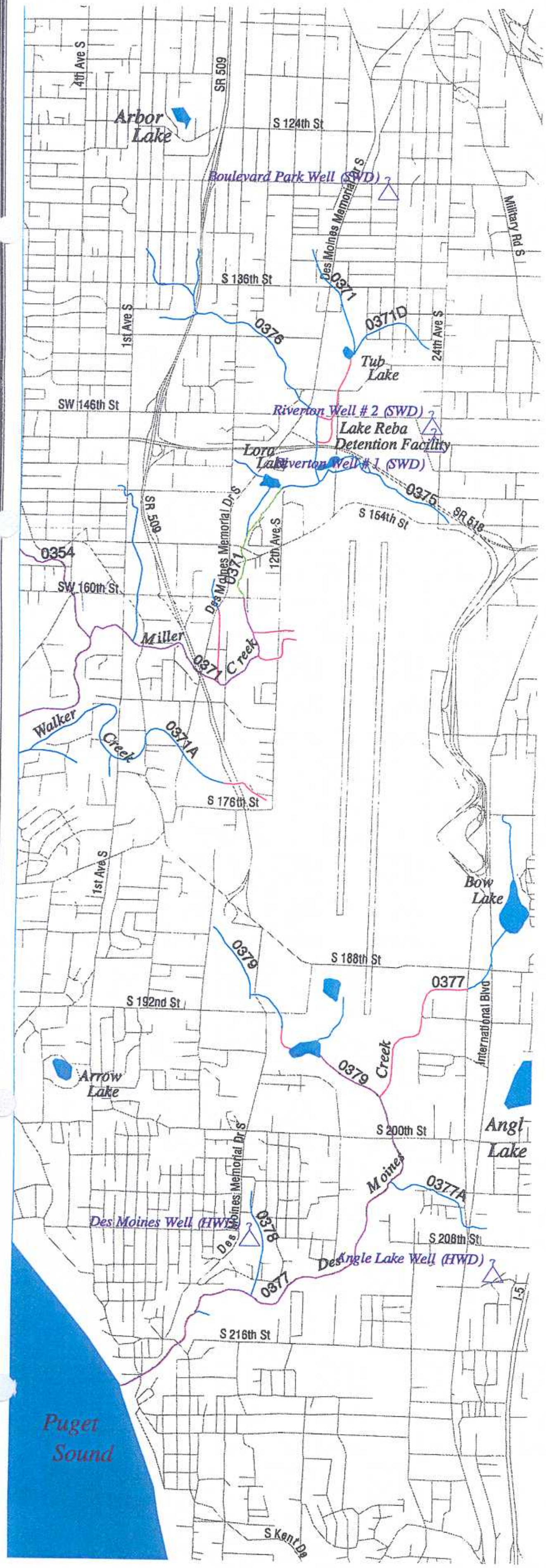
Source: Montgomery Water Group, 1995.

AR 003854

Seattle-Tacoma International Airport
Environmental Impact Statement
for the Master Plan Update

Exhibit IV.10-4

Water Resources: Streams and Lakes



Class 2. Perennial stream with salmonids.

Class 2. Perennial. Salmonids undetermined.

Class 3. Intermittent stream.

Unclassified stream.

Lake

Drinking Water Supply Wells:
Highline Water District (HWD)
Seattle Water Department (SWD)

Source: Gambrell Urban, Inc. and
Shapiro & Associates, 1995
King County Basin Reconnaissance Reports, 1987
King County Sensitive Areas Map Folio, 1990

Scale 1" = 2,500'

0 2500 5000

Scale in Feet

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

November 30, 1995

- IV.10-20J -

AR 003855

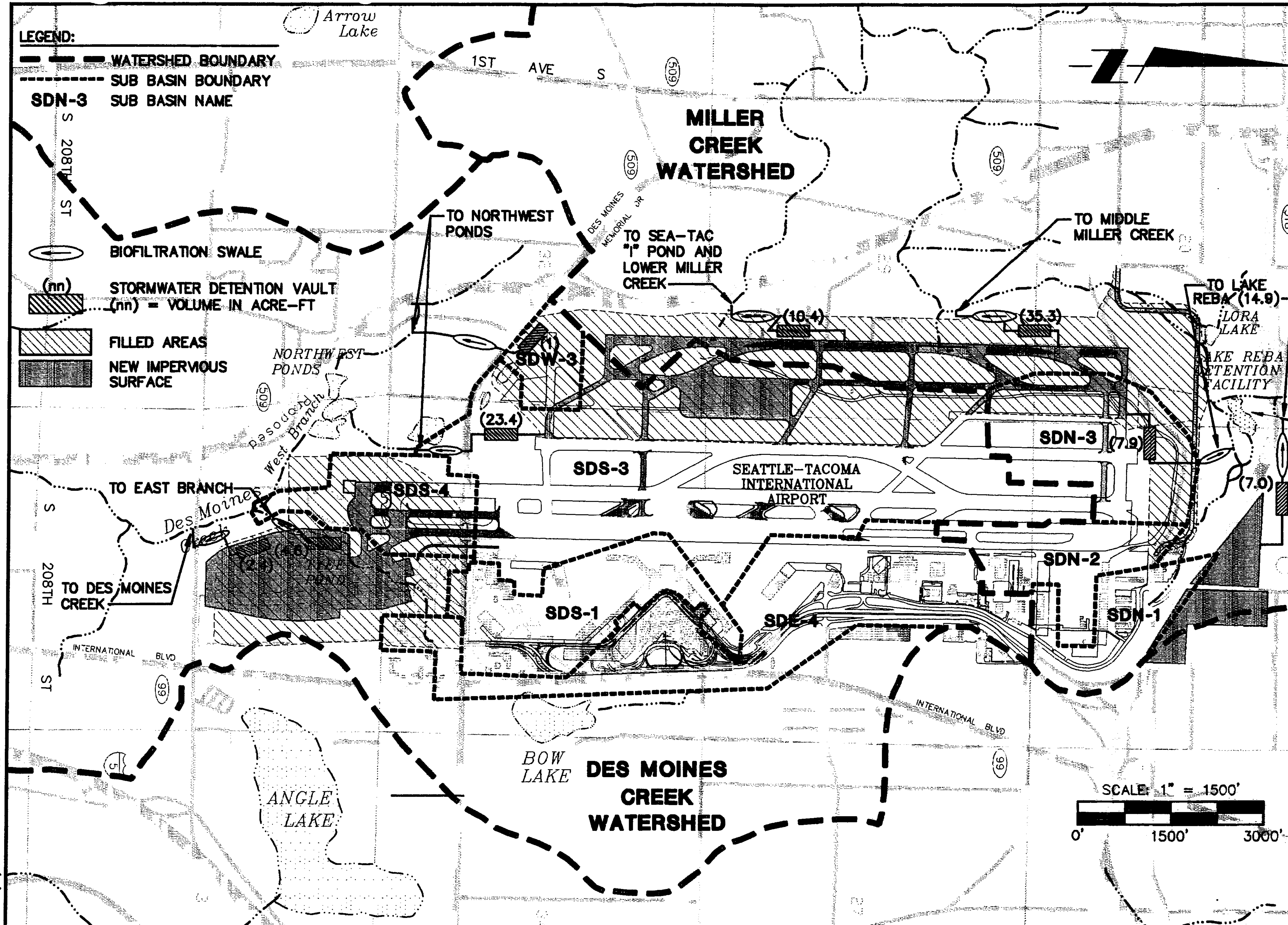


EXHIBIT: IV.10-5

Conceptual Layout of Proposed Stormwater Management System

Seattle - Tacoma International Airport

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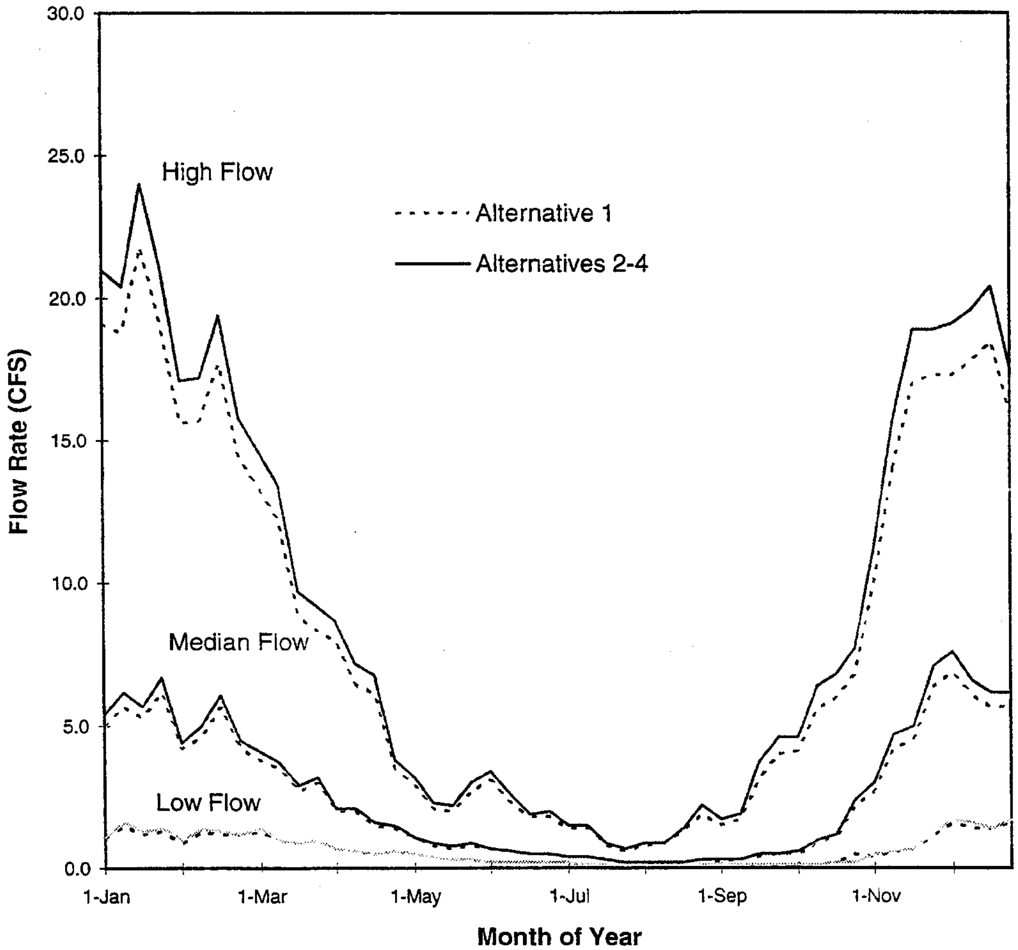
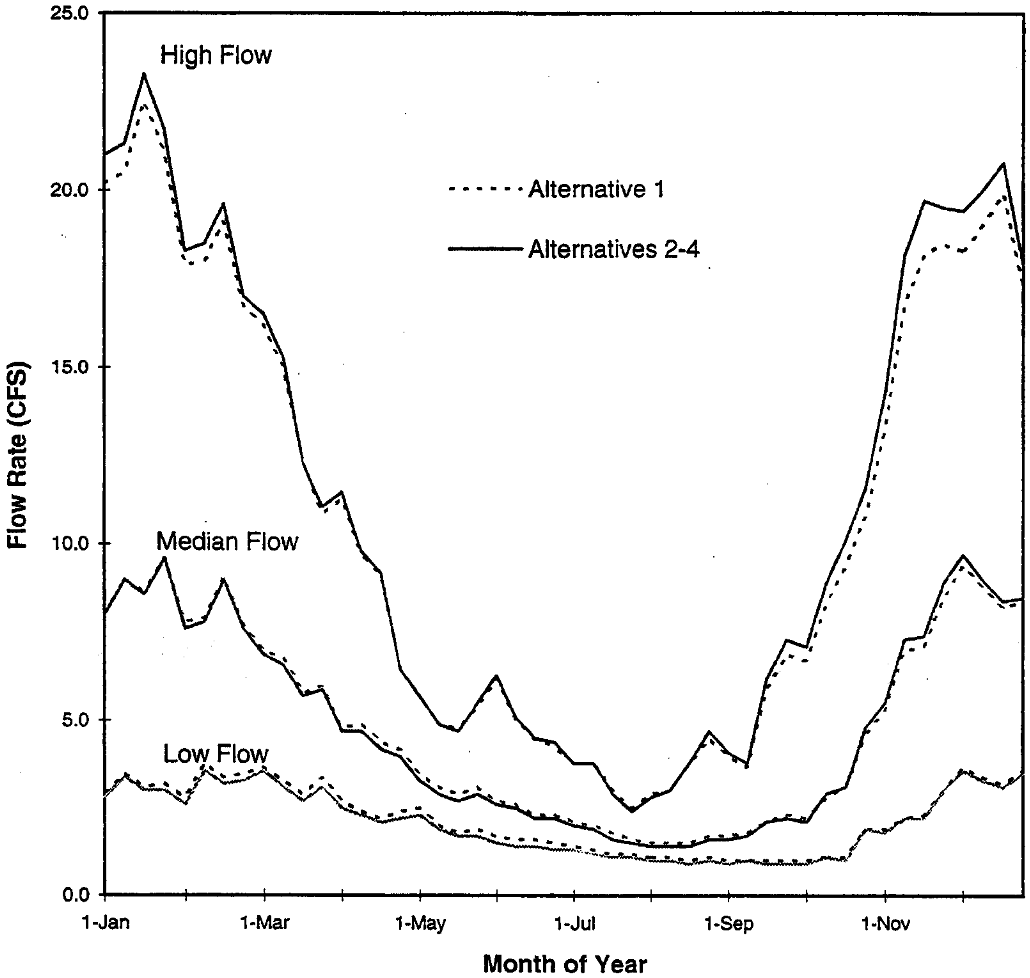
DATE: 1/3/95 TIME: 08:00

Exhibit IV.10-6. Average low, median, and high flow rates for Alternative 1 and Alternatives 2-4 at Location B along Miller Creek.



Source: Montgomery Water Group, 1995.

Exhibit IV.10-7. Average low, median, and high flow rates for Alternative 1 and Alternative 2-4 at Location D along Des Moines Creek.

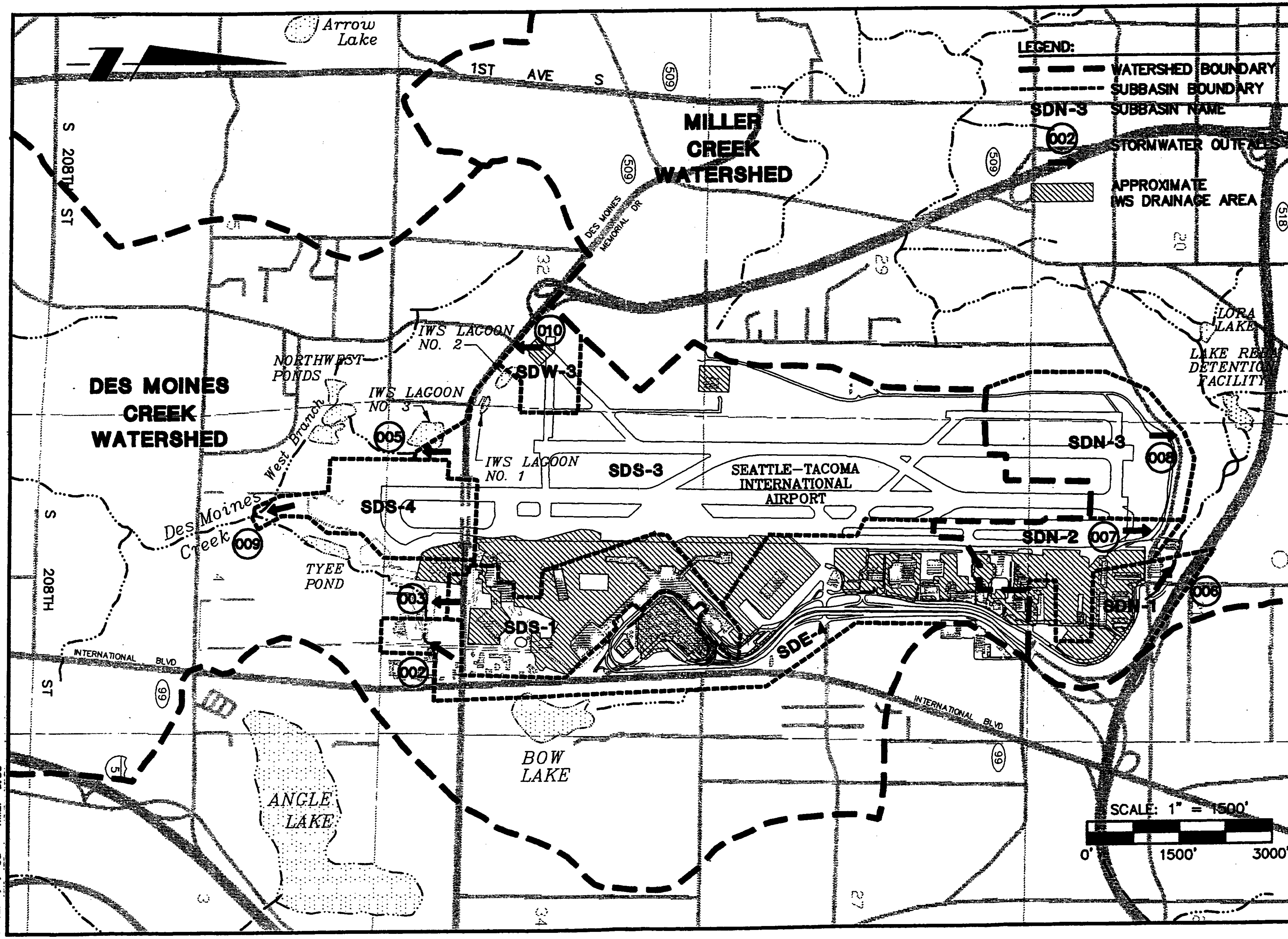


Source: Montgomery Water Group, 1995.

EXHIBIT: IV.10-8

Onsite Basins At SEA-TAC Airport

Seattle - Tacoma International Airport



CAD CONTROL BLOCK REF: EXHIBIT2.DWG
DATE: 4-7-95 TIME: 9:00

AR 003859

CHAPTER IV, SECTION 11

WETLANDS

Proposed Master Plan Update alternatives at Sea-Tac Airport would affect existing wetlands. Impacts on these wetlands would include: placement of fill material, dredging, removal of existing vegetation, and changes in hydrologic regimes as a result of increased impervious surface area and stormwater management system restructuring.

Wetlands that would be affected by each of the "With Project" alternatives are palustrine emergent, scrub-shrub, open water, and forested systems.[1/] Wetland investigations of the airport area identified almost 144 acres of wetland. The specific number of wetlands that would be affected by the "With Project" alternatives will be determined by how much earth is excavated from the on-site borrow locations. Utilization of Borrow Area 8 (North Borrow Area) would result in direct impacts occurring to 16-acres of wetland in six different systems. Due to these large impacts, excavation is not proposed to occur in Borrow Area 8.

About 34 individual wetlands could be directly affected by development at the Airport. Including fill for the following:

Alternative	Wetland Impacts
Alt 1 (Do-Nothing)	1.70 acres
Alt 2 (Central Terminal with):	
8,500 ft runway	10.37 acres
7,500 ft runway	9.43 acres
7,000 ft runway	9.62 acres
Alt 3 (North Terminal with):	
8,500 ft	10.37 acres
7,500 ft	9.43 acres
7,000 ft	9.62 acres
Alt 4 (South Terminal with):	
8,500 ft	10.37 acres
7,500 ft	9.43 acres
7,000 ft	9.62 acres

Source: Shapiro & Associates. 1995
Assumes fill is not excavated from On-Site Borrow Area 8.

Adverse impacts on wetlands would require permits or approvals from the following agencies: U.S. Army Corps of Engineers, Washington State Department of Ecology, and Washington Department of Fisheries and Wildlife. In addition to required permits or approvals, compensatory mitigation would be required.

(1) METHODOLOGY

Three different methods were used to identify wetlands, and potential impacts:

- comprehensive and intermediate, on-site wetland determinations[2/3/] were conducted to delineate wetlands that could be affected;
- existing wetland delineations of portions of the detailed study area were reviewed and included as part of this document; and
- in those portions of the detailed study area where right-of-entry was not granted, wetlands were identified from aerial photographs, existing inventories, and observations made from adjacent properties.

A detailed description of criteria used to make wetland determinations is contained in **Appendix H-A**.[4/] As is noted in Appendix A, the U.S. Army Corps of Engineers is a cooperating agency in the preparation of this EIS.

(2) EXISTING CONDITIONS

A total of 55 individual wetlands were identified within the detailed study area and are shown in **Exhibit IV.11-1**. These wetlands range in size from approximately 0.02 acre to 30 acres with a total area of approximately 144 acres. A total of 20 emergent, 9 scrub-shrub, 4 open water, and 22 forested wetlands were identified. Wetlands may have more than one classification, (i.e., forested/scrub-shrub), in these cases the predominant vegetation class is listed first. **Table IV.11-1** contains a list of wetlands identified, their classification, the approximate area of each wetland, and the degree to which they may be affected by the proposed Master Plan Update alternatives.

1/ *Classification of Wetlands and Deepwater Habitats of the United States*, Cowardin, et al., 1979.

2/ *Corps of Engineers Wetlands Delineation Manual*, Environmental Laboratory, 1987.

3/ *Federal Manual for Identifying and Delineating Jurisdictional Wetlands*, Federal Interagency Committee for Wetland Delineation, 1989.

4/ *Jurisdictional Wetland Determination for the Seattle-Tacoma International Airport Master Plan Update Environmental Impact Statement*, Shapiro and Associates, Inc., 1995.

Wetlands provide hydrologic and biological functions that are considered important to human health, safety, and welfare. Hydrologic functions provided by wetlands include: storage of flood or stormwater; enhancement of water quality by filtering out pollutants; recharge of groundwater aquifers; and dissipation of floodwater energy. Biological functions of wetlands include providing breeding, feeding, nesting, and resting habitat for fish and wildlife species as well as retention and detention of nutrients. Different classifications of wetlands are generally considered to be better suited to provide different wetland functions. Forested and scrub-shrub wetlands are generally considered to provide greater flood energy dissipation and wildlife nesting habitat than that provided by emergent wetlands. Emergent wetlands are generally considered to provide greater water quality improvement functions and wildlife feeding opportunities than other wetland types. Open water wetlands are usually associated with groundwater recharge and fish habitat functions. Additional detail on the biological and hydrologic functions impacted by the proposed Master Plan Update alternatives are presented in the Wetland Mitigation Plan (**Appendix P**).

The following sections briefly describe the location, size, and general characteristics of wetlands in the study area. Wetlands are discussed by region in which they occur, as illustrated in **Exhibit IV.11-2**: North Borrow Source Areas and Warehouse/Parking Area, West Area, South Aviation Support Area, and South Borrow Source Areas. Detailed descriptions of each wetland are provided in **Appendix H-A**.

(A) <u>North Borrow Source Areas (5 & 8) and Warehouse/Parking Area Wetlands</u>

A total of 16 wetlands were identified in the North Borrow Source Areas and the Warehouse/Parking Area. Of these, 14 were delineated (Wetlands 1 through 14), and two (Wetlands 33 and 34) were identified from existing wetland inventories. Wetland numbering follows the labels assigned in the wetland delineation report as provided in **Appendix H-A**. This portion of the study area is bound on the south by S. 154th Street, on the west by 15th Avenue S., on the north by S. 146th Street, and generally on the east by 28th Avenue S. Sizes of wetlands in this area range from 0.07 acres (Wetland 1) to 17.6 acres (Wetland 33). As a result of the quantities of wetland in Borrow Area 8, the excavation will not occur in this area.

(B) <u>West Wetland Area</u>

Thirteen wetlands (Wetlands 15 through 27) were delineated in the area of the proposed new parallel runway during August and September, 1994. Ten additional wetlands (Wetlands 35 through 44) were identified in the west wetland area from either aerial-photograph interpretation or review of existing inventories, delineations were not conducted as right-of-entry was not granted by property owners. The west wetland area is bound on the west by Des Moines Memorial Drive S., on the east by existing runways, on the north by S. 154th Street, and on the south by S. 200th Street. Soils throughout this area consist of fill and are highly compacted. The wetlands in this area range in size from 0.06 acres (Wetland 22) to 30.3 acres (Wetland 43).

(C) <u>South Aviation Support Area Wetlands</u>

Three wetlands were identified within the South Aviation Support Area (SASA). Two wetlands (Wetlands 52 and 53) were identified and delineated as part of the 1994 SASA Final EIS.[5] A wetland (Wetland 28) was identified and the portion within the potential construction area was delineated. The SASA boundaries are demarked on the north by S. 188th Street, on the east by Pacific Highway S. (Highway 99), on the south by S. 200th Street, and on the west by 18th Avenue S. Wetlands in this area range in size from 0.6 acres (Wetland 53) to 18.1 acres (Wetland 28).

(D) <u>South Borrow Area Wetlands</u>

Four wetlands (Wetlands 29, 30, 31, and 32) were delineated in the south borrow area during November 1994. The South Borrow Area (Borrow Areas 1, 2, and 3) is located between 16th Avenue S., 24th Avenue S., S. 216th Street, and S. 200th Street. Three additional wetlands (Wetlands 48, 49, and 50) were delineated and are described in the Des Moines Creek Technology Campus Draft

[5] *South Aviation Support Area Final EIS*, Port of Seattle, 1991.

EIS.[6] Des Moines Creek traverses this area in a relatively deep ravine. Wetlands in this area are smaller than 0.03 acres.

(E) Other Wetlands

Four wetlands were identified in the general vicinity, outside of any identified impact area. These wetlands were not delineated but rather were identified from the *National Wetland Inventory Map, Des Moines, Washington, Quadrangle*.[7] These wetlands range in size from 0.06 acres (Wetland 46) to 26 acres (Wetland 54).

(3) FUTURE CONDITIONS

Of the 55 individual wetlands identified, 34 could be directly affected by future airport improvements at Sea-Tac. Each of the proposed "With Project" alternatives would affect wetlands. The specific area of wetland that could be affected would depend upon the amount of fill excavated from the on-site borrow locations. This analysis assumes that Borrow Area 8 would not be utilized. Wetland impacts can be avoided or minimized through the use of off-site fill. However, use of off-site material would increase the amount of truck traffic affecting area roads during the construction period, as discussed in Section 23 "Construction Impacts".

Development of an 8,500-ft runway and full utilization of the south borrow source and warehouse/parking areas would directly affect about 10.4 acres of wetland including; 7.07 acres of forested wetlands, 0.39 acres of scrub-shrub wetlands, and 2.88 acres of emergent wetlands. Development of a 7,500-ft runway would directly affect 9.43 acres of wetland including; about 6.6 acres of forested wetland, 0.38 acres of scrub-shrub wetland, and about 2.46 acres of emergent wetland. Development of the 7,000-ft runway option would directly affect about 9.62 acres of wetland including; about 6.58 acres of forested wetland, 0.38 acre of scrub-shrub wetland, and 2.56 acre of emergent wetland.

All impacts on wetlands would be anticipated to occur during the Phase I time period (1996-2001). No wetland impacts would occur as a result of terminal expansion options. **Table IV.11-2** summarizes potential impacts on wetlands by location and alternative.

Construction of the proposed new parallel runway, extension of Runway 34R, grading and filling of the Runway Safety Areas, and utilization of borrow source areas would require removal of existing vegetation, draining, and discharging of fill material to wetland habitats. Existing wetland area and functions would be lost or diminished as a result of these actions. Loss of wetland habitat and function represent a significant adverse environmental impact.

Wetland impacts associated with each of the proposed Master Plan Update alternatives are described below.

(A) Do-Nothing (Alternative 1)

The Do-Nothing alternative would maintain Sea-Tac as it exists today. As the Port of Seattle has received approval from the FAA to initiate development of the South Aviation Support Area, impacts to wetlands could occur to complete that development. As was described in the Final Environmental Impact Statement for the SASA development, approximately 1.7 acres of wetland would be affected (Wetlands 52, 53, and 55). No other wetland impacts would be expected. Proposed extension of SR509 could effect up to 11.1 acres of wetland.[8] However, as a specific alignment as not been identified, these impacts are not included in the Do-Nothing assessment.

(B) "With Project" Alternatives (Alternatives 2, 3, and 4)

Each of the "With Project" alternatives would affect wetlands. No direct wetland impacts would be anticipated as a result of the various landside improvements. However, wetland impacts would vary as a result of the three alternative runway lengths (8,500, 7,500, or 7,000 feet). Wetland impacts associated with each runway length option are listed in **Table IV.11-2**.

[6] *Des Moines Creek Technology Campus, Draft EIS*, Port of Seattle, February, 1995.

[7] *National Wetland Inventory Map, Des Moines, Washington, Quadrangle*, U.S. Fish and Wildlife Service, 1987.

[8] *SR 509/South Access Draft EIS*, December, 1995.

1. **8,500-ft New Runway**

Construction activities associated with building an 8,500-ft proposed new parallel runway, separated by 2,500 feet from Runway 16L/34R, extending Runway 34R, development of additional warehouse and parking space, and utilizing Borrow Areas 1,2,3 and 5 for structural fill would affect 10.37 acres in 31 different wetland habitats.

Impacts associated with construction of the proposed new runway include filling, grading, or otherwise affecting 7 forested wetlands (Wetlands 11, 14, 18, 19, 21, 37, and 40) with a total area of approximately 2.88 acres. Two scrub-shrub wetlands (Wetlands 20, and 22) totaling 0.07 acre would be impacted. Approximately 2.51 acres of 11 different emergent wetlands would be affected by construction of an 8,500-foot-long third runway. About 5.48 acres of wetland habitat would be impacted as a result of the proposed new parallel runway.

2. **7,500-ft New Runway**

Impacts associated with new runway construction include filling, grading, or otherwise affecting 6 forested wetlands (Wetlands 18, 19, 21, 25, 37, and 40) with a total area of approximately 2.40 acres. Two scrub-shrub wetlands (Wetlands 20 and 22) totaling 0.06 acre would be directly impacted. Approximately 2.09 acres of 9 different emergent wetlands (Wetlands 12, 15, 16, 17, 23, 24, 26, 35, and 41) would be affected by construction of a 7,500-foot-long third runway. Impacts would occur on 4.55 acres of wetland habitat as a result of the 7,500 ft long new parallel runway.

3. **7,000-ft New Runway**

Impacts associated with development of a 7,000 foot-long runway would be similar to those described for the 7,500 foot-long runway option, with the exception of emergent wetland impacts. Direct impacts as a result of this alternative would include filling, grading or otherwise affecting 2.19 acres of 9 different emergent wetlands. Impacts on scrub-shrub wetlands would be the same as those described for the 7,500 foot-long runway option.

* * *

Development in the SASA would affect two forested wetlands (Wetlands 52 and 53), and shrub/scrub wetland (#55) with a total area of 1.7 acres. Proposed extension of Runway 34R would affect Wetland 28 (0.06 acre).

Full development of warehouse/parking facilities north of the existing air-cargo area at the Airport would directly affect two forested wetlands (Wetlands 1 and 2). The total wetland impact as a result of construction in this area would be approximately 0.81 acre.

Utilization of Borrow Areas 1, 2, and 3 for structural fill would result in direct impacts on two forested wetlands (Wetlands 29 and 51), two scrub-shrub wetlands (Wetlands 30 and 49), and three emergent wetlands (Wetlands 31, 32, and 50). Total wetland area affected by utilization of the south borrow source areas would be: 1.62 acres of forested wetland habitat, 0.12 acre of scrub-shrub wetland habitat, and 0.08 acre of emergent wetland habitat. A total of 1.82 acres of wetland habitat would experience impacts as a result of development activities in this area.

(C) **Preferred Alternative**

As is described in Chapter II, the Port of Seattle staff have recommended the implementation of Alternative 3 (North Unit Terminal) with a new parallel runway with a length of 8,500 feet. As the previous paragraphs indicate, all of the alternatives would result in the filling of wetlands. The preferred alternative would result in the filling of 10.37 acres of wetland in 33 different wetland habitats. These impacts include the following:

- 7.07 acres of forested wetlands
- 0.39 acres of shrub-scrub wetlands
- 2.88 acres of emergent wetlands

No wetlands were identified in Borrow Area 5. The Port will not excavate earth from Borrow Area 8 in order to avoid over 16 acres of impact to wetland areas.

* * *

FAA Order 5050.4A "Airport Environmental Handbook" states:

"Federal agencies ... avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds: a) that there are no practicable alternatives to such construction, and b) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use." [Chapter 5, Paragraph 47 e (11) (b)]

"The term 'practicable' means feasible. Whether another alternative is practicable depends on its feasibility in terms of safety, meeting transportation objectives, design, engineering, environment, economics, and any other applicable factors." [Chapter 5, paragraph 47e(11)(e)]

In evaluating alternatives, Chapter II considered:

- *Off-site alternatives* to satisfying the existing and future aviation needs - as was shown none of the off-site alternative can satisfy the need for the following reasons:
    1. There is no sponsor, identified source of funds or acceptable site for a new airport;
    2. Extensive study of this issue resulted in the consideration of all alternatives for addressing air transportation capacity issues in this Region. Based on this process, the Puget Sound Regional Council (PSRC) adopted Resolution A-93-03 and EB-94-01 confirming that no feasible sites exist; and
    3. If a new site could be identified, market forces would not enable it to be successful until regional origin and destination air travel demand exceeds 10 million enplanements annually - currently forecast to occur around the year 2010. In addition, all of the sites considered in the Major Supplemental Airport Study were found to affect wetlands.
- *Technology or Activity/Demand Management Alternatives* - no technology or activity/demand management related alternative is capable of addressing the poor weather related constraint at Sea-Tac or to accommodate forecast increases in air travel demand.
- *On-Site Alternatives* - Because of FAA safety related airport design standards, no other on-site alternative exists to avoid the fill of wetlands. Within the on-site alternatives (Alternatives 1 through 4), the Do-Nothing alternative (Alternative 1) will not satisfy the Region's aviation needs. In assessing Alternatives 2, 3 and 4, attempts would be made to minimize adverse impacts to wetlands.

As the Do-Nothing alternative would not satisfy the needs identified by the EIS, it was determined not to be a practicable alternative.

Wetland impacts could be avoided through the acquisition of off-site fill to complete a portion of the "With Project" alternatives. As is noted in the previous sections, about 16 acres of wetland could be affected in on-site Borrow Area 8.

(4) <u>CUMULATIVE IMPACTS</u>

As previously mentioned, a maximum of 10.37 acres of wetland would be filled as a result of the Master Plan Update "With Project" alternatives. Loss of this amount of wetland area, however, should be viewed as one of many contributing to cumulative effects on natural resources in the Puget Sound Region. The result of past wetland filling has been to increase the functional importance of the remaining wetlands in the Region. Removal or alteration of wetlands as a result of the alternative airport development and other projects in the area may limit the ability of remaining wetlands to perform the lost or diminished functions. This may be particularly true of the stormwater storage functions of wetlands in the project vicinity. Increased impervious surfaces associated with development activities at the Airport may increase both the depth and duration of stormwater in remaining wetlands. This could result in increased floodwater elevations for longer periods of time in the watershed.

(4) <u>MITIGATION</u>

Actions that affect wetlands generally require authorization from various federal, state, and applicable local agencies. In the State of Washington, projects with significant adverse wetland impacts require a Section 404 permit from the U.S. Army Corps of Engineers (Corps), and Section 401 Water Quality Certification from the Washington State Department of Ecology (Ecology). In addition to the required permits and approvals, compensatory wetland mitigation may also be required to offset significant adverse impacts on wetlands and their functions.

The Port of Seattle has initiated the wetland permitting process with the Seattle District of the Corps. The Corps is a cooperating agency in the preparation of this EIS. Additional coordination is anticipated with the Washington State Department of Ecology. It is anticipated that permits would be issued after approval of the Final Environmental Impact Statement/Record of Decision for the Master Plan Update actions and that no adverse impacts would occur on wetlands as a result of the Master Plan Update prior to issuance of the appropriate permits.

Significant unavoidable adverse impacts would occur to wetlands; these impacts include filling, grading, changes of hydrology, and removal of vegetation. The Port of Seattle would avoid adverse impacts where possible (e.g., use of off-site fill to avoid approximately 16-acres of wetland impact in Borrow Area 8), and would minimize impact by using Best Management Practices (BMP) during construction and operation of the proposed improvements. Among the BMPs to be utilized are: installation of silt-fences around wetlands not being directly affected, timing of construction activities to avoid impacts during the rainy season, and staging of construction equipment and vehicles away from wetland areas.

In addition to avoidance and minimization as mitigation for direct impacts on wetlands, the Port of Seattle has identified the following wetland compensatory mitigation needs as a result of direct impacts on wetlands. Direct wetland impacts and mitigation area required, presented in **Table IV.11-3**, represents the "worst-case scenario;" that is, the maximum wetland impact that could occur as a result of the proposed action (a new parallel runway with a length of up to 8,500 feet and full utilization of on-site south borrow source areas and warehouse/ parking facilities). Wetland mitigation ratios listed assume creation of new wetland area as presented in **Appendix P**.

After extensive study, the Port of Seattle has selected a preferred wetland mitigation site in the lower Green River Valley. Mitigation for impacts on wetlands at the Airport, within the watershed where the impacts may occur, is not feasible for three reasons: (1) the majority of the area surrounding the Airport is developed, and not enough land area exists in the watershed to create compensatory mitigation wetlands, (2) much of the undeveloped land in the watersheds is existing wetland, or land unsuitable for wetland mitigation due to topographic (moderate to steeply sloping) or hydrologic (lack of sufficient water) conditions, and (3) the FAA guidelines strongly recommend[9] that airports do not have "wildlife attractions" within 10,000 feet of the edge of any active jet runway. For these reasons, the Port proposes to conduct wetland mitigation outside of the watershed where these constraints do not exist.

The Port of Seattle is committed to attaining "no net loss" of wetlands through mitigation efforts. After investigating over 100 individual parcels, the Port has selected a site located within the City of Auburn for the development of the compensatory wetland mitigation. This site, located in Section 31, Township 22N, Range 5E, Willamette Meridian in the Green River watershed, is a 69 acre parcel of land slightly south of S. 277th Street and east of Auburn Way. The undeveloped parcel has been farmed in the recent past, and currently supports a mix of upland pasture grasses and forbs that are common to abandoned agricultural land in the Puget Sound Region. Approximately 4.3 acres of reed canarygrass-dominated wetland was delineated at the site. The site is bound by a variety of land uses including agriculture to the north and south; undeveloped land, multi-family housing and a drive-in theater to the west; and the Green River, patches of riparian forest, and undeveloped slopes to the east. A narrow strip of land along the western banks of the Green River is held by King County. In December 1995, the Port of Seattle gained ownership of the property following completion of a bankruptcy proceeding by the previous owners.

The Port of Seattle is coordinating with the Corps of Engineers concerning the proposed mitigation site and the plan included in this Final EIS. **Appendix P** contains a detailed mitigation plan for the proposed wetland mitigation, including:

- Water regime;
- Site grading;
- Landscape plan; and
- Monitoring plan

Initially, the City of Auburn expressed reservations concerning the development of the mitigation site within the City boundaries. However, the final mitigation plan was developed to reflect their concerns regarding land use.

[9] "Wildlife Attractions On or Near Airports," *FAA Draft Advisory Circular 150/5200-*, no date.

TABLE IV.11-1
Page 1 of 2

Seattle-Tacoma International Airport
Environmental Impact Statement

WETLAND CLASSIFICATION AND AREA

Option Wetland Number	Classification	Area[1/] (ac)	(8,500 Foot Runway Impact[1/] (ac)
1	PFO	0.07	0.07
2	PFO/EM	0.74	0.74
3	PFO	0.56	0.56
4	PFO	5.02	0.0
5	PFO/SS	4.58	0.0
6	PSS	0.878	0.0
7	PFO/OW/EM	6.7	0.0
8	PSS/EM	4.95	0.0
9	PEM/FO	2.85	0.13
10	PSS	0.31	0.0
11	PFO/EM	0.50	0.47
12	PEM/FO	0.21	0.21
13	PEM	0.05	0.05
14	PFO	0.19	0.19
15	PEM	0.28	0.28
16	PEM	0.06	0.06
17	PEM	0.03	0.03
18	PFO	0.12	0.12
19	PFO	0.57	0.57
20	PSS/EM	0.06	0.06
21	PFO	0.22	0.22
22	PSS/EM	0.06	0.06
23	PEM	0.78	0.78
24	PEM	0.14	0.14
25	PFO	0.06	0.06
26	PEM	0.02	0.02
27	PEM	0.0	0.0
28	POW/SS	18.1	0.06
29	PFO	0.74	0.74
30	PSS/FO	0.50	0.50
31	PEM	0.05	0.00
32	PEM	0.05	0.05
33	PFO/SS/EM/OW	17.6	0.0
34	POW	1.4	0.0
35	PEM	0.21	0.18
36	PFO/EM	0.3	0.0
37	PFO/SS	2.41	1.68
38	PEM/SS	0.0	0.0
39	PFO	0.07	0.0

TABLE IV.11-1
Page 2 of 2

Seattle-Tacoma International Airport
Environmental Impact Statement

WETLAND CLASSIFICATION AND AREA

Wetland Number	Classification	Area[1/] (ac)	Impacts[1/] (ac)
40	PFO	0.09	0.09
41	PEM	0.08	0.08
42	PEM	0.5	0.0
43	PEM/SS/FO/OW	30.3	0.0
44	PFO/SS	0.7	0.0
45	PEM	5.0	0.0
46	POW	0.06	0.0
47	POW	0.2	0.0
48	PEM	0.02	0.0
49	PSS	0.02	0.02
50	PEM	0.03	0.03
51	PFO	8.1	0.48
52	PFO/SS	1.0	1.0
53	PFO	0.6	0.6
54	PSS/OW	25.7	0.0
55	PSS	0.04	0.04
	TOTALS	143.8	10.37

P - Palusterine
EM - Emergent Marsh
OW - Open Water
FO - Forested
SS - Shrub/Scrub

1/ Source: Parametrix; and Shapiro & Associates, Wetland impact values provided by a GIS operated by Gambrell Urban, 1995. Wetland area values for wetlands 1-31 based on survey conducted by Port of Seattle (1995). Area values for wetlands 32-48 based on GIS output. Area values for wetlands 49-54 based on existing literature.

TABLE IV.11-2

SUMMARY OF WETLAND IMPACTS BY AREA AND ALTERNATIVE

	Wetland Types Affected (acres) a/			
Runway Length Option	Forested	Shrub/Scrub	Emergent	Total
8,500 ft. New Parallel Runway				
Runway	2.88	0.07	2.51	5.48
SASA	1.50	0.20	0.00	1.70
Warehouse/Parking	0.51	0.00	0.29	0.81
South Borrow Areas	1.62	0.12	0.08	1.82
North Borrow Areas	0.56	0.00	0.00	0.56
TOTAL	7.07	0.39	2.88	10.37
7,500 ft. Parallel Runways				
Runway	2.40	0.06	2.09	4.55
SASA	1.50	0.20	0.00	1.70
Warehouse/Parking	0.51	0.00	0.29	0.81
South Borrow Areas	1.62	0.12	0.08	1.82
North Borrow Areas	0.56	0.00	0.00	0.56
TOTAL	6.59	0.38	2.46	9.43
7,000 ft. Parallel Runways				
Runway	2.49	0.06	2.19	4.74
SASA	1.50	0.20	0.00	1.70
Warehouse/Parking	0.51	0.00	0.29	0.81
South Borrow Areas	1.62	0.12	0.08	1.82
North Borrow Areas	0.56	0.00	0.00	0.56
TOTAL	6.68	0.38	2.56	9.62

a/ All runway lengths assume a 2,500 foot (dependent) separation from Runway 16L/34R.
The impacts noted above assume maximum use of south on-site fill for construction, resulting in a worst-case presentation of wetland impacts. Assumes no material is taken from Borrow Area 8.
Source: Parametrix; Shapiro and Associates, and Gambrell Urban, 1995.

TABLE IV.11-3

SUMMARY OF WETLAND IMPACTS AND POTENTIAL MITIGATION AREA

	Wetland Class			
	Total	Forested	Shrub/Scrub	Emergent
Total Wetland in Study Area (ac)	143.8	51.7	50.8	41.3
Wetland Area Directly Impacted (ac)	10.37	7.07	0.39	2.88
Minimum Mitigation Ratio		2:1	2:1	1.5:1
Mitigation Area Required (ac)	19.24	14.14	0.78	4.32

Source: Parametrix; and Shapiro & Associates, 1995.

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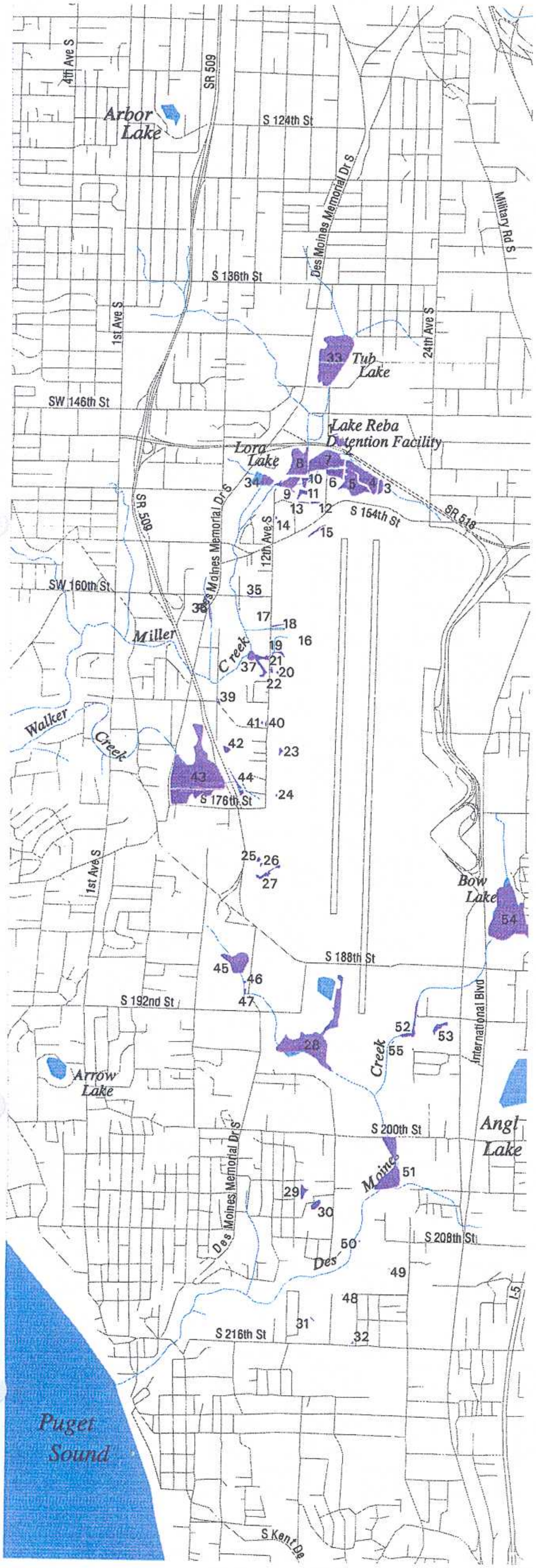
Seattle-Tacoma International Airport
Environmental Impact Statement
for the Master Plan Update

Exhibit IV.11-1

Wetlands in the Study Area



Palustrine Wetland

Source: Gambrell Urban, Inc. and
Shapiro & Associates, 1994
SASA Final EIS, 1994
King County Sensitive Areas Map Folio, 1990
City of SeaTac Wetland and
Stream Classfication, 1991
National Wetland Inventory, 1988
Port of Seattle Wetland Management Plan, 1992

Scale 1" = 2,500'

0 2500 5000
Scale in Feet

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

December 20, 1995

Seattle-Tacoma International Airport
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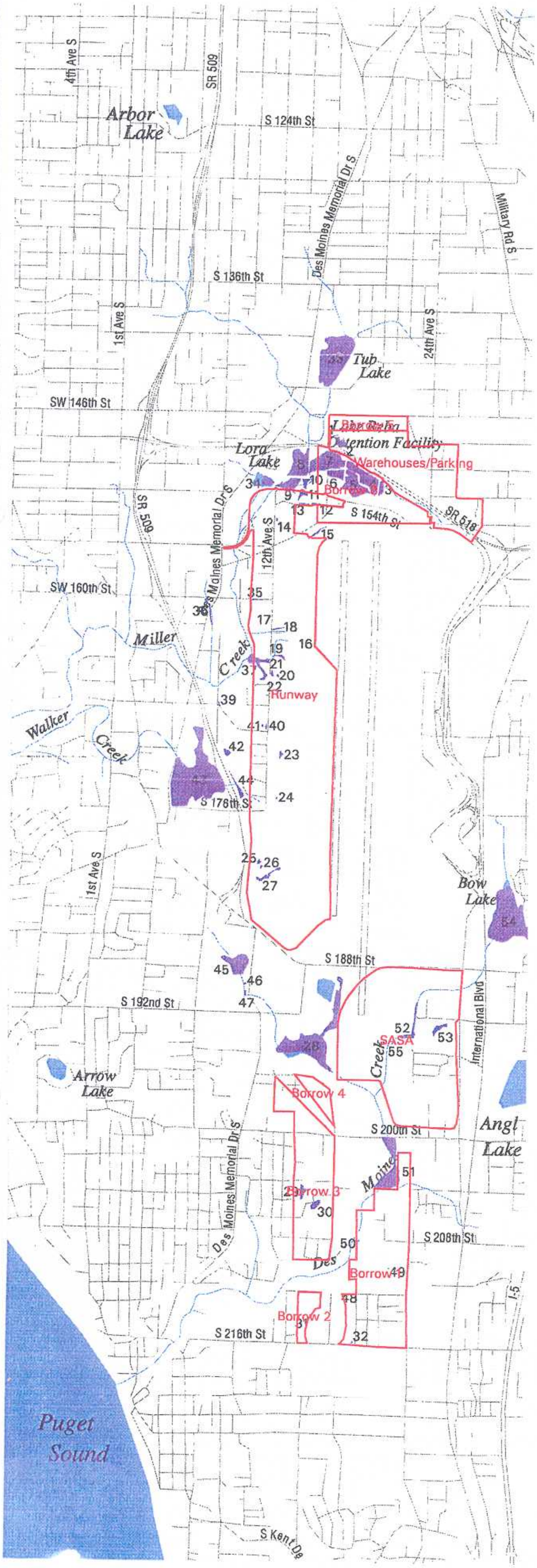
Exhibit IV.11-2

Wetlands Affected by Construction (8,500 Foot New Runway Option)



Palustrine Wetland

Potential Construction Impact Area

Source: Gambrell Urban, Inc. and
Shapiro & Associates, 1994
SASA Final EIS, 1994
King County Sensitive Areas Map Folio, 1990
City of SeaTac Wetland and
Stream Classfication, 1991
National Wetland Inventory, 1988
Port of Seattle Wetland Management Plan, 1992

Scale 1" = 2,500'

0 2500 5000
Scale in Feet

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

D—mber 20, 1995

CHAPTER IV, SECTION 12
FLOODPLAINS

Reported flooding and 100-year floodplains in the Sea-Tac area were identified from the most recent Flood Insurance Rate Maps compiled by the Federal Emergency Management Agency, flood insurance studies, and drainage complaints. Potential impacts on floodplains and flooding in Miller and Des Moines Creeks were evaluated by using construction footprints associated with the "With Project" alternatives and by modeling post-construction flows.

Without mitigation, construction, and operation of the proposed Master Plan Update alternatives could result in significant adverse floodplain impacts, including reduction of 100-year floodplain area and flood storage capacity, increased volumes of stormwater runoff and peak flows, and increased flooding potential in downstream areas on both Miller and Des Moines Creeks. Because mitigation would be required to prevent reduction of 100-year floodplain area and flood storage capacity, the proposed Master Plan Update alternatives would be unlikely to result in loss of flood storage or conveyance capacity. In addition, flow modeling results using detention requirements for the new development show that the proposed Master Plan Update alternatives would not increase peak flows or potential flooding in downstream areas of Miller of Des Moines Creek.

(1) METHODOLOGY

The boundaries of 100-year floodplains are determined by the Federal Emergency Management Agency (FEMA) and the U.S. Army Corps of Engineers. Floodplain boundaries are estimated on the basis of hydraulic modeling. Existing 100-year floodplain boundaries discussed in this section are those identified in the most current FEMA flood insurance rate maps and flood insurance studies. The approximate floodplain area affected by each alternative was determined by overlaying the potential construction footprints for each proposed Master Plan Update alternative on the floodplain maps.

Potential flooding impacts of the alternatives were determined by using recent hydrologic modeling results for Miller and Des Moines Creeks. Hydrologic models calibrated with existing stream flow information are used to identify existing and future peak flow rates and flood frequencies. Future peak flow rates and flood frequencies are calculated by using existing detention requirements for the 2-, 10-, and 100-year storm events. Potential flooding and impacts are estimated by comparing existing flow rate return frequencies to future flow rate return frequency.

(2) EXISTING CONDITIONS

Existing floodplains have been significantly altered by modern urbanization in both the Miller and Des Moines Creek basins, contributing to existing floodplain encroachment and reduction in available flood storage capacity. Urban development in two basins also has altered the hydrology of Miller and Des Moines Creeks, causing historic flooding in some areas, generally downstream of the Airport, and increased risk of flooding in naturally floodprone areas (i.e., depressions and low-lying downstream areas adjacent to these creeks).

(A) Present Floodplain Conditions

Urban development within the two basins has altered the existing size and structure of floodplains and contributed to the present floodplain configurations. As is typical of most urbanized drainage basins, streamside development has resulted in channelization of Miller and Des Moines Creeks and has eliminated or reduced linkages between the creeks and floodplain areas. Urban development activities that have contributed to altered floodplain configuration include filling of wetlands and riparian areas, removal of streamside vegetation within stream corridors, and construction of roads, residences, and commercial development. These alterations contribute to flooding by reducing channel capacity and floodplain storage in Miller and Des Moines Creeks.

In the Miller and Des Moines Creek basins, FEMA identifies two types of 100-year floodplain boundaries: Zone A and Zone AE. In Zone A, no base flood elevations have been determined. Base flood elevations have been determined for Zone AE. Existing 100-

year floodplains in each drainage basin are identified in **Exhibit IV.12-1.**[1] The Zone A 100-year floodplain boundary is an estimated boundary. Zone AE includes the 100-year floodplain boundaries from which the base flood elevations have been determined.

The 100-year floodplain widths vary, depending on topography. In the Miller Creek basin, relatively wide 100-year floodplain areas extend southward from the Lake Reba Detention facility and Lake Lora areas. These floodplains are located in depressions and relatively flat areas with little topographic relief, and extend downstream to about First Avenue S. The Lake Reba Detention Facility and Lake Lora provide considerable flood storage because of their associated wetlands and a flow control structure at the outlet of the Lake Reba Detention facility. This flow control structure was constructed recently by the King County Surface Water Management Division as part of the Lake Reba regional detention facility capital improvement project. Below First Avenue S., Miller Creek is more confined by the narrow, steep ravine topography. The average 100-year floodplain width in this area is about 50 feet. As the creek nears Puget Sound and the base of the steep ravine, the channel and floodplain widen to about 300 feet.[1] The areas most susceptible to flooding in the Miller Creek basin are along the lower reaches of Miller Creek and Walker Creek. This flood prone area lies within the northwest portion of the City of Normandy Park, near the Puget Sound shoreline.[2] Only minor flooding problems have been reported in the past few years.

The Des Moines Creek 100-year floodplain has a configuration similar to Miller Creek. From the origins of the two main tributaries at Bow Lake and the Northwest Ponds down to South 200th Street, no 100-year floodplain has been identified. In this gently sloping area around the Tyee Valley Golf Course, there are two manmade detention facilities, Northwest Pond, and Tyee Pond. Both the Northwest Pond and the Tyee Pond, the latter of which was constructed in 1989, [3] provide significant flood storage. (**See Chapter IV, Section 10, "Water Quality and Hydrology"**) As the creek begins its descent toward Puget Sound near South 200th Street, the channel becomes more incised and confined, and there is a narrow floodplain. Farther down the ravine, the creek becomes well confined and the floodplain is very narrow, averaging about 30 feet in width. The floodplain widens to about 280 feet near the mouth of the creek and confluence with Puget Sound at Covenant Beach Camp. The area most susceptible to flooding and which has experienced historic flooding is Covenant Beach Camp near the mouth of Des Moines Creek. Flooding has occurred primarily during large storms and unusually high tide conditions.[4]

(B) Historic Flooding

In the Miller Creek basin, historic flooding problems have been reported between Southwest 150th Street and Southwest 152nd Street just west of Des Moines Memorial Drive, upstream of Southwest 160th Street, and elsewhere throughout the basin where yard waste has constrained streamflow.[5] This flooding, caused primarily by undersized or poorly maintained conveyance structures, has been corrected by modification of the Lake Reba regional detention facility, other structural improvements, and maintenance activities (e.g., culvert debris removal).

Historic flooding also has been reported for the Des Moines Creek system.[6] An undersized grassy swale and filling of a wetland near South 216th Street have contributed to flooding problems in this reach of Des Moines Creek. An undersized detention facility and filling of wetland also

1/ *Flood Insurance Rate Maps, King County, Washington, and Incorporated Areas.* Map Number 53033C0319D, 53033C0309D, 53033C0308E, and 53033C0317D Federal Emergency Management Agency. September 29, 1989 and September 30, 1994.

2/ *Flood Insurance Study, City of Normandy Park, Washington, King County.* U.S. Department of Housing and Urgan Development, Federal Insurance Administration. 1980.

3/ *South Aviation Support Final Environment Impact Statement,* Federal Aviation Administration and Port of Seattle, Seattle, WA, 1994.

4/ *Flood Insurance Study, City of Des Moines, Washington, King County.* Federal Emergency Management Agency. 1985.

5/ *Reconnaissance Report No. 12, Miller Creek Basin.* King County Basin Reconnaissance Summary Program. Vol. III. King County Surface Water Management, Seattle, WA. 1987.

6/ *Reconnaissance Report No. 9, Des Moines Creek Basin. King County Basin Reconnaissance Summary Program. Vol. III.* King County Surface Water Management, Seattle, WA 1987.

have contributed to flooding on Tributary 0377A (shown in **Exhibit IV.10-4**). Similarly, wetland filling has contributed to flooding on Tributary 0379 near the outlet of Wetland 53 (as shown in **Exhibit IV.11-1**).

According to conversations with public works personnel in the cities of Normandy Park, Des Moines, and SeaTac, no significant flooding problems were reported during the November 1990 and January 1991 storms. The last major flood events on Miller and Des Moines Creeks were in 1972 and 1977, respectively. According to the flood insurance study, damage has generally been limited to stream erosion and limited flooding of residences in Normandy Park (Miller Creek) and Des Moines (Des Moines Creek). The 1977 flood event on Des Moines Creek, which was associated with a high tide with an approximate recurrence interval of 70 years, caused some property damage to buildings at the Covenant Beach Bible Camp.[7/]

(3) FUTURE CONDITIONS

Without mitigation, the proposed Master Plan Update alternatives could result in significant floodplain encroachment, reduced flood storage capacity, and increased flow rates and flow volumes, and could cause flooding in downstream areas adjacent to Miller and Des Moines Creeks. Development requirements prohibit significant floodplain encroachment and reduction of flood storage capacity. In addition, stormwater runoff detention requirements will prevent significant increases in peak flow rates. Implementation of these mitigation requirements would be expected to prevent significant floodplain or flooding impacts from the proposed Master Plan Update alternatives.

(A) Do-Nothing (Alternative 1)

Under Alternative 1, adverse impacts on floodplains or flooding in the Des Moines basin would potentially result from development of the South Aviation Support Area. The Tyee Pond would be relocated elsewhere on the Tyee Valley Golf Course as part of the SASA mitigation to retain existing storage capacity and flood control on Des Moines Creek. This would maintain existing conditions and prevent flooding as a result of the SASA.

(B) "With Project Alternatives (Alternatives 2,3, and 4)

The proposed airside and landside alternatives would result in floodplain encroachment of varying amounts, depending on the runway length, as shown in **Exhibit IV.12-2**. An 8,500-ft new parallel runway (with a lateral separation of 2,500 feet from existing Runway 16L/34R) would result in the loss of about 7.2 acres of 100-year floodplain adjacent to and downstream of Lake Lora. By contrast, about 1.1 acres of 100-year floodplain would be eliminated with a 7,500-foot staggered, runway alignment. A 7,000-foot runway would displace an estimated 0.03 acre of 100-year floodplain. Encroachment on the floodplain could result in loss of flood storage capacity. Increases in flood heights in downstream areas, particularly in those susceptible to flooding, would depend on the amount of flood storage displaced and on stormwater runoff detention facility flow release rates, volumes, and timing of peak rates relative to other areas of the watershed.

Without mitigation, flooding could occur in receiving areas downstream of Airport stormwater runoff discharges into Miller and Des Moines Creeks. The amount of stormwater runoff and potential flood impacts would be directly related to the amount of new impervious surface area constructed for each alternative. Because the landside options are essentially the same for the different runway lengths, the amount of impervious surface area varies only as a function of the runway alignment options. An 8,500-foot runway could have the greatest potential flood impacts because it would result in the most impervious surface area (an estimated 73 acres). By comparison, the 7,500-foot and 7,000-foot runway alignments could have lower potential flood impacts because they would create an estimated 65 and 60 acres of impervious surfaces, respectively. Because stormwater drainage controls are required for new Airport developments, it is unlikely that the proposed alternatives would have significant flood impacts.

7/ Flood Insurance Study, King County, Washington & Incorporated Areas, Volumes 1-4, FEMA, 1994.

(C) **Preferred Alternative (Alternative 3)**

As is described in Chapter II, the Port of Seattle staff have recommended the implementation of Alternative 3 (North Unit Terminal) with a new parallel runway with a length up to 8,500 feet. As the previous paragraphs indicate, all of the alternatives would result in the floodplain encroachment. About 7.2 acres of the 100-year floodplain adjacent to and downstream of Lake Lora would be filled. However, as is noted, **Appendix P** contains a proposed mitigation plan for this area that would compensate for the filled floodplain.

(4) CUMULATIVE IMPACTS

Adverse impacts on floodplains or flooding in the Des Moines basin would potentially result from development of other proposed projects in the vicinity, particularly if these encroach on existing floodplains or fail to meet regional detention requirements for stormwater runoff. Enforcement of local floodplain development standards and stormwater runoff detention requirements would prevent floodplain encroachment and mitigate potential flooding impacts from other proposed development.

(5) MITIGATION

Floodplain encroachment and flooding impacts in the Miller and Des Moines Creek basins resulting from the proposed alternatives would be unlikely because of required mitigation. Mitigation would include adherence to floodplain development standards and floodway management requirements of the FAA and Washington State Department of Ecology. Floodplain development standards prohibit any reduction in the 100-year floodplain or base flood storage volume. Compensatory mitigation is required by state law for any proposed filling of 100-year floodplain so as to achieve no net loss in flood storage capacity and to prevent an increased risk of loss of human life or property damage.[8/]

Compensatory mitigation for floodplain impacts near the northwest corner of the proposed new parallel runway has been incorporated into the stream relocation design (**Appendix P**). The stream mitigation design would create an equivalent amount of floodplain storage - so no net loss of flood storage capacity.

Another potential flood storage and flood control mitigation option for the Miller Creek basin that is being considered involves modification of current operating procedures at the Lake Reba Regional Detention facility to provide additional storage. King County Surface Water Management Division, which currently operates the facility, is negotiating transfer of the facility operating responsibilities to the Port of Seattle. According to as-built drawings, the Lake Reba Detention facility has a design storage capacity of about 80-acre feet; however, a dam safety report indicates that it has a maximum storage capacity of about 90-acre feet. Based on the dam safety report, the storage capacity appears to be underused. Before any recommendations can be made on operational procedure modification for maximizing or providing additional capacity, the outlet rating curve for the facility must be verified to accurately determine detention characteristics and available storage capacity.

FAA directives state: "a significant encroachment will require a federal finding as part of any favorable decision on the action that there is no practicable alternative and that the action conforms to applicable state and/or local floodplain protection standards."[9/] Significant encroachment includes the risk of loss of human life, likely property damage, and notable adverse impacts on natural and beneficial floodplain values (e.g., groundwater recharge, wildlife habitat, flood storage and control). FAA directives also state: "The term practicable means feasible. Whether another alternative is practicable depends on its feasibility in terms of safety, meeting transportation objectives, design, engineering, environment, economics and other applicable factors." FAA directives indicate that an alternative is feasible if it can engineered, but an alternative also must be prudent, which is a reference to safety, policy, environmental, social, or economic consequences.[10/] These directives require analysis of all practicable measures to minimize harm, restore and preserve the natural and beneficial floodplain values affected, and provide evidence of conformance with applicable state or local floodplain protection standards.

8/ *Environmentally Sensitive Areas - Flood Hazard Areas, Chapter 15.30210-250, City of SeaTac Municipal Code.*

9/ *FAA Airport Environmental Handbook. 5050.4A* Chapter 5, Paragrph 47e.(12)(F). Federal Aviation Administration, Washington, D.C. October 8, 1985.

10/ 49 USC 47101 and Section 4(f) of the Department of Transportation Act require findings that no "possible" or "feasible" alternative exists.

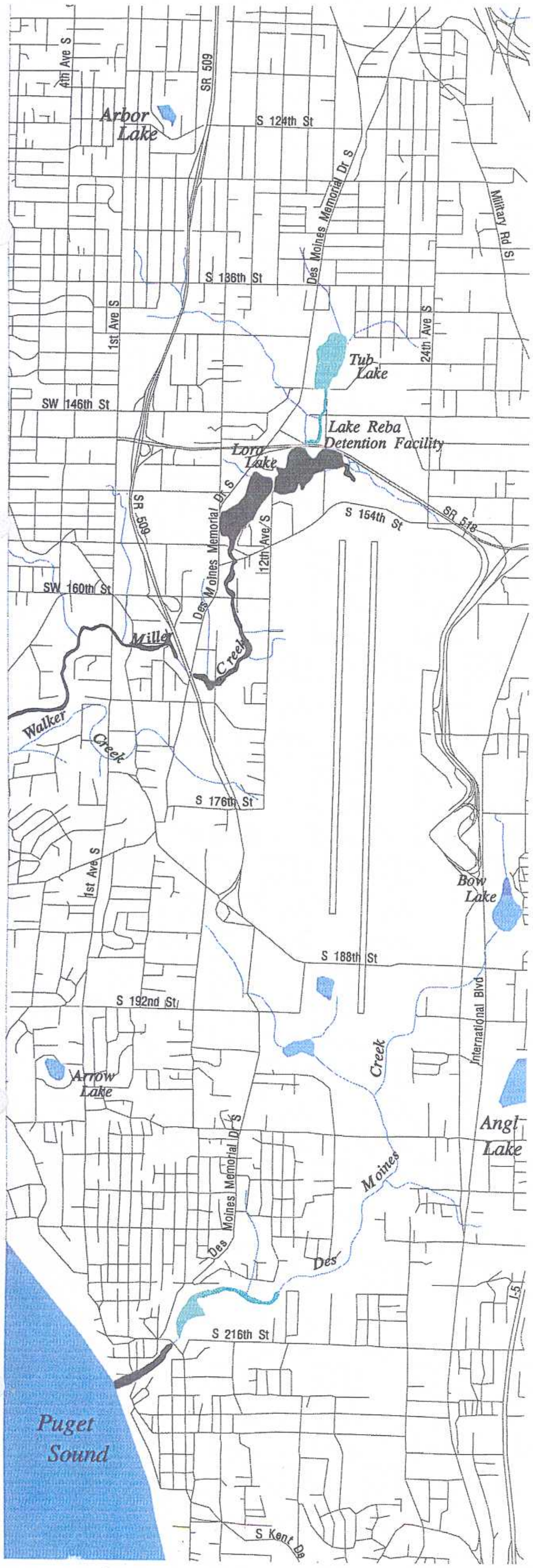
AR 003875

As this Environmental Impact Statement demonstrates, no other practicable alternative exists other than completion of one of the proposed Master Plan Update alternatives. Significant floodplain encroachment would be unlikely as a result of the "With Project" alternatives due to strict mitigation requirements which would be adhered to under any of the alternatives.

The Washington State Department of Ecology also has specific mitigation requirements to reduce potential flooding impacts from new developments. New projects are required to meet Ecology stormwater drainage detention for the 2-, 10-, and 100-year storm events.[11] Storm flow modeling based on conceptual stormwater detention facilities and using these design storms indicates no increase in peak flow rates and little risk of flooding from the proposed Master Plan Update alternatives. Required mitigation would be expected to prevent significant adverse impacts on floodplains or flooding in the Miller and Des Moines Creek basins. Preliminary compensatory floodplain replacement designs for floodplain encroachment in the Miller Creek basin for the 8,500-ft. runway length, demonstrating no net loss of flood storage capacity, are presented in **Appendix P**.

As shown in the preceding section, the Master Plan Update alternatives are the only practicable alternative to satisfying the needs identified by this EIS. While the displacement would be substantially greater (7.2 acres displaced versus 0.03 acres) with the preferred alternative, potential impacts would be mitigated through creation of an equivalent amount of floodplain so there would be no net loss of flood storage capacity of increased risk of loss of human life or property damage.

[11] *Stormwater Management Manual for the Puget Sount Basin.* Washington State Department of Ecology, 1990.



Seattle-Tacoma International Airport
Environmental Impact Statement
for the Master Plan Update

Exhibit IV.12-1

Floodplains - Existing

Zone A - Base Elevation Not Determined

Zone AE - Base Elevation Determined

Source: Gambrell Urban, Inc. and Shapiro & Associates, 1994
Federal Emergency Management Agency, 1994, 1989

100-year floodplains based on FEMA maps shown for Miller Creek and Des Moines Creek only.

Scale 1" = 2,500'

0 2500 5000

SCALE IN FEET

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

April 11, 1995

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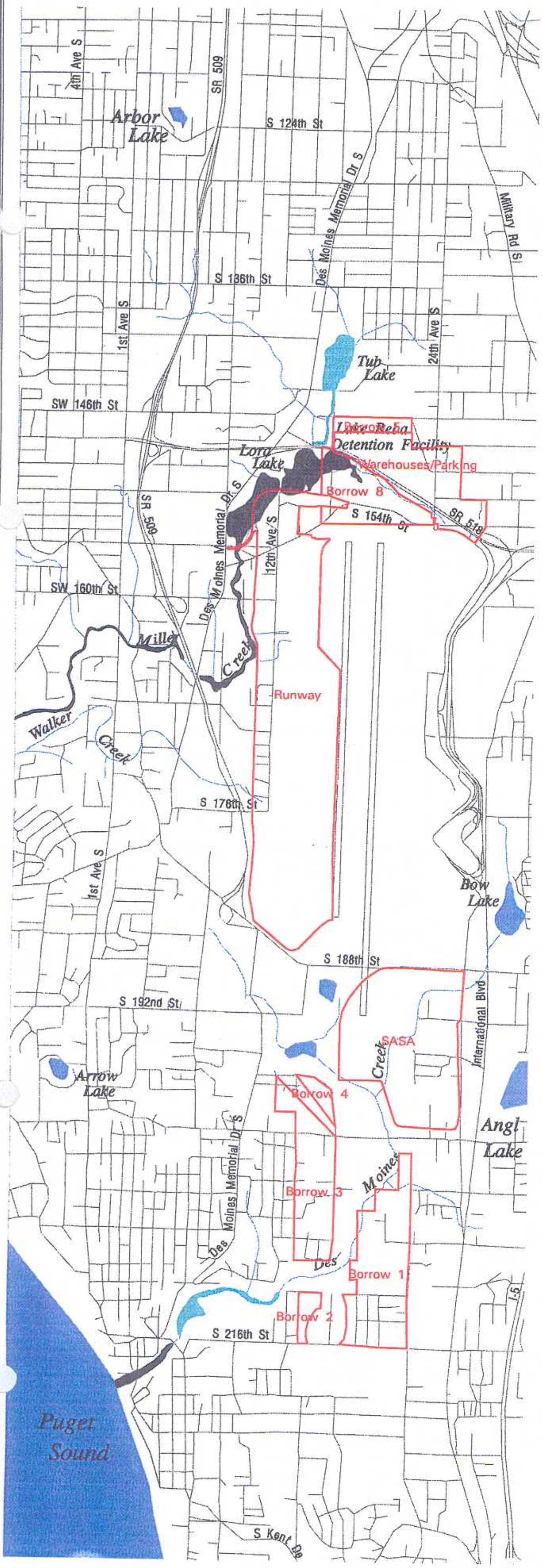

Seattle-Tacoma International Airport
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Exhibit IV.12-2

Floodplains Affected by Construction

(8,500 Foot New Runway Option)

Zone A - Base Elevation Not Determined

Zone AE - Base Elevation Determined

Potential Construction Impact Area

Source: Gambrell Urban, Inc. and Shapiro & Associates, 1994
Landrum & Brown, Inc. 1994
Federal Emergency Management Agency, 1994, 1989

100-year floodplains based on FEMA maps shown for Miller Creek and Des Moines Creek only.

N
S

Scale 1" = 2,500'

0 2500 5000
SCALE IN FEET

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

April 11, 1995

CHAPTER IV, SECTION 16
PLANTS AND ANIMALS (BIOTIC COMMUNITIES)

This report describes vegetation and wildlife communities and evaluates potential impacts of the proposed Master Plan Update alternatives on these communities.

Approximately 40 percent of the detailed study area is occupied by Sea-Tac Airport and is characterized by frequently mowed grassland bisected by service roads and taxiways. This area provides little wildlife habitat value. Wildlife habitat surrounding the airfield consists of fragmented habitat, which is composed of forest, shrub, and grassland with scattered wetlands. These areas are subject to a variety of airport-related disturbances as well as increasing residential, commercial, and industrial development. Each of the "With Project" alternatives would remove approximately the same amounts of vegetation (about 712 acres total). Of that total, the majority is managed grassland (about 303 acres), which provides little wildlife habitat value. In addition, about 269 acres of forest, 78 acres of shrub, 52 acres of unmanaged grassland, and 10 acres of wetlands would be removed under each "With Project" alternative.

Various physical, biological, and chemical factors affect fisheries and aquatic biota. Urbanization in the Miller and Des Moines Creek basins has altered some of these factors with resulting changes in the aquatic ecosystem. Hydrologic regime and channel morphology have been altered, habitat complexity and quality have been reduced, and water quality has been degraded. These alterations have resulted in reduced diversity and abundance of fish and aquatic biota in Miller and Des Moines Creeks.

Construction and operation of the proposed new dependent parallel runway would have some adverse affects on fishery and aquatic resources of Miller and Des Moines Creeks and Puget Sound. About 3,700 feet of Miller Creek and its tributaries would require realignment and relocation to complete the runway. About 200 feet of Des Moines Creek would require relocation due to the 600 ft extension of Runway 34R. About 2,200 feet of open channel on Des Moines Creek would require relocation due to the South Aviation Support Area. The 200-foot section of Des Moines Creek that would be affected by the extension of Runway 34R is within the area that would be realigned as mitigation for SASA. Proposed mitigation would reduce potential impacts on the hydrology, water quality, and aquatic habitat and biota of Miller and Des Moines Creeks and Puget Sound.

(1) METHODOLOGY

For purposes of this analysis, the study area consists of a 4 square mile area that is bound by Highway 99 to the east, S. 140th Street to the north, State Route 509 (SR509) and Des Moines Way S. to the west, and S. 216th Street to the south.[1/] Study area boundaries were determined using preliminary site plans to analyze the proposed Master Plan Update alternatives and their potential impacts. Because of restricted access in the privately-owned, residential areas, studies focused on public property and lands owned by the Port of Seattle.

Information for this report was gathered from a variety of sources. The Washington Department of Fisheries and Wildlife (WDFW) Nongame and Priority Habitats and Species) Programs, and the Washington State Department of Natural Resources Natural Heritage Program were consulted regarding sensitive wildlife and plant species and priority habitats in the study area. In accordance with Section 7(c) of the Endangered Species Act of 1973, the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service were consulted regarding federally listed threatened or endangered species possibly occurring in the project area (as described in Chapter IV, Section 17).

Analysis of fishery and aquatic resources within the Miller and Des Moines Creek basins was based on past and recent studies. The *King County Sensitive Areas Map Folio* (1990),[2/]

1/ This area includes portions of Sections 4, 5, 8, and 9, Township 22N, Range 4E, and Sections 16, 17, 20, 21, 28, 29, 32 and 33, Township 23N, Range 4E.

2/ *King County Sensitive Areas Map Folio*. Department of Parks, Planning and Resources, Planning and Community Development Division, King County, Washington, 1990.

AR 003879

National wetlands inventory maps,[3] and the catalog of Washington streams for the Puget Sound Region[4] were reviewed for information on sensitive habitat areas and fisheries resources. Discussions of fish habitat (e.g., substrate composition, pool: riffle ratios, riparian vegetation, in-stream cover, and channel morphology) are based on recent fish habitat surveys performed on Miller Creek (as described in greater detail in **Appendix F**) and Des Moines Creek.[5] Evaluation of potential construction and operation impacts on fisheries in these drainages involved a comparison of existing and future fish population vitality (e.g., abundance and diversity) based on fish habitat requirements and preferences, water quality, and water quantity.

Vegetative cover and wildlife habitat in the study area were assessed by aerial photograph and map interpretation. Habitat classification was determined using a two-tiered system of generally accepted vegetation and wildlife habitat categories: forest, shrub, grassland, and wetland. The secondary levels included three types of forest and two types of grassland: coniferous, deciduous and mixed forest, and managed or unmanaged grassland. Wetlands are classified according to the USFWS Wetland Classification System.[6] The vegetative classification was interpreted from color aerial photographs at a scale of 1:24,000 and a vegetative cover map of the focus area was developed at a scale of 1:2,500. Further consultation was made with the Port of Seattle. Personnel with specific knowledge of the study area provided information on bald eagles and other wildlife.

A review of this information along with information provided in previous technical studies,[7/8] agency reports, natural resource inventories, and topographic and resource maps allowed an inventory and assessment of resources that could be affected by the proposed Master Plan Update alternatives.

Two, one-day site visits were conducted in October and November 1994 to field-verify information collected on vegetation communities within the study area, wildlife habitat, and general wildlife use of the area. Additional field surveys were conducted during December 1994 in conjunction with wetland surveys. Wildlife observations and habitat data were recorded to further augment existing information.

(2) EXISTING CONDITIONS

Both wetland and upland habitats are located within the study area and are shown in **Exhibit IV.16-1.** Several wetland communities and several upland habitat associations were identified. These communities are discussed in the following section. A detailed characterization of vegetation, wildlife species, and fish, and common and scientific names of plant species occurring in the study area are presented in **Appendix M.** Scientific nomenclature follows industry standards.[9]

(A) Vegetation

No rare plants, high-quality native wetlands, or high-quality native plant communities listed by the Washington Department of Natural Heritage Information System are located in the study area.[10]

Upland vegetative communities consist of grassland, shrub, deciduous forest, coniferous forest, and mixed deciduous/coniferous forest. Eight habitat types are distinguished as shown in **Exhibit IV.16-1**: grassland, managed lawn, pasture, row crop, mixed shrub, coniferous forest, deciduous forest, mixed forest, mixed vegetation classes, and wetland. Existing acreages of each habitat type were determined by overlay of the vegetation map and are shown in **Table IV.16-1.** For ease of tabulation; the managed lawn, pasture, and row crop categories were combined into one category (managed grassland), which includes managed

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[3] *National Wetlands Inventory, Maple Valley, Washington Quadrangle.* U.S. Fish and Wildlife Service. 1988.

[4] *A Catalog of Washington Streams and Salmon Utilization; Vol. 1, Puget Sound Region.* Williams, R.W., R.M. Laramie and J.J. Ames, Washington Department of Fisheries, 1975.

[5] *Draft Fish Habitat Survey of Des Moines Creek.* Prepared by Resource Planning Associates, Aquatic Resource Consultants, and Caldwell Associates for the Port of Seattle. May, 1994.

[6] *Classification of Wetlands and Deepwater Habitats of the United States.* U.S. Fish and Wildlife Service, Pub. #FWS/OBS-79/31. Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe, 1979.

[7] *South Aviation Support Area Final EIS.* Port of Seattle, 1994.

[8] *Des Moines Creek Technology Campus, Preliminary DEIS.* Port of Seattle. 1994.

[9] *Flora of the Pacific Northwest.* Hitchcock, C.L. and A. Cronquist, 1976.

[10] Communication with Sandra Norwood, Washington Natural Heritage Program, Division of Land and Water Conservation. January, 1995.

grassland areas associated with airport operations areas, industrial and commercial development, and agricultural lands. From a wildlife perspective, these areas provide similar habitat value.

Seven streams were identified. Des Moines Creek and Miller Creek are the largest of these streams. The riparian areas associated with streams consist of both upland and wetland communities dominated by an overstory of red alder, black cottonwood, and willow trees with Himalayan blackberry, mixed grasses, lady fern, field horsetail, slough sedge, burreed, reed canarygrass, and creeping buttercup comprising much of the understory.

TABLE IV.16-1
EXISTING WILDLIFE HABITAT

Vegetation Class	(Acres) Existing Area
Managed Grassland	900
Grassland*	142
Shrub	253
Wetland**	
Forested Wetland	52
Scrub-shrub Wetland	51
Emergent Marsh	41
Deciduous Forest	723
Mixed Forest	78
Coniferous Forest	112
Total	**2,352**

* Includes unmanaged grassland such as overgrown fields and grassland areas scattered throughout less developed portions of the site.

** Refer to Wetland Section of this report for detailed information on wetlands

Source: Shapiro and Associates, Inc., 1994

Wooded residential areas characterize parts of the easternmost portion of the study area, between the airport and Highway 99. Field studies were not conducted in this portion of the study area due to restricted access. Existing information shows that these areas are dominated by Douglas fir, big-leaf maple, and red alder. Common understory species include red alder saplings, Himalayan blackberry, hazelnut, and Indian plum. Ornamental trees and shrubs also are common throughout these residential areas.

For descriptive purposes, the study area has been divided into five distinct areas: (1) Airfield Vegetation, (2) South Aviation Support Area (SASA) Vegetation, (3) West SeaTac Vegetation, (4) North Borrow Area, (areas 5 and 8) and (5) South Borrow Area (areas 1-4). **Appendix M** contains a detailed description of the vegetation communities in each of these areas. Vegetation communities in each of these areas are briefly described below.

1. **Airfield Vegetation**

The airfield encompasses the runway area and associated airport facilities and is bound on the east and west by runways, on the north by S. 154th Street, and on the south by S. 192nd Street. This area is characterized almost entirely by managed grassland interrupted by an array of service roads, airport runways, and taxiways. This is the most common vegetative community in this area, totaling approximately 774 acres in the airfield. Upland shrub habitat often borders the runway area and is scattered throughout the site. Several small patches of grass/forb association emergent wetland occur in the airfield area.

2. **South Aviation Support Area (SASA) Vegetation**

The SASA area is located immediately south of the airfield and is bound on the west by Des Moines Way S., on the east by Highway 99, and on the south by S. 200th Street. Much of this area has been previously described in the 1994 SASA Final EIS and is predominately characterized by a former residential area that is now revegetated with grassland and shrubland, two small mixed deciduous/coniferous woodlots, and the Tyee Valley Golf Course.

3. **West SeaTac Vegetation**

Fragmented stands of second-growth mixed deciduous/coniferous forest are prominent components of the vegetative cover along the western portion of the focus area. It is bound on the east by the airfield, on the west by Des Moines Way S. and SR509, on the north by S. 154th Street, and on the south by S. 200th Street.

4. **North Borrow Area (On-site Borrow Source Areas 5 and 8)**

The North Borrow Area is bound on the south by S. 154th Street, on the north by S. 146th Street, and Lora Lake on the west. Houses that once existed in this area have been removed as part of the Port's Noise Remedy Program. The North Borrow Area is largely forested and contains the Lake Reba Detention facility, a King County regional stormwater detention facility. A gravel storage area is located in the southern portion of this borrow site and is predominately devoid of vegetation. Miller Creek enters the north end of this area, flows past the north end of Lake Reba, and into Lora Lake. Forested wetland is the most common vegetative community in the North Borrow Area.

5. **South Borrow Area (On-site Borrow Source Areas 1-4)**

The South Borrow Area is bound on the south by S. 216th Street, on the north by S. 200th Street, on the east by 16th Avenue S., and on the west by 24th Avenue S. Des Moines Creek Park is located in the central portion of this area, between Borrow Areas 1 and 2. Both upland and wetland second-growth deciduous forest are prevalent vegetative components of the South Borrow Area. Des Moines Creek flows through a steep forested ravine from the north side of this area to the southwest corner.

(B) Wildlife Species

Wildlife habitat within the Airport vicinity has been highly modified through urbanization and residential development. Much of the study area is protected from human and domestic animal intrusion through restricted access and fencing. When considering habitat value from a regional perspective, the relatively undisturbed vegetation communities in the area offer valuable habitat for wildlife.

Vegetation communities provide habitat for several species of terrestrial and aquatic wildlife. Wildlife diversity is generally related to the structure and plant species composition within these vegetative communities. Fragmentation of habitat and significant ongoing noise disturbance caused by airport operations limit wildlife use of the study area.[11/] Wetlands and forested areas with well developed shrub layers are likely to support the greatest number of species and populations of wildlife.[12/] Common and scientific names of wildlife species discussed in the following text are presented in **Appendix M** along with a detailed characterization of the study area.

(C) Fisheries and Aquatic Resources

Although urbanization has significantly altered channel morphology and fish habitat, Miller, Walker, and Des Moines Creeks continue to support populations of resident and anadromous fish, other fishes, and associated aquatic biota. Historically, Miller and Des Moines Creek basins supported large runs of coho salmon (*Oncorhynchus kisutch*) and perhaps small runs of chum salmon (*O. keta*).[13/] Presently, both basins support only small runs of coho salmon, which appear to be maintained by annual releases of hatchery-reared fingerlings raised by the Des Moines Salmon Chapter of Trout Unlimited. WDFW has not conducted any spawner surveys on either Miller or Des Moines Creeks since 1985; no spawning coho were observed in the 1985 survey.[14/] The Des Moines Salmon Chapter of Trout Unlimited reported about 91 fish in a recent coho spawner survey conducted on Miller Creek.[15/] There is no known chum salmon or steelhead use of

11/ *Disturbance to birds by gas compressor noise stimulators, aircraft, and human activity in the Mackenzie Valley and North Slope, 1972.* Arct. Gas Biol. Rep. Ser. 14. Gunn, W.W.H., and J.A. Livingston, eds., 1974.

12/ *Management of Wildlife Habitats in Forests of Western Oregon and Washington, Vols.1 and 2.* Brown, E.R. (ed).,U.S. Forest Service, 1985.

13/ *Catalog of Washington Streams and Salmon Utilization.* Williams, R.W., R.M Laramie, and J.J. Ames. Washington Department of Fisheries. 1975.

14/ Personal communication with Joe Robel, Fisheries Biologist, Washington Department of Fish and Wildlife. August 8, 1994.

15/ Personal communication with Allen Miller, Restoration Coordinator, Des Moines Salmon Chapter of Trout Unlimited. July 18, 1994.

either creek.[16/,17/] Barriers to upstream fish passage limits salmon use of Miller Creek to the area below the culvert at 1st Avenue S. (about 2 miles) and to the below S. 200th Street on Des Moines Creek (about 2.5 miles).

In addition to anadromous fish, both Miller and Des Moines Creeks support resident populations of cutthroat trout (*O. clarki*) and pumpkinseed sunfish (*Lepomis gibbosus*).[18/] Des Moines Creek also supports resident populations of rainbow trout (*Oncorhynchus mykiss*), bluegill(*Lepomis macrochirus*), black bullhead (*Ictalurus melas*), and largemouth bass(*Micropterus salmoides*). In addition, Miller, Walker, and Des Moines Creeks likely support small populations of native nongame fishes, including sculpin (*Cottus* sp.) and other nongame fishes indigenous to the area. Electrofishing conducted on Des Moines Creek in four reaches (one downstream and three upstream of S. 200th Street) captured five rainbow trout, 13 bluegill, 17 black bullhead, and two largemouth bass.[19/] Bluegill, bullhead, and largemouth bass appear to be restricted to the Northwest Ponds, Bow Lake and slower water habitats at the Tyee Valley Golf Course. In a recent (October 1994) electrofishing survey at seven locations on Des Moines Creek between Marine View Drive and S. 200th Street, a total of 50 salmonids were captured, including 48 cutthroat trout ranging from about 3 to 13 inches and two juvenile coho salmon.[20/] Lengths of juvenile coho were not reported. Cutthroat trout were captured at all seven locations, but juvenile coho were captured only at the most downstream station. In addition, 14 pumpkinseed sunfish were captured, ranging from about 1.5 to 2.5 inches. The source of pumpkinseed sunfish, which were caught at six of the seven sampling locations, is likely Bow Lake and the Northwest Ponds upstream of S. 200th Street. Though no comprehensive population studies have been conducted on either creek, recent electrofishing surveys conducted on Des Moines Creek and limited observations made on Miller Creek, suggested that these creeks support relatively small populations of salmonid and nongame fish species.

16/ Personal communication with Joe Robel, Fisheries Biologist, Washington Department of Fish and Wildlife. August 8, 1994.

17/ Personal communication with Phil Schneider, Fisheries Biologist, Washington Department of Fish and Wildlife. August 18, 1994.

18/ Personal communication with Alan Johnson, Aquatic Scientist, Aquatic Resource Consultants, November 12, 1994.

19/ *South Aviation Support Area Final EIS*. Port of Seattle. 1994.

20/ Personal communication with Alan Johnson, Aquatic Scientist, Aquatic Resource Consultant, August 18, 1994.

(3) FUTURE CONDITIONS

Potential impacts on vegetation communities and wildlife habitat are discussed in the following section. Potential construction and operational impacts for each of the "With Project" alternatives are evaluated by the years 2000, 2010, and 2020.

Construction and operation impacts on fish and aquatic biota that could result from the proposed alternatives include effects on water quality, water quantity, and aquatic habitat. It is anticipated that required mitigation would prevent such impacts, however.

(A) Do-Nothing (Alternative 1)

The following paragraphs summarize the impact of Alternative 1 on vegetation, wildlife and fish.

1. Vegetation

The Do-Nothing alternative would result in the Airport area remaining as it exists today, with the exception of minor improvements. Therefore, no impact on vegetation and wildlife habitat would be expected as a result of continued functioning of Airport facilities. Due to the completion of the SASA development approved in the 1994 SASA Final EIS, about 142 acres of land would be affected. The primary vegetation affected (60 percent) would be managed grassland. Construction activities associated with the SR509/South Access Road project would result in the permanent loss of between 28 and 56 acres of vegetation, depending on the selected alternative.

2. Wildlife Species

The Do-Nothing alternative would result in the Airport area remaining as it exists today, with the exception of improvements such as the SASA and the

SR509/South Access road project. Habitat degradation and vegetation removal as a result of construction would result in displacement of wildlife species. Noise disturbance related to construction activities may cause disturbance-sensitive species to avoid potential habitat in an area surrounding the construction zone.

3. **Fish and Aquatic Resources**

Fish and aquatic biota will continue to be adversely affected by existing degraded water quality, water quantity, and stream habitat conditions that result from various land uses in these basins. About 2,200 feet of open channel of tributary 0377, a Class 3 intermittent segment of Des Moines Creek, would require relocation due to SASA. Water quality of Miller and Des Moines Creeks could improve due to implementation of NPDES permit requirements for the Airport. Several other proposed developments in the basins (e.g., SR509 extension) could adversely affect hydrology, water quality, and aquatic habitat in Miller and Des Moines Creeks and Puget Sound if not adequately mitigated.

Stormwater runoff from the Airport contains pollutants that can be toxic to aquatic biota at levels above acute and chronic toxicity standards. Standards are generally established below levels observed to have toxic effects on the most sensitive test organisms. Toxicants found in stormwater runoff include dissolved copper and zinc, glycols, and ammonia. Acute and chronic toxicity of these pollutants on aquatic biota in Miller and Des Moines Creeks depend on other receiving water qualities, including ;H, hardness, and temperature. The toxicity of metals is inversely proportional to water hardness (toxicity increases as hardness decreases). Ammonia toxicity varies as a function of pH and temperature. Based on existing stormwater monitoring data, levels of copper, zinc, and ammonia occasionally appear to exceed acute and chronic toxicity standards. Glycol levels in stormwater runoff generally appear to be several orders of magnitude lower than those causing acute toxic effects on salmonids but could contribute to chronic effects on aquatic biota.

The actual quantities of these pollutants in receiving waters and corresponding toxicity to aquatic biota depend on concentrations of these pollutants in the creeks and the total pollutant loads for the entire Miller and Des Moines Creek basins. Most of the total estimated annual pollutant loadings for total suspended solids, oil and grease, total copper, total lead, total zinc, biochemical oxygen demand, and total phosphorus comes from other residential, commercial, and light industrial areas in these basins (see Chapter IV, Section 10 "Water Quality and Hydrology" and Appendix M for a more detailed discussion of pollutant loading contributions from the Airport and copper toxicity). However, the Airport may contribute a relatively high proportion of total loadings of the more toxic dissolved forms of copper and zinc. Additional studies are being conducted by the Port of Seattle to evaluate the toxicity of stormwater runoff on the aquatic biota in Miller and Des Moines Creeks.

(B) "With Project" Alternatives (Alternative 2, 3 and 4)

The following paragraphs summarize the impact of "With Project" alternatives on vegetation, wildlife and aquatic resources.

1. **Vegetation**

The primary effect on vegetation communities from construction is the direct removal of vegetation. This impact is similar among all "With Project" alternatives but varies in severity depending on the type and quantity of vegetation that would be affected. Loss of plant communities that offer limited habitat value, such as managed grassland, result in less of an adverse effect than loss of more complex vegetation associations, such as mature forests, wetlands and riparian zones. **Table IV.16-2** shows the approximate amount of each vegetation community that would be lost as a result of each alternative. All "With Project" alternatives would result in a direct conversion of approximately 10 acres of wetland, 52 acres of unmanaged grassland, 269 acres of upland forest, 78 acres of shrub, and 303 acres of managed grassland to impervious surfaces. Slight differences in impacts between the "With Project" alternatives would occur as a result of the different terminal location.

TABLE IV.16-2

IMPACTS ON VEGETATION AND WILDLIFE HABITAT

Vegetation Class	Existing Area (ac)	AREA IMPACTED (acres)* Alternatives Alt 1	Alt 2	Alt 3	Alt 4
Managed Grassland	900	85	303	283	311
Grassland	142	0	52	57	57
Shrub	253	20	78	83	71
Wetland					
Forested Wetland	52	2	7	7	7
Scrub-shrub Wetland	51	0	1	1	1
Emergent Marsh	41	0.2	2	2	2
Deciduous Forest	723	34	251	255	244
Coniferous Forest	112	1	18	14	14
Mixed Forest	78	0	0	0	0
Total	**2,352**	**142.2**	**711.7**	**701.7**	**706.7**

* Assumes 8,500-foot runway alternative separated by 2,500 feet from 16L/34R.

Source: Shapiro and Associates, Inc. 1994

Phase 1 construction activities scheduled for completion by the year 2000 would affect the greatest amount of vegetation. Construction areas for this phase total over 300 acres (for an 8,500-ft new parallel runway). Phase 1 construction activities would include construction of the new parallel runway, realignment of S. 156th Way and S. 154th Street, and construction of specified airport infrastructures.

Construction of the proposed new runway itself would require the clearing, grading, and filling of over 200 acres of upland forest, shrub, grassland, and wetland communities. Phase 1 construction with either the 7,500-foot runway or 7,000-foot runway options would require the removal of similar vegetation communities in comparison to the 8,500-foot option; however, construction of either of the shorter runway options would result in a correspondingly lower impact on these communities. In addition to the 300 acres of vegetation removed as a result of Phase 1 construction, approximately 221 acres of upland forest, shrub, grassland, and wetland vegetation would be cleared in Borrow Areas 1, 2, 3, 4, and 5. To minimize wetland impacts, Borrow Area 8 would not be used as a fill source. No excavation would occur in this portion of the site. Grading, clearing, and excavation of Borrow Areas 1,2,3,4, and 5 would be expected to occur during Phase 1.

Construction activities that would be scheduled for completion by the year 2010 (Phases 2 and 3) would be limited to airport infrastructures required to support airport operations, including expansion of existing parking areas and creation of a new parking garage, and expansion of the north and south satellite concourses. Construction activities for Phases 2 and 3 would require the clearing, grading, and filling of approximately 100 acres of upland forest, shrub, grassland, and wetland communities.

Construction activities that would be scheduled for completion by the year 2020 (Phases 4 and 5) would include construction of new taxiways, additional expansion of the north and south satellite concourses, additional expansion of existing parking facilities, and new aircraft maintenance facilities within

SASA. Construction activities associated with these efforts would occur predominantly in former residential areas that are part of the Port's Noise Remedy Program. Primary impacts would involve the removal of approximately 90 acres of grassland and shrub communities.

Cumulative impacts on plant communities could occur as a result of concurrent or future construction of several other proposed projects in the Airport vicinity. The primary impacts associated with construction and operation of these projects are habitat degradation and removal of vegetation. These impacts would contribute to additional loss of native vegetation and habitat, thus further reducing the limited natural resources in the vicinity of the Airport. Vegetation communities potentially affected include managed grassland, shrub, mixed deciduous/coniferous forest, and wetland.

No loss of vegetation communities would be anticipated during the operational phase of the proposed Master Plan Update alternatives. Indirect impacts may occur as a result of increased local development associated with increased human use of the area.

Impacts on vegetation communities as a result of Alternative 2, 3 and 4 are similar. Slight differences in impacts would occur as a result of the different terminal locations. These differences would almost entirely involve managed grassland.

2. Wildlife

Construction activities associated with development of any of the "With Project" alternatives would result in the displacement of wildlife species. Highly mobile animals such as large mammals and birds are able to move away from disturbances into nearby habitats. It is generally assumed, however, that these habitats are at or near carrying capacity and these animals would be required to compete for already limited resources. Less mobile animals such as small mammals, amphibians, reptiles, young animals, and nesting birds, would most likely perish during construction.

Disturbance caused by construction activities in the study area may have an adverse impact on wildlife by disrupting feeding and nesting activities. Clearing and grading activities in the South Borrow Area, adjacent to the large forested tract that encompasses Des Moines Creek Park could have an impact on breeding wildlife. This habitat is used extensively by neotropical migrant and resident songbirds for breeding. Significant noise disturbance, especially in this relatively undisturbed area of the site, could cause birds to abandon their nests.

Construction activities associated with any of the "With Project" alternatives could have adverse effects on wildlife populations in aquatic habitats. Approximately 10 acres of wetland loss would occur as a result of filling and grading. A variety of small mammals and amphibians would be directly impacted by this loss because they rely on these areas for foraging, breeding, and overwintering habitat. Because of their limited mobility, these taxa would likely perish during construction activities. Many of the aquatic habitats have been previously degraded by activities such as construction, fuel spills, and refuse dumping. Exposing soil and removing vegetation could result in an increase in sediments and other non-point pollutants entering adjacent wetlands, contributing to further degradation of aquatic habitat. Many amphibian species are sensitive to pollutants, and water quality in aquatic habitats on the site may be a limiting factor for some of these species.

The conversion of one habitat type to another, such as forested tracts to managed grassland, can have a profound effect on the complement of wildlife species using an area. Loss of forested parcels in the study area would further stress those species dependent on forested habitats because these species would be displaced to similar habitats elsewhere. Increasing urbanization over the past 15 years has fragmented existing forested tracts and greatly reduced the area of forest habitat available for wildlife.

The effects of habitat fragmentation on wildlife has been well documented for birds, but recent studies have been conducted with other taxa. In general, the number of species using a particular habitat decreases as the distance between patches of habitat increases (i.e., fragmentation of habitats typically results in loss of species). Studies with birds have shown that smaller patches of habitat, with proportionately more edge, may be associated with increased predation and nest parasitism.[21/]

The long-term effect of conversion of one successional habitat to another is a shift in the local carrying capacity. Populations of species that utilize grasslands and more urbanized habitats such as American robin, European starling, house sparrow, raccoon, opossum, and deer mouse would likely increase after construction of the proposed Master Plan Update alternatives, and species that utilize older, more complex successional stages would experience population decreases due to habitat loss.[22/]

As is noted in the FAA's *Aviation Noise Effects* "The effects of aviation noise on animals ... have revealed that the effects are highly species-dependent and that the degree of the effect may vary widely." Upon construction of the proposed new parallel runway, aircraft would approach the Airport at varying altitudes and locations in comparison to current approach procedures. The varied approach procedures may cause some wildlife species to avoid the Airport area.

Phase 1 construction activities that would be scheduled for completion by the year 2000 would have the greatest effect on wildlife communities. The construction footprint for this phase covers over 300 acres of upland forest, shrub, grassland, and wetland habitat with a new runway length up to 8,500 feet. This mosaic of habitats is located in the area west of the airfield and wildlife species inhabiting these areas would be directly impacted as described above. Phase 1 construction with 7,500-foot runway or 7,000-foot runway options would require the removal of similar habitat in comparison to the 8,500-foot option; however, construction of either shorter new runway option would result in a correspondingly lower impact on wildlife species and habitat. In addition to the 100 acres of habitat removed as a result of Phase 1 construction, approximately 221 acres of upland forest, shrub, grassland, and wetland habitat would be cleared in Borrow Areas 1,2,3, 4 and 5. Construction of the new runway would require the use of approximately 17 million cubic yards of fill. The north and south borrow source areas have been identified by the Port as potential fill source areas (with the exception of Borrow Area 8, where no fill excavation will occur). Grading, clearing, and excavation of Borrow Areas 1,2,3,4 and 5 would be expected to occur during Phase 1.

Construction activities that would be scheduled for completion by the year 2010 (Phases 2 and 3) would require the clearing, grading, and filling of an additional 100 acres of upland forest, shrub, grassland, and wetland habitat. Impacts on wildlife communities related to these construction activities would be relatively low, in comparison to Phase 1-related impacts. Of the 100 acres of habitat removed during these phases, approximately 60 acres would be managed grassland. This vegetation community offers little wildlife habitat due to low species diversity and frequent mowing.

Construction activities that would be scheduled for completion by the year 2020 (Phases 4 and 5) would require the removal of approximately 90 acres of grassland and shrub habitat. This would occur mostly in the former residential areas of the site. These open grassland areas currently provide habitat for small mammals, birds, and reptiles which, in turn, provides foraging habitat for raptors and predatory mammals. A relative abundance of these urban grassland areas are available in the Airport vicinity and raptors and coyote likely would move

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21/ *Species Richness, Population Dynamics, and Wildlife Conservation in Fragmented Landscapes*. Lehmkuhl, John F, College of Forest Resources, University of Washington, 1985.

22/ *Conservation Biology: The Science and Scarcity of Diversity*. Soulé, Michael E. 1986.

away from disturbed areas on the construction site to these areas.

Cumulative impacts on wildlife communities may occur as a result of other projects proposed in the Airport vicinity. Fragmentation of habitat, wildlife disturbance caused primarily by vehicular traffic and airport operations, and other activities associated with urbanization have diminished wildlife use of the area. Continuing development in the vicinity would contribute to additional loss of wildlife habitat and further reduce the limited wildlife resources in the area.

Cumulative impacts on wildlife associated with increased local development would be related to the loss of wildlife habitat and displacement of wildlife species.

No loss of habitat would be anticipated during the operational phase of the proposed Master Plan Update alternatives. Indirect impacts may occur as a result of increased local development associated with increased human use of the Airport area.

Impacts on wildlife as a result of Alternative 2, 3, or 4 are similar. Slight differences in habitat impacts would occur as a result of the different terminal locations. These differences would almost entirely involve managed grassland.

3. Fish

Potential construction impacts on fish and aquatic biota would be both short and long-term in nature. If not effectively mitigated, erosion of exposed surfaces at construction sites could contribute to temporary increases in total suspended solids and sedimentation in Miller and Des Moines Creeks. (**See Chapter IV, Section 23 "Construction Impacts"**)

Potential long-term impacts on fish and aquatic biota would result from planned fill activities under the different new runway options. All new runway options would require the realignment and relocation of portions of Miller Creek resulting in the loss of existing fish habitat. For the 8,500-foot new runway option, about 3,700 feet of Miller Creek and its tributaries would be realigned and relocated, including about 980 feet of Miller Creek and 440 feet of the tributary south of Lora Lake (see **Appendix P**). This entire 980-foot section of Miller Creek is adjacent to the Vacca Farms and has a ditch-like character with a sandy bottom. About 200 feet of Des Moines Creek tributary 0377, a Class 3 intermittent stream, would require relocation to complete the extension of Runway 34R. It is assumed that proposed improvements identified in the South Side Aviation Support Area EIS also would be implemented. This would require relocation of 2,200 feet of open channel of tributary 0377, a Class 3 intermittent segment of Des Moines Creek.[23] A 7,500-foot runway alignment option would require relocation of a total of about 2,700 feet of Miller Creek and its tributaries, including about 400 feet the tributary south of Lora Lake with undetermined salmonid use. A 7,000-foot runway alignment would require realignment and relocation of about 2,300 feet of Miller Creek tributaries. These tributary reaches are intermittent Class 3 streams.

Of the different new runway lengths, the 8,500-foot option would directly affect the greatest amount of stream. The 7,500-foot and 7,000-foot runway alignments would affect about 27 percent and 38 percent less stream channel, respectively, than the 8,500-foot runway option. Stream sections directly affected by runway fill would be replaced by reconstructing new channels with enhanced aquatic habitat at relocated alignments under all new runway options and alternatives .

Potential operational impacts on fishery and aquatic resources would also include adverse effects on water quality and water quantity (i.e., hydrology). Chapter IV, Section 10 summarized the hydrological impacts. Pollutant toxicity and potential water quality impacts are discussed in **Appendix M** and Chapter

[23] *South Aviation Support Area Final Environmental Impact Statement.* U.S. Department of Transportation, Federal Aviation Administration, and Port of Seattle, Seattle, WA. 1994.

IV, Section 10. Reduced groundwater recharge and reduced base flows could occur in Miller and Des Moines Creeks as a result of the proposed Master Plan Update alternatives. All new runway length options would result in increased impervious surface area, contributing to reduced groundwater recharge and possibly reduced base flows in the creeks. Reduced base flows could adversely affect stream temperature and dissolved oxygen levels. Exceedingly high temperatures (above 70°F) and low dissolved oxygen (below 6 mg/L) could be lethal or have other adverse affects (e.g., reduced growth) on salmonids and other aquatic biota. It is unlikely that base flow reductions that would be caused by the "With Project" alternatives would contribute to lethal temperatures or dissolved oxygen levels.

Cumulative Impacts: Even with successful implementation of proposed mitigation, construction and operation of the proposed Master Plan Update alternatives and other planned development in the area could contribute to cumulative impacts on fish and aquatic resources. Although stormwater drainage controls would reduce pollutant loading to Miller and Des Moines Creeks some increased pollutant loads would reach receiving water bodies. Potential cumulative impacts would be greatest for bottom dwelling fish and invertebrates that are exposed to pollutants near the sediment-water interface or in contaminated sediments.

(C) Preferred Alternative

As is described in Chapter II, the Port of Seattle staff have recommended the implementation of Alternative 3 (North Unit Terminal) with a new parallel runway with a length of 8,500 feet. All of the "With Project" alternatives, including the preferred alternative, would affect plants and animals. **Appendix P** contains a proposed mitigation plan for this the creek relocations that would compensate for the segments of the creek affected by the proposed airport improvements.

1. Vegetation

Like all "With Project" alternatives, the preferred alternative would result in a direct conversion of approximately 10 acres of wetland, 52 acres of unmanaged grassland, 269 acres of upland forest, 78 acres of shrub, and 303 acres of managed grassland to impervious surfaces.

Phase 1 construction activities scheduled for completion by the year 2000 would affect the greatest amount of vegetation. Construction areas for this phase total over 300 acres. Construction of the proposed new runway itself would require the clearing, grading, and filling of over 200 acres of upland forest, shrub, grassland, and wetland communities. In addition to the 300 acres of vegetation removed as a result of Phase 1 construction, approximately 221 acres of upland forest, shrub, grassland, and wetland vegetation would be cleared in Borrow Areas 1, 2, 3, 4, and 5. To minimize wetland impacts, Borrow Area 8 would not be used as a fill source. No excavation would occur in this portion of the site.

Construction activities for Phases 2 and 3 would require the clearing, grading, and filling of approximately 100 acres of upland forest, shrub, grassland, and wetland communities. Construction activities scheduled for completion by the year 2020 (Phases 4 and 5) would include construction of new taxiways, additional expansion of the north and south satellite concourses, additional expansion of existing parking facilities, and new aircraft maintenance facilities within SASA. Construction activities associated with these efforts would occur predominantly in former residential areas that are part of the Port's Noise Remedy Program. Primary impacts would involve the removal of approximately 90 acres of grassland and shrub communities.

Cumulative impacts on plant communities could occur as a result of concurrent or future construction of several other proposed projects in the Airport vicinity. These impacts would contribute to additional loss of native vegetation and habitat, thus further reducing the limited natural resources in the vicinity of the Airport. Vegetation communities potentially affected include managed grassland, shrub, mixed deciduous/coniferous forest, and wetland.

2. Wildlife

Construction activities associated with development of any of the preferred alternative would result in the displacement of wildlife species. Highly mobile animals such as large mammals and birds are able to move away from disturbances into nearby habitats. It is generally assumed, however, that these habitats are at or near carrying capacity and these animals would be required to compete for already limited resources. Less mobile animals such as small mammals, amphibians, reptiles, young animals, and nesting birds, would most likely perish during construction.

Disturbance caused by construction activities in the study area may have an adverse impact on wildlife by disrupting feeding and nesting activities. Clearing and grading activities in the South Borrow Area, adjacent to the large forested tract that encompasses Des Moines Creek Park could have an impact on breeding wildlife. This habitat is used extensively by neotropical migrant and resident songbirds for breeding. Significant noise disturbance, especially in this relatively undisturbed area of the site, could cause birds to abandon their nests.

Construction activities could have adverse effects on wildlife populations in aquatic habitats. Approximately 10 acres of wetland loss would occur as a result of filling and grading. A variety of small mammals and amphibians would be directly impacted by this loss because they rely on these areas for foraging, breeding, and overwintering habitat. Because of their limited mobility, these taxa would likely perish during construction activities. Many of the aquatic habitats have been previously degraded by activities such as construction, fuel spills, and refuse dumping. Exposing soil and removing vegetation could result in an increase in sediments and other non-point pollutants entering adjacent wetlands, contributing to further degradation of aquatic habitat. Many amphibian species are sensitive to pollutants, and water quality in aquatic habitats on the site may be a limiting factor for some of these species.

The conversion of one habitat type to another, such as forested tracts to managed grassland, can have a profound effect on the complement of wildlife species using an area. Loss of forested parcels in the study area would further stress those species dependent on forested habitats because these species would be displaced to similar habitats elsewhere.

The long-term effect of conversion of one successional habitat to another is a shift in the local carrying capacity. Populations of species that utilize grasslands and more urbanized habitats such as American robin, European starling, house sparrow, raccoon, opossum, and deer mouse would likely increase after construction of the proposed improvements, and species that utilize older, more complex successional stages would experience population decreases due to habitat loss.[24]

Phase 1 construction activities scheduled for completion by the year 2000 would have the greatest effect on wildlife communities. The construction footprint for this phase covers over 300 acres of upland forest, shrub, grassland, and wetland habitat with a new runway length up to 8,500 feet. This mosaic of habitats is located in the area west of the airfield and wildlife species inhabiting these areas would be directly impacted as described above. In addition to the 100 acres of habitat removed as a result of Phase 1 construction, approximately 221 acres of upland forest, shrub, grassland, and wetland habitat would be cleared in Borrow Areas 1,2,3, 4 and 5.

Construction activities scheduled for completion by the year 2010 (Phases 2 and 3) would require the clearing, grading, and filling of an additional 100 acres of upland forest, shrub, grassland, and wetland habitat. Impacts on wildlife

[24] *Conservation Biology: The Science and Scarcity of Diversity*. Soulé, Michael E. 1986.

communities related to these construction activities would be relatively low, in comparison to Phase 1-related impacts. Of the 100 acres of habitat removed during these phases, approximately 60 acres would be managed grassland. This vegetation community offers little wildlife habitat due to low species diversity and frequent mowing.

Construction activities scheduled for completion by the year 2020 (Phases 4 and 5) would require the removal of approximately 90 acres of grassland and shrub habitat. This would occur mostly in the former residential areas of the site. These open grassland areas currently provide habitat for small mammals, birds, and reptiles which, in turn, provides foraging habitat for raptors and predatory mammals. A relative abundance of these urban grassland areas are available in the Airport vicinity and raptors and coyote likely would move away from disturbed areas on the construction site to these areas.

Cumulative impacts on wildlife communities may occur as a result of other projects proposed in the Airport vicinity. Fragmentation of habitat, wildlife disturbance caused primarily by vehicular traffic and airport operations, and other activities associated with urbanization have diminished wildlife use of the area. Continuing development in the vicinity would contribute to additional loss of wildlife habitat and further reduce the limited wildlife resources in the area.

3. <u>Fish</u>

Potential long-term impacts on fish and aquatic biota would result from planned fill activities. The proposed new parallel runway would require the relocation of about 3,700 feet of Miller Creek and its tributaries, including about 980 feet of Miller Creek and 440 feet of Class 2 tributary south of Lora Lake (see **Appendix P**). This entire 980-foot section of Miller Creek is adjacent to the Vacca Farms and has a ditch-like character with a sandy bottom. About 200 feet of Des Moines Creek tributary 0377, a Class 3 intermittent stream, would require relocation to complete the extension of Runway 34R and the development of the South Aviation Support Area.[25] This would require relocation of 2,200 feet of open channel tributary 0377, a Class 3 intermittent segment of Des Moines Creek.

Potential operational impacts on fishery and aquatic resources would also include adverse effects on water quality and water quantity (i.e., hydrology). Chapter IV, Section 10 summarized the hydrological impacts. Reduced groundwater recharge and reduced base flows could occur in Miller and Des Moines Creeks as a result of the proposed Master Plan Update alternatives. All of the "With Project" alternatives, including the preferred alternative, would result in increased impervious surface area, contributing to reduced groundwater recharge and possibly reduced base flows in the creeks. Reduced base flows could adversely affect stream temperature and dissolved oxygen levels. Exceedingly high temperatures (above 70°F) and low dissolved oxygen (below 6 mg/L) could be lethal or have other adverse affects (e.g., reduced growth) on salmonids and other aquatic biota. It is unlikely that base flow reductions would contribute to lethal temperatures or dissolved oxygen levels.

Cumulative Impacts: Even with successful implementation of proposed mitigation, construction and operation of the proposed Master Plan Update and other planned development in the area could contribute to cumulative impacts on fish and aquatic resources. Although stormwater drainage controls would reduce pollutant loading to Miller and Des Moines Creeks some increased pollutant loads would reach receiving water bodies. Potential cumulative impacts would be greatest for bottom dwelling fish and invertebrates that are exposed to pollutants near the sediment-water interface or in contaminated sediments.

[25] *South Aviation Support Area Final Environmental Impact Statement.* U.S. Department of Transportation, Federal Aviation Administration, and Port of Seattle, Seattle, WA. 1994.

(4) MITIGATION

Safety issues concerning wildlife-caused aircraft accidents are a serious concern to both Port and the Federal Aviation Administration (FAA). In accordance with FAA requirements, a *Wildlife Hazard Management Plan* was prepared for Sea-Tac Airport. A wildlife control program was developed as part of this management plan and consists of both long-term and short-term programs for controlling wildlife populations in the immediate vicinity of the Airport. The primary goals of these programs focus on: identifying potential wildlife attractants on-site and altering or eliminating these features to reduce the risk of a wildlife and aircraft collision.

Potential construction and operation impacts on water quality, hydrology (i.e., flow regime), and aquatic habitat would be reduced or avoided by proposed mitigation as discussed in **Appendices G and P**. In addition, several required elements of the Port of Seattle NPDES permit for discharges of stormwater runoff and the Industrial Waste System, including the Stormwater Pollution Prevention Plan and the Spill Prevention Control and Countermeasures Plan, would reduce pollutant loads to Miller and Des Moines Creeks and Puget Sound.

Impacts from Airport stormwater runoff would be mitigated by implementing Washington Department of Ecology detention and treatment requirements for stormwater runoff. Although implementation of detention requirements for the 2-, 10-, and 100-year design storms are expected to control increases in peak flows compared to existing conditions, they would not mitigate increased duration and frequency of higher flows following storms. Because there already is a lack of high flow habitat in both Miller and Des Moines Creeks, additional mitigation could be required to minimize adverse impacts on resident and anadromous salmonids caused by high flow events. Potential changes in flow regime could be mitigated by implementing stormwater releases and drainage controls that emulate existing flow conditions. This could include infiltrating treated stormwater runoff (e.g., roof and sidewalk runoff) to reduce stormwater runoff volumes and rates. This would also increase groundwater recharge and maintain base flows. Potential adverse impacts on high and low flows also could be reduced by constructing emergent wetlands that moderate flood flows and contribute to base flows.

Potential adverse impacts on aquatic habitat from channel realignment and relocation or flow regime modifications could be mitigated through properly reconstructing the stream channels to provide enhanced fish and aquatic biota habitat conditions. It is assumed that no stream realignment mitigation of Des Moines Creek is necessary for extension of Runway 34R because the entire length of tributary 0377 flowing through Tyee Golf Course would be aligned based on mitigation proposed in the SASA Final EIS. The U.S. Army Corps of Engineers (Corps), and WDFW would be consulted to ensure that specific features and design standards are implemented to mitigate direct impacts on stream habitat caused by filling of existing stream channels. Proposed realignment and relocations of Miller and Des Moines Creeks or their tributaries would require various permits, including a Hydraulic Project Approval (HPA) from WDFW and a Section 10/404 permit from the Corps. Design requirements and specific conditions of the HPA and Section 10/404 permits would be complied with in the proposed stream channel relocation designs. HPA regulations specify that such plans must provide comparable or better habitat in realigned and relocated sections of streams, including habitat type and structure, channel gradient, substrate composition, and riparian or streamside vegetation.[26]

In addition, City of SeaTac (SeaTac) Zoning Code contains provisions relating to stream relocations and to protection of streams and aquatic resources. These provisions are summarized as follows. Stream buffers range from between 100 feet (Class 1) and 25 feet (Class 3), depending on stream class and presence of salmonid fishes. A buffer of 50 feet is required for Class 2 streams, which are not used by salmonids. Class 1 streams are those identified as "Shorelines of the State" in adopted shoreline master programs. Class 2 streams are perennially flowing streams, and Class 3 streams have intermittent flow and are not used by salmonids. Stream buffers begin at the ordinary high water mark or top of the bank on either side of the stream and extend perpendicular away from the stream. Stream relocations are permitted subject to the stream alteration and mitigation requirements of the zoning code. Special studies and mitigation plans are required that demonstrate maintenance of base flood

[26] *Washington Administrative Code - Hydraulic Code Regulations.* Washington Department of Fish and Wildlife. 1994.

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storage volume and functions, replacement or improvement of water quality and fish habitat, and maintenance or improvement of other biological and hydrological functions of the stream. Relocated streams have the same buffer requirements as the previously unaltered stream.

The cities of SeaTac and Des Moines have adopted measures for protecting streams from potential water quality and water quantity impacts, resulting from increased stormwater runoff. Both local governments have adopted the *King County Surface Water Design Manual* (SWDM), which has specific designs standards for stormwater management facilities (e.g., detention ponds and biofiltration swales). The SWDM is in the process of being revised. The revised version is expected to contain design standards that are comparable to or more stringent than those of the *Stormwater Management Manual for the Puget Sound Basin.*

As noted in Chapter IV, Section 2 "Land Use", the Port of Seattle is involved in interlocal negotiations with the City of SeaTac concerning jurisdictional authority. This process, which is not expected to be completed until after the Final EIS is issued, is expected to resolve the issue of applicability of City of SeaTac regulations to the Master Plan Update.

Potential adverse impacts of Airport operations on high and low-flow in-stream habitat could be mitigated by constructing high and low flow habitat in the relocated and realigned sections of Miller and Des Moines Creeks. This would be accomplished using in-stream structures, such as large organic debris and other channel roughness features, altering the existing channel geometry, and constructing scour pools. The channel improvements would be based on hydrologic and hydraulic analysis to determine where and how structures should be placed to create optimum benefit. This mitigation plan for the stream relocation and habitat improvement in Miller Creek was developed in cooperation with resource management agencies and others including the Corps of Engineers, the Washington State Department of Fish and Wildlife, King County, and the Des Moines Salmon Chapter of Trout Unlimited.

The Port continues to actively participate in the development of cooperative basin plans that include measures to reduce and control point and non-point pollution throughout the Des Moines Creek basin. Effectively implemented basin plans would result in improved water quality and associated benefits to fish and other aquatic biota.

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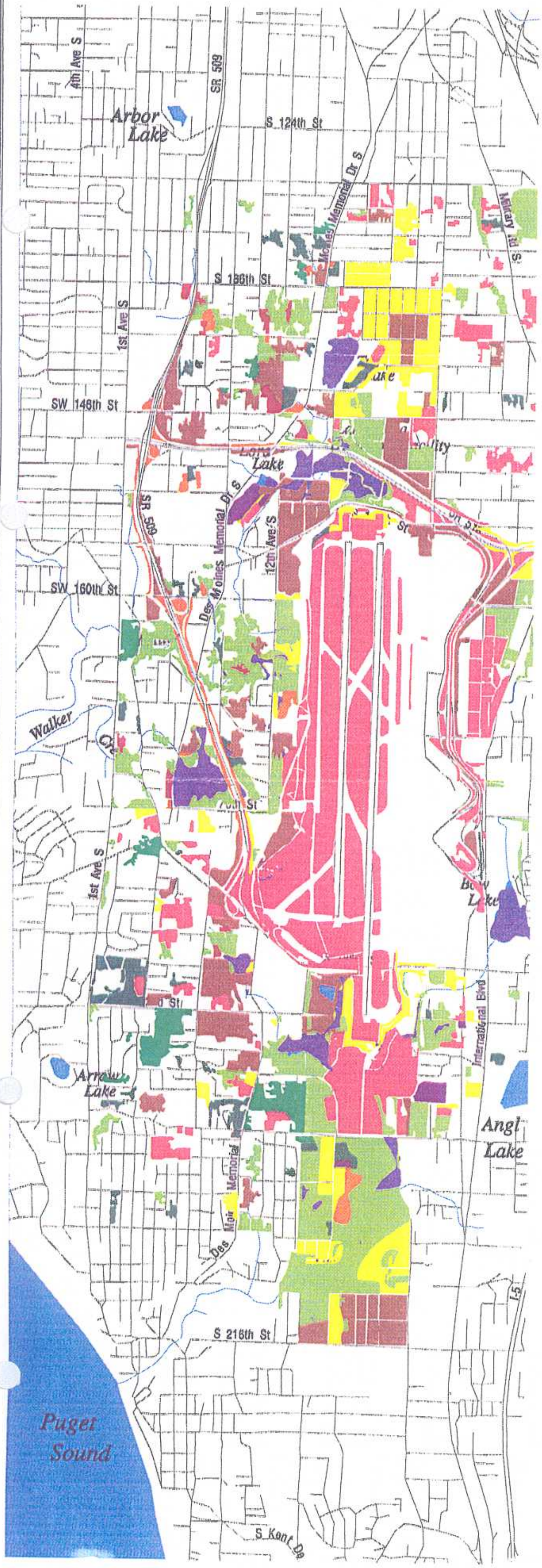
Seattle-Tacoma International Airport
Environmental Impact Statement
for the Master Plan Update

Exhibit IV.16-1

Vegetation Communities in the Study Area



- Grassland, Overgrown Fields
- Lawns, Managed Lawns
- Pastures, Hayfields
- Row Crops
- Mixed Shrub
- Coniferous Forest
- Deciduous Forest
- Mixed Deciduous/Coniferous Forest
- Mixed Vegetation Classes
- Wetland

Source: Gambrell Urban, Inc. and Shapiro & Associates, 1995

Scale 1" = 2,500'

0 2500 5000
SCALE IN FEET

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

14, 1996

CHAPTER IV, SECTION 19

EARTH

This section describes existing topography, geology, soils, and sensitive hazard areas associated with the proposed Airport Master Plan Update alternatives. Potential impacts on earth resources that could result from construction and operation (including clearing, grading, excavation, and fill placement), are evaluated and potential mitigation measures identified. Source of fill materials, depth of fill placement, and methods of placement and compaction also are addressed. Actions that would occur in sensitive hazard areas are identified and described.

The Master Plan alternatives would require the movement of the following quantities of earth:

Alternative	Million Cubic Yards of Fill
Alternative 1 (Do-Nothing)	2.4
Alternative 2	23
Alternative 3 (Preferred Alt)	23
Alternative 4	23

Note: Alternatives 2, 3 and 4 assume a new parallel runway with a length up to 8,500 feet, located 2,500 ft west of Runway 16L/34R.

Approximately 17.25 million cubic yards of fill would be needed for a proposed 8,500-foot new parallel runway. Preliminary investigations indicate that all of the required fill could be obtained from a combination of Port of Seattle-owned property, and off-site borrow sources.

Two seismic hazard areas have been identified by the City of SeaTac on the site of the proposed new parallel runway. They are small areas of shallow, loose sediment that likely would liquefy during a seismic event. During construction this sediment would be removed and replaced with compacted fill.

Erosion of exposed soils in areas of excavation, fill, and stockpile would occur during construction. The amount of erosion would depend on the design and implementation of an Erosion and Sedimentation Control Plan.

(1) METHODOLOGY

Methods used to prepare the discussion on earth impacts included review of existing information regarding geologic and soil conditions and sensitive hazard areas within the detailed study area. Results of geotechnical investigations and preliminary engineering design analyses for projects included in the Master Plan alternatives have been summarized in this document.[1/,2/]

Substantial amounts of fill would be needed to construct the proposed airside and landside improvements. Potential sources of large amounts of fill have been identified on Port of Seattle-owned properties on and adjacent to the Airport (on-site) as well as off-site properties. Impacts to on-site borrow source areas are included in this section. Because impacts to off-site borrow source areas have already been documented during the permitting process for these facilities, they are not addressed in this document.

(2) EXISTING CONDITIONS

The following paragraphs summarize the existing topography and geology.

(A) Topography

Sea-Tac Airport is located along a north-south trending ridge, with elevations decreasing to the west toward Puget Sound. **Exhibit IV.19-1** shows topography. Elevations east of the Airport range from about 325 to 450 feet above mean sea level (MSL). Elevations just west of the Airport range from about 250 to 400 above MSL, but drop to sea level within approximately two miles. North and south of the Airport, elevations generally range from 125 to 400 feet above MSL. From north to south, elevation at the main runways ranges from about 420 feet 340 above MSL.

Slopes along the east side of the Airport are generally moderate. Slopes north and south of the Airport are slightly steeper, particularly those associated with Des Moines Creek on the south end and Miller Creek on the north end. The steepest slopes

1/ *Seattle-Tacoma International Airport Third Dependent Runway Preliminary Engineering Report*, HNTB, 1994.

2/ *South Aviation Support Area Final EIS*, Port of Seattle, 1994.

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in the detailed study area exist west of the Airport and are associated with Miller Creek, before the creek turns westward to drain into Puget Sound, and within two large swales that drain westward toward that creek.

The South Aviation Support Area (SASA) is located on a hillslope that generally slopes westward to Des Moines Creek. That creek is located along the eastern margin of the SASA site, and separates it from the adjacent airport. Elevation ranges from 425 feet to 250 feet above MSL. Slopes from east to west generally are moderately steep. Fill material for the existing runway and taxiways is located in the northwest corner of the site. The fill is at an elevation of 340 feet, and has embankment slopes of 50 percent.

The topography of the Des Moines Creek Technology Campus (DMCTC) site is gently rolling with slopes that range from nearly level to about 6 percent. Des Moines Creek flows just outside the northwest boundary of the site. The creek ravine is about 70 feet deep and has side slopes of 40 to 60 percent. Elevation on the sites ranges from 275 to 350 feet above MSL.

(B) Geology

The existing geology and subsurface conditions are described in the following section.

1. Regional Geology and Stratigraphy

The Airport and vicinity are located within the Des Moines Drift Plain of the Puget Lowland subprovince of the Pacific Border physiographic province, a north-south trending structural and topographic depression bordered on the west by the Olympic Mountains and on the east by the Cascade Mountains.

The Puget Lowland physiographic subprovince is underlain by Tertiary volcanic and sedimentary bedrock, which is covered with Quaternary glacial and nonglacial sediments to the existing land surface. Deposits of at least four glaciations have been identified with the Vashon period being the most recent (ending approximately 11,000 years ago).

The area around Sea-Tac occupies the top of a north-south trending ridge, which is comprised of deposits from the Vashon glaciation. This ridge is dissected by several swales and gulleys, which have been partially filled as part of the extensive grading performed during initial construction of the airfield and subsequent expansions. Deposits of the older Salmon Springs glaciation are exposed along the walls of stream and river valleys.

Surface geology typically encountered in the vicinity of the Airport is described below.

- Lacustrine Deposits: These deposits consist of peat, silt, and clay and typically occur in shallow depressions overlying glaciolacustrine sand and recessional outwash. These materials are generally not suitable fill or subgrade material.
- Recessional Outwash: This unit typically overlies Vashon till and partly fills depressions and former glacial channels. The predominant type is a medium sand with localized deposits of coarse sand and gravel.
- Glacial (Vashon) Till: This unit is exposed at the ground surface or underlies a variable thickness of Recessional Outwash. It typically consists of an unsorted mixture of highly compacted sand, silt, and gravel that is often cemented.
- Kame Terrace Deposits: A kame terrace is stratified drift that has been deposited between a glacier and an adjacent valley wall. It is comprised of silty sand and gravel with lenses of glacial till and sand, silt, and clay.
- Advance Outwash: This unit underlies the till and typically consists of dense medium sand with variable amounts of gravel. Advance outwash deposits beneath the Vashon Till comprise the uppermost aquifer in the Airport area.
- Salmon Springs Drift: These sediments range from fine-grained lacustrine silts and volcanic ash to silty sand and gravel. This unit includes glacial and non-glacial sediments.

2. **Site Subsurface Conditions**

Surface geology of the Airport area has been modified by extensive grading and filling during construction of the original airfield and subsequent expansions. Fill of variable thickness overlies native deposits over most of the Airport.

The site of the proposed new parallel runway is primarily underlain by till, often with a thin covering of recessional outwash.[3/] Perched groundwater occurs during the winter wet season at depths of 5 to 15 feet below ground surface, and permanent groundwater occurs in advance outwash at a depth of 27 feet (300 feet above MSL). Fill material ranging from 15 to 42 feet thick overlies the native soils at two locations within this area: one is located south of S. 176th Street, and the second is located west of the airfield and north of S. 168th Street. The fill is of variable quality and consistency and contains variable amounts of asphalt and cement concrete and wood debris. It is not likely to be suitable subgrade material. Isolated lenses of perched groundwater occur within the fill. Soft, wet soil and recessional outwash silt, ranging from 5 to 20 feet thick, occur within swales that extend across the proposed new parallel runway site. These materials have low bearing capacity and compressibility, and are generally not suitable fill or subgrade material. Similar low bearing-capacity soils are expected to occur at the north end of the north safety area embankment.

Surface geology on the higher, east side of the SASA is primarily advance outwash sand that is underlain by a thick stratum of dense gravels.[4/] Glacial till overlies the advance outwash in the northeast and southeast corners of the site. About 30 feet of fill has been placed on the Seattle Christian School property, which is located in the southeast corner of the site. The fill is comprised of various materials including glacial till, concrete rubble, and other debris. The lower, west side of the SASA is predominantly recessional outwash that overlies glacial till. In some places, the recessional outwash directly overlies advance outwash. Lacustrine deposits, chiefly silt and clay, occur in the vicinity of Des Moines Creek near the western margin of the site. Fill material associated with the south end of the Airport covers the northwest corner of the site. Shallow (perched) groundwater occurs on the site at depths of 10 to 28 feet below ground surface.

Surface geology on the DMCTC site is primarily glacial till. Recessional outwash overlies the till in the northwest corner of the site. Shallow groundwater occurs in wetland areas and in localized areas of perched groundwater above the till.

(C) **Soils**

Soils in the portion of the study area south of S. 192nd Street are identified in the 1973 *King County Soil Survey* as belonging to the Alderwood Soil Association.[5/] Soils north of S. 192nd Street were not mapped during the 1973 soil survey, but were identified as Alderwood soils in a 1952 soil survey.[6/] However, since that survey, much of that area has been excavated and covered with varying thickness of fill.

The Alderwood Soil Association consists of moderately well drained, undulating to hilly soils that have dense, very slowly permeable glacial till at depths ranging from 20 to 40 inches. The association is comprised of about 85 percent Alderwood soils, 8 percent Everett soils, and 7 percent less extensive soils. The Alderwood Association occurs as large tracts on uplands and terraces in both the northern and southern parts of King County. It occupies approximately 52 percent of the soil survey area in King County.

The Alderwood soil series is made up of moderately well drained soils that have a "weakly consolidated" to "strongly consolidated" substratum at a depth of 24 to

3/ *Seattle-Tacoma International Airport Third Dependent Runway Preliminary Engineering Report*, HNTB, 1994.

4/ *Seattle-Tacoma International Airport Third Dependent Runway Preliminary Engineering Report*, HNTB, 1994.

5/ *Soil Survey of King County Area , Washington*, USDA Soil Conservation Service, 1973.

6/ *Soil Survey of King County Area , Washington*, USDA Soil Conservation Service, 1952.

40 inches. These soils have formed under conifers on glacial uplands. Slopes are convex and generally range from 0 to 30 percent, but range as steep as 70 percent. Slopes greater than 15 percent are considered an erosion hazard.

The Everett soil series is made up of somewhat excessively drained soils that are underlain by very gravelly sand at a depth of 18 to 36 inches. These soils formed in very gravelly recessional outwash deposits, under conifers. They exist on terraces and terrace fronts and are gently undulating and moderately steep with slopes ranging from 0 to 30 percent. Slopes greater than 15 percent have a moderate to severe rating for erosion hazard.

The less extensive soils in this association occur in depressions or on terraces along small streams. These soils, mostly the Norma, Bellingham, Orcas, Shalcar, and Seattle soil series, have impeded drainage and are subject to flooding. There are substantial areas of Kitsap soils, which have a silty substratum, in the major valleys.

(D) Hazard Areas

The City of SeaTac and King County have ordinances regulating the use and development of environmentally sensitive areas and have developed map folios indicating hazard areas within their jurisdictions.[7/,8/] For Earth resources, hazard areas would include erosion hazard, landslide hazard, and seismic hazard. The extent of these hazard areas in the vicinity of the Airport are shown in **Exhibit IV.19-2.**

1. Erosion Hazard

Erosion hazard areas are defined by King County and the City of SeaTac as areas with soil types that have been rated by the Soil Conservation Service (SCS) as having severe to very severe erosion hazard. Because this definition is based on SCS soils classification, the County and City sensitive-areas studies identify erosion hazard areas only in portions of the county that have been covered by the *King County Soil Survey*.[9/] The area located south of S. 192 Street is within the limits of the soil survey. Within this area, King County and the City of SeaTac have identified erosion hazard areas along segments of Des Moines Creek. Because the study area located north of S. 192 Street, including the site of the proposed new parallel runway, is outside the limits of the soil survey, no erosion hazard areas have been identified in this area by King County or the City of SeaTac. The embankments along the west side of the existing airfield could potentially be an erosion hazard area, however.

2. Landslide Hazard

In landslide-sensitive areas, unstable or potentially unstable conditions increase the risk of a slope failure. Criteria used for determining landslide sensitivity include slope percentage and gradient, soil type, character of underlying stratigraphic units, presence of springs or seepage, and type of vegetative cover. No landslide hazard areas have been identified in the study area by King County or the City of SeaTac. Fill material on the Seattle Christian School property within the SASA site may be a landslide hazard; the hazard potential of this fill has not been verified.[10/] During a stream survey of Miller Creek (Appendix F of the Draft EIS), a recent slump/landslide scar was identified on the left bank (looking downstream) of Miller Creek, near its confluence with the Burien Lake tributary.

3. Seismic Hazard

Seismic hazards include ground shaking and associated ground failure (including landslides), soil liquefaction, and surface fault rupture resulting directly from earthquakes. The Puget Lowland physiographic subprovince is a seismically active region and historically has experienced thousands of earthquakes. This has led to the designation of the subprovince in the

7/ *Sensitive Areas Ordinance*, King County, 1990.

8/ *Environmentally Sensitive Areas Ordinance*, City of SeaTac, 1994.

9/ *Soil Survey of King County Area , Washington*, USDA Soil Conservation Service, 1973.

10/ *South Aviation Support Area Final EIS*, Port of Seattle, 1994.

Uniform Building Code for Puget Sound as a zone 3 for seismic risk on a scale of 1 (lowest) to 4 (highest).[11] No evidence has been reported that shows a fault trace across the project area,[12/13]. Although the Airport is in proximity to the Seattle fault, which is recognized as seismically active, the relationship between the Seattle fault and seismic activity in the vicinity of the Airport remains uncertain.[13]

Seismic hazard areas are defined by King County and the City of SeaTac as areas subject to severe risk of earthquake damage as a result of seismically induced settlement or soil liquefaction. These conditions occur in areas underlain by cohesionless soils of low density usually in association with a shallow groundwater table. Such conditions are found in areas of recent river, lake, or beach deposits, and areas of artificial fill. Several seismic hazard areas have been identified in the study area by the County and the City of SeaTac. These areas occur in lacustrine deposits and along segments of Miller, Walker, and Des Moines Creeks. Two seismic hazard areas occur on the site of the proposed new parallel runway.

(E) Borrow Source Areas

Preliminary evaluation of potential borrow source areas indicates that a substantial portion of the anticipated fill needs could be obtained from six sites on Port-owned properties on and adjacent to the Airport.[14/15] The sites, labeled Areas 1 through 5, and Area 8, total approximately 335 acres. Potential on-site borrow source area locations are shown in **Exhibit IV.19-1**. As is noted in Section 11 "Wetlands", maximum use of these on-site borrow areas would result in 21.3 acres of wetland impacts (about 74% of the total wetland impacts). Four borrow sites are located south of the Airport and two are located to the north. Additionally, some of the required fill could be supplied by the excavation of SASA.

1. Borrow Source Area 1

Area 1 is an approximately 110-acre former residential area within the south-runway protection zone of the existing runways. The area slopes gently to moderately to the northwest, toward Des Moines Creek. Elevation ranges from 250 to 350 feet above MSL. A small portion of the north side of Area 1 is mapped as a seismic hazard area. An erosion hazard area for this area is mapped in the southwest corner of the site **(Exhibit IV.19-2)**. No landslide hazards have been identified on the site.

Higher elevations of Area 1 are underlain by glacial till. In places, the till has a thin mantle of silty sand fill and recessional outwash. Lower elevations in the northern and western parts of the site are underlain by recessional outwash. At the extreme northern end of the site, the outwash is overlain by organic silt lacustrine deposits. Advance outwash was encountered beneath the till and recessional outwash. Depth to groundwater ranges from 30 to 49 feet below ground surface (bgs). Seasonally perched groundwater occurs at depths of up to 7 feet in recessional outwash that overlies glacial till, and at a depth of 4 feet in the lacustrine deposits.

2. Borrow Source Area 2

Area 2 is an approximately 20-acre site of mostly undeveloped land situated north of S. 216th Street between 15th and 16th Avenues. Slopes are gentle to moderate to the northwest, becoming steeply sloping in the extreme northwest corner near Des Moines Creek. Elevations range from 175 to 275 feet above MSL, with the majority of the site being at or above 225 feet above MSL. An erosion hazard area associated with the Des Moines Creek Ravine is mapped along the northern margin of the site. No seismic or landslide hazards have been identified on the site.

11/ *Uniform Building Code*, International Congress of Building Officials, 1988.

12/ *Seismotectonic Map of the Puget Sound Region, Washington*, Gower, H. D., J. C. Yount, and R. S. Crosson, 1985. U.S.G.S. Map No. I-1613.

13/ Personal communication with Steve Palmer, U.S. Geological Survey, Olympia Office, September 8, 1995.

14/ *Seattle-Tacoma International Airport Third Dependent Runway Preliminary Engineering Report*, HNTB, 1994.

15/ *Draft Borrow Source Study, Proposed New Roadway, Seattle-Tacoma International Airport*, SeaTac, Washington, AGI, April, 1995.

Surface geology is predominantly glacial till. Till thickness ranges from 17 to 31 feet. Up to 13 feet of recessional outwash overlies the till in the southern portion of the site. Advance outwash underlies the till throughout the site. Depth to groundwater ranges from 34 to 39 feet bgs. No perched groundwater was encountered during drilling performed in December, 1993 and November, 1994.

3. **Borrow Source Area 3**

Area 3 is an approximately 60-acre former residential area that is within the fenced security portion of the Airport runway protection zone. Des Moines Creek Park is located immediately south of Area 3. Elevations range from 250 to 350 feet above MSL, sloping gently to moderately to the southeast. Moderate to steep slopes occur in the south-central portion of the site, in an area that appears to be a former borrow site. Abandoned playing fields east of the site also appear to have been used as a former borrow source.

Recessional outwash blankets Area 3. It occurs to depths more than of 49 feet in the southern part of the site, but is underlain by glacial till at depths of about 10 feet in the northern part of the site. Permanent groundwater occurs between 34 and 87 feet. No seismic or landslide hazards have been identified on the site.

4. **Borrow Source Area 4**

Area 4 is an approximately 40-acre area on an undeveloped wooded hill situated west of Tyee Valley Golf Course, which is immediately south of Sea-Tac. The top of the wooded hill is about 395 feet above MSL. The site slopes moderately to steeply down all sides of the hill. No seismic, erosion, or landslide hazard areas are identified by King County or the City of SeaTac.

Till was encountered along the east slope of the hill. Till thickness averages about 20 feet. The hilltop and the west and north slopes appear to be underlain by advance outwash that occurs at depths of 118 feet on the hilltop. Pre-Vashon drift underlies the advance outwash in the northern part of the site. Groundwater conditions on the site are highly variable. Groundwater was encountered in the advance outwash and perched on top of the pre-Vashon drift, ranging in depths from 10 to 100 feet bgs.

5. **Borrow Source Area 5**

Area 5 is approximately 60 acres of vacant and cleared former residential property situated immediately north of SR-518, south of 146th Street, and west of 24th Avenue S. The site slopes moderately to the southwest, toward SR-518. Elevation ranges from 275 to 475 feet above MSL. A landfill is located in the north part of Area 5. A seismic hazard area is mapped along the southwestern boundary of the site. No landslide or erosion hazard areas are identified by King County or the City of SeaTac.

The site is underlain by glacial till that extends to depths of 57 to 103 feet before contacting the underlying advance outwash. Recessional outwash up to 10 feet thick and fill material overlie the till in places. The landfill material ranges from 7 to 17 feet thick and is comprised of silty sand to sandy silt with asphalt, concrete, and wood construction debris. The landfill also is reported to contain 50,000 to 70,000 cubic yards of petroleum hydrocarbon-contaminated street sweeping material. The fill is underlain by 4 to 17 feet of recessional outwash which, in turn, is underlain by glacial till. Depth to groundwater ranges from 110 to 118 feet bgs. In places, perched groundwater occurs in recessional outwash on top of the till.

6. **Borrow Source Area 8**

Area 8 is an approximately 55-acre site that has been used in the past for both borrow and fill disposal. It is located between S. 154th Street and SR 518, immediately north of the existing runways. A moderate to steep slope extends northward down from S. 154th Street to the site. The slope becomes gently sloping further to the northwest, toward Lake Reba. Elevations range from 270 to 375 feet above MSL, although most of the site is at or below

325 feet above MSL. An area designated as a seismic hazard is located along the northeastern boundary of the site. No erosion or landslide hazard areas are identified by King County or the City of SeaTac.

A steep slope in the southeast corner of Area 8 appears to be largely comprised of fill. Numerous small piles of debris are located immediately south of Lake Reba. Surface water and shallow groundwater associated with Lake Reba occur in the northern low-lying portions of the site, and about 20.7 acres of the site is wetland. The eastern portion of the site has a substantial thickness of fill that contains large pieces of asphalt and concrete debris. Till occurs in the southwest corner of the site to depths of about 12 feet. Advance outwash underlies the till and fill material. Depth to groundwater varies from about 6 to 35 feet bgs.

7. Other On-Site Sources

It is anticipated that the Port of Seattle will investigate the availability of additional borrow source sites on other current or future Port-owned land. Such sites could include the South Aviation Support Area (SASA), where material could be excavated, and then replaced through a landfill-type operation. Prior to the use of this material, the Port would comply with all requisite environmental analysis.

(3) FUTURE CONDITIONS

The following sections summarize the impacts of the four Master Plan Update alternatives on earth resources.

(A) Do-Nothing (Alternative 1)

As is identified in the Final EIS for the South Aviation Support Area (SASA), approximately 2.38 million cubic yards (mcy) of fill would be excavated from the SASA site to complete the approved preferred alternative.[16] About 2.16 mcy could be used as backfill on the site. About 300,000 cubic yards (cy) of imported fill would be needed for retaining wall construction and about 20,000 cy of material would be needed to complete grading for the 34L runway safety area.

Approximately 192,000 to 529,000 cubic yards of material would be excavated for construction of the Des Moines Creek Technology Campus (DMCTC) site, depending on the grading option selected.[17] Some of this material could be used on-site as backfill. Approximately 11,000 to 518,000 cubic yards of excess material would be generated.

Extensive earthwork would be required to prepare the SR509/South Access roadbeds for construction. Between 3.7 and 7.5 miles of new roadway and impervious surface area could be created, depending on the selected alternative. At its maximum extent, the SR509 corridor would cross erosion and landslide hazard areas associated with Des Moines Creek, Massey Creek, and the north and south forks of McSorley Creeks. Two additional erosion hazard areas, and up to five seismic hazard areas could be located within the proposed alignments.[18] Approximately 3.2 to 4.2 million cubic yards of material would be excavated during construction of the SR 509/South Access road project, depending on the alternative selected. Between 3.2 and 8.6 million cubic yards of fill would be required for embankment and roadbed construction.[19]

(B) Alternative 2 (Central Terminal)

Impacts on earth resources as a result of the "With Project" alternatives would include changes to topography, construction in seismic hazard areas, and soil erosion. Measures to control erosion during construction could be required to comply with state and applicable local regulations. Transportation-system impacts related to transport of fill materials are addressed in the

16/ *Final Environmental Impact Statement, South Aviation Support Area*, Port of Seattle, March, 1994

17/ *Port of Seattle Des Moines Creek Technology Campus Draft EIS*, CH2M HILL, 1995.

18/ *SR-509/South Access Road Corridor EIS Phase II Study Geology Discipline Report*, Shapiro and Associates, Inc., March, 1995.

19/ *Draft Environmental Impact Statement and Section 4(f) Evaluation, SR 509/South Access Road Corridor Project*, U.S. Department of Transportation Federal Highway Administration and Washington State Department of Transportation, December, 1995.

Chapter IV, Section 23 "Construction Impacts" of this report.

1. **Borrow Requirements**

The most extensive earthwork associated with the Master Plan alternatives would occur from the proposed new parallel runway, the 600-foot extension of Runway 16L/34R, runway safety area improvements, and site preparation of the SASA. These elements of each "With Project" alternative would require a total of approximately 23 million cubic yards of compacted fill (**Table IV.19-1**) with approximately 17.25 million cubic yards for an 8,500-foot new runway; 2.4 million cubic yards for extension of Runway 16/34R; 0.98 million cubic yards for the runway safety area improvements; and 2.38 million cubic yards to level the SASA in preparation for support facility construction. The 7,500-foot and new parallel runway options are estimated to require 13.52 and 16.77 million cubic yards of fill, respectively. Cut and fill estimates for the aircraft apron area, additional taxiways, and relocation of S. 156th Way are not available at this time, but are not expected to be of the magnitude of the other airfield projects.

Preliminary estimates indicate that approximately 3.1 million cubic yards of the required fill could be generated during excavation of the new runway site, and approximately 2.16 million cubic yards of fill could be generated during SASA site excavation.

Approximately 17.73 million cubic yards of additional fill would be needed. Preliminary evaluation of potential on-site borrow source areas indicates that 4 to 8 million cubic yards of the required borrow could be obtained from Port-owned properties on and adjacent to the Airport. Resource verification would be necessary to confirm availability, quantity, and quality of fill materials at each potential on-site borrow source area, however. The borrow potential of additional current or future Port-owned properties also may be evaluated. Additional fill could be excavated from the SASA property for construction of the new parallel runway. This material would have to be replaced, however, to develop the airfield level facilities of the SASA as currently proposed. Sixteen potential off-site borrow sources have been identified that could supply the remaining volumes of required fill.[20]

Construction of terminals, airport support facilities, utilities, and roads would occur in developed areas that previously have been excavated and filled. Relatively minor amounts of fill would be required for their construction and could be supplied by off-site borrow sources.

As described in Section 11 "Wetlands", the disadvantage of using the on-site borrow areas could be the impact of about 2.4 acres of wetland. However, as is discussed in Section 23 "Construction", if these borrow areas are not used, an increase in off-airport truck trips would be required to import fill to Sea-Tac Airport.

2. **Excavation and Fill Placement**

The following sections summarize the excavation and fill placement associated with each of the major construction sites.

a. **New Parallel Runway**

The aerial extent of runway excavation and construction is shown on **Exhibit IV.19-1**. The new runway site would first be stripped of all vegetation and topsoil. Subsurface material over most of the site is primarily till and recessional outwash that has moderate to good bearing capacity, low to moderate compressibility, and is suitable subgrade material. Over-excavation of unsuitable subgrade materials beneath the proposed new runway, taxiways, and embankment toes would be required, however. Over-excavation would include 10 to 20 feet of soft soils in swales that cross the new runway and north safety area; two existing fills, ranging from 15 to 42 feet thick; and, potentially, soils in wetland areas (as shown in **Exhibit IV.11-2**). Temporary control of groundwater would be

[20] *Seattle-Tacoma International Airport Third Dependent Runway Preliminary Engineering Report*, HNTB, 1994.

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needed in the swale and wetland areas. Over-excavation materials would be either distributed over the infill area or disposed of at approved disposal sites.

Additional site preparation would include keying and benching along the existing embankment to create a stable fill base where the existing grades slope beneath the proposed new runway embankment. Streamflow within the swales that cross the proposed site would need to be intercepted and controlled to protect embankment fill stability. Subdrains should also be installed behind any reinforced earth slopes and walls.

The new runway would require construction of an extensive fill embankment to establish the proposed runway and runway safety area grades. Upon completion, runway grades would range from 410 feet above MSL at the north threshold to 350 feet above MSL at the south threshold. To establish these grades, fill thickness would range up to approximately 160 feet at the maximum depth, with typical depths ranging between 30 and 100 feet. Cuts in existing grade of up to 20 feet would be required.

Unreinforced fill slopes no steeper than 2 horizontal to 1 vertical are recommended for most of the safety area embankment west of the new parallel runway. The fill would be placed in layers using common construction techniques. Reinforced earth embankments, allowing embankment slopes of up to 55 degrees from the horizontal, could be used along portions of the west embankment, where practical, to minimize encroachment onto adjacent areas. Construction of reinforced embankments involves establishing a zone of moderately well-compacted fill with layers of steel or polymer reinforcement. Retaining walls would be used wherever practical to minimize encroachment on SR 509.

Fill zones may be used to maximize use of on-site fill and produce a new runway that would have acceptable strength, compressibility, and long-term fill settlement. Three general zones are proposed:

- Zone A. High strength and low compressibility would be required to a depth of 5 feet below runway and taxiway pavement subgrade. High quality, import select fill should be used in this zone to achieve consistent, high compaction.
- Zone B. Moderate strength and low compressibility would be required at depth beneath the runway and taxiways, and for construction of reinforced earth slopes. Import select fill or on-site fill may be used in these areas to provide consistent, moderate to moderately high compaction.
- Zone C. General compacted fill with moderate strength and compressibility would be acceptable for the infill zone of the embankment between any reinforced earth slopes and the runway and taxiway fill zones. Because more variable, low to moderate compaction is acceptable in Zone C, on-site fill could be used.

Embankment settlement could result from settlement of the underlying native soils, settlement of embankment fill during placement due to self weight, and post-placement settlement of fill due to creep and inundation.

Over the long-term, differential settlement of the new parallel runway and taxiway pavements would occur in proportion to variations in fill thickness along the alignment. Differential settlement criteria for the runway pavement is limited to less than 0.5 inch in 50 feet. Based on currently proposed new runway elevations and corresponding fill thickness, it appears feasible that the proposed fill zones can achieve the required differential settlement criteria over runway alignment and the runway and taxiways. Mitigating measures may be necessary to meet differential settlement criteria in areas where there are large changes in fill thickness over relatively short distances, which could occur in the vicinity of the existing fill slope south of S. 176th Street, and where the proposed parallel taxiway would straddle the existing airfield embankment north of S. 170th Street.

Runway construction is scheduled for completion by the year 2001. To meet this schedule, year-round construction of the embankment may be necessary. Import-select fill has low moisture sensitivity and can generally be used during wet weather. The majority of on-site borrow source materials is moderately to highly moisture-sensitive because of its high fines content. This material would not be suitable for year-round construction in fill zones requiring consistent, moderate to high compaction. Construction sequencing could be established to use all-weather construction material from off-site sources in these areas during the winter months. It should be feasible to achieve low to moderate compaction with on-site borrow material during the wetter winter months.

Four stockpile sites have been identified on Port property near the new runway site. These four sites, identified as Stockpile Sites AB, C, J, and O on **Exhibit IV.19-1**, have a total estimated stockpile capacity of 580,000 cubic yards.[21]

[21] *Sea-Tac International Airport, Design Development for a New Runway, Draft Fill Material Stockpile Site Study,* HNTB, December, 1994

b. **Runway Extension and Safety Area**

Construction of fill embankments would be needed for the proposed extension of Runway 34R and safety area. Approximately 3.38 million cubic yards of fill would be needed for embankment construction. Upon completion, the elevation of the runway and safety area would be about 340 feet above MSL.

Site preparation, construction requirements, fill placement, fill settlement, and seasonal construction restrictions would be similar to those described for the new runway.

c. **SASA Site**

The SASA would require extensive earthwork to prepare the site for paving and construction of Airport support facilities. The finished area would be approximately 80 acres with a total paved area of about 56 acres. The excavation and construction area footprint is shown in **Exhibit IV.19-1**. The footprint area would be leveled to grades of about 0.7 percent by excavating the higher eastern side of the site and filling the lower west side of the site. Des Moines Creek would be relocated to the east. Post-construction elevation would be about 450 feet above MSL. Fills up to 70 feet thick and cuts up to 60 feet would be necessary to achieve the proposed grades. Because groundwater has been observed at depths of less than 10 feet below ground surface, dewatering would be required in some areas during excavation.

Approximately 2.38 million cubic yards of material would be excavated, most of which could be used on-site as compacted backfill. About 0.22 million cubic yards of topsoil and other material not suitable for fill would need to be disposed of either on Port property for the runway safety area or off-site at a pre-approved disposal site.

A series of retaining walls would be constructed around the site. A reinforced earth wall is proposed for the west side of the site. The walls would have a maximum height of 90 feet, and would be constructed in tiers about 30 feet in height with a 30-foot setback to the next tier. A permanent tieback pile wall would be necessary on the east side of the site. The tieback walls would have a maximum height of 63 feet and would be nearly vertical. Import fill would be needed to construct the reinforced earth wall as on-site fill is unsuitable for this purpose because of its high moisture sensitivity.

d. <u>Des Moines Creek Technology Campus</u>

The technology campus would be constructed on 54 acres of the 90-acre site. This site is a large portion of the Borrow Area 1 already identified. As identified in the Draft EIS for the Des Moines Creek Technology Campus, two grading options are under consideration. Grading Option A would conform to the existing topography as closely as possible. Approximately 192,000 cubic yards of material would be excavated, most of which could be used on-site as compacted backfill. Approximately 10,000 cubic yards of excess material would need to be disposed of either on Port property or at an approved disposal site. Under Grading Option B, the hilly terrain of the site would be leveled and finished grades would more closely match the lower elevations of the northwest corner of the site. Approximately 529,000 cubic yards of material would be excavated; 11,000 cubic yards of this could be used on-site. Approximately 518,000 cubic yards of excess material would be generated. These cut and fill estimates assume that all on-site material is suitable for reuse. Most of the excavated material would be glacial till, however. Till has limited use for general site grading and cannot be used for structural backfill. Imported select fill would be required for backfill around footings, retaining walls, pipe trenches, and other structures.

During excavation, shallow groundwater likely would be encountered in wetland areas and in localized areas of perched groundwater above the till. Trenching and sump pumps could be used to control perched groundwater. Permanent drainage systems may be needed in wetlands and low-lying areas to maintain stability of fill slopes and retaining structures.

e. <u>Airport Area</u>

Construction of facilities within the airfield, terminal, and support facility areas would require minor amounts of earthwork relative to construction of other elements included in the "With Project" alternative. Because construction would occur in nearly level, developed areas that have previously been excavated and filled, required amounts of excavation and fill, and consequent changes to existing topography, are expected to be small.

f. <u>Borrow Source Areas</u>

On-site borrow source areas likely would be used to the maximum extent possible to minimize off-site borrow source area utilization. Deposits on the sites were divided into soil units, and samples from each unit were analyzed to evaluate their suitability for use as fill material and to develop preliminary design criteria. In general, the majority of potential fill material from on-site borrow source areas would be derived from recessional outwash, till, and advance outwash deposits. Fill derived from advance outwash and recessional outwash deposits would likely be less moisture-sensitive than material derived from till deposits. The maximum borrow soil volume (in place) was estimated for each on-site source area. These estimates are based on a maximum cut of 10 feet above the water table or to the pre-Vashon drift across each area; a minimum 30-foot-wide buffer from adjacent property lines; and cut slopes at 2:1 (horizontal:vertical). Other assumptions specific to individual borrow source areas are discussed below.

The following borrow estimates are based on in-place soil volumes on the borrow sites. Volumes of the in-place material may either increase or decrease after excavation, placement, and compaction. The amount of fluff (increase) or compression (decrease) varies with the soil material type and the degree of compaction after placement. Fluff and compaction factors are expected to range from +12% to -9%, respectively, for material obtained from the on-site borrow source areas.[22]

- *Area 1.* About 2.3 million cubic yards of material could be obtained using a uniform 15-foot cut and no material is removed from the DMCTC site. Deeper cuts of up to 45 feet on portions would result in the removal of up to 4.0 million cubic yards of material. Excavation of the low-lying area at the north end of the site was not included in the estimates because of the likely occurrence of shallow groundwater. The current plans for this site call for the removal of up to 500,000 cubic yards.
- *Areas 2.* About 330,000 cubic yards fill material could be obtained using a uniform 15-foot cut. Deeper cuts appear feasible and could provide up to 650,000 cubic yards of fill material.
- *Area 3.* Excavation depths of 0 to 30 feet at the south end of Area 3, and 0 to 55 feet at the north end could produce up to 2.9 million cubic yards of material.
- *Area 4.* About 300,000 cubic yards fill material could be obtained using a uniform 15-foot cut. Deeper cuts up to 30 feet may be feasible west of the proposed SR509 right-of-way, which could result in the removal of up to 2.2 million cubic yards of material. Both estimates assume no material would be excavated within the SR509 corridor.
- *Area 5.* About 1.1 million cubic yards of fill material could be obtained using a uniform 15-foot cut. Up to 1.75 million cubic yards of material may be excavated using a maximum cut of 35 feet in places. Petroleum hydrocarbon-contaminated fill that occurs on the site is included in these estimates.
- *Area 8.* About 20.7 acres of wetland occur on the site. Additionally, the site is located near the Lake Reba detention facility. To avoid impacts on wetlands and the lake, no material will be excavated from Area 8.

3. Hazard Areas

Under Alternative 2, excavation and construction would occur in areas that have been identified as seismic hazards by the City of SeaTac (**Exhibit IV.19-2**).[23] Soils in seismic hazard areas are prone to liquefaction during an earthquake, which could result in vertical displacement of embankments and pavement. Two of these areas are located on the SASA. Geotechnical analysis of soils in these areas indicates that these soils would not liquefy during a seismic event and these areas, therefore, do not pose a seismic hazard.[24] Two seismic hazard areas occur on the site of the proposed new parallel runway. Geotechnical investigations indicate these seismic hazards are loose, saturated sediment, about 5 to 20 feet deep, that likely would liquefy during a seismic event. During runway construction, the sediment would be removed and replaced with compacted fill. Seismic hazard areas also occur on Borrow Source Areas 1, 5, and 8. Excavated cut slopes in these

[22] *Draft Borrow Source Area Study,* AGI, April, 1995.

[23] *Environmentally Sensitive Areas Map Folio,* City of SeaTac, 1991.

[24] *South Aviation Support Area Final EIS,* Port of Seattle, 1994.

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areas would be prone to failure during a seismic event.

No landslide hazards have been identified in the study area, based on existing information sources. Fill material on the Seattle Christian School property within the SASA may be a landslide hazard, however.[25] The types of material and placement method used to construct this fill should be investigated to evaluate its landslide potential.

Erosion hazards are identified in the northwest corner of the DMCTC site, along the western margin of Borrow Source Area 1 and along the northern margin of Borrow Source Area 2 (**Exhibit IV.19-2**). These hazard areas are associated with steep ravines along Des Moines Creek. No development or borrow excavation would occur within these hazard areas and their associated buffer areas.

4. **Erosion**

Erosion of exposed soils in areas of excavation, fill, and stockpile would occur during construction. Erosion and sedimentation estimates for the new parallel runway, runway improvements, and on-site borrow source areas are listed in **Table IV.23-3**, and discussed in Chapter IV, Section 10, "Water Quality and Hydrology", and Section 23, "Construction Impacts", of this Final EIS. An Erosion and Sedimentation Control Plan would be designed and implemented to control erosion, dust, and waste disposal and minimize impacts.

(C) **Alternative 3 (North Unit Terminal)**

Under Alternative 3, impacts associated with development of the new parallel runway and the SASA, airfield improvements, relocation of S. 156th Way, and excavation of on-site borrow source areas would be the same as for Alternative 2.

Similar to Alternative 2, construction within the airfield, terminal, and support facility areas would require minor amounts of earthwork relative to construction of other elements included in Alternative 3. Because construction would occur in nearly level, developed areas that have previously been excavated and filled, required amounts of excavation and fill, and consequent changes to existing topography, are expected to be relatively small.

(D) **Alternative 4 (South Unit Terminal)**

Under Alternative 4, impacts associated with development of the new parallel runway and the SASA, airfield improvements, relocation of S. 156th Way, and excavation of on-site borrow source areas would be the same as for Alternative 2.

Similar to Alternative 2, construction within the airfield, terminal, and support facility areas would require minor amounts of earthwork relative to construction of other elements included in Alternative 4. Because construction would occur in nearly level, developed areas that have previously been excavated and filled, required amounts of excavation and fill, and consequent changes to existing topography, are expected to be relatively small.

(E) **Preferred Alternative (Alternative 3)**

As is described in Chapter II, the Port of Seattle staff have recommended the implementation of Alternative 3 (North Unit Terminal) with a new parallel runway with a length of 8,500 feet. The following summarize the earth impacts of this alternative.

1. **Borrow Requirements**

The most extensive earthwork associated with the Preferred Alternative would occur from the proposed new parallel runway, the 600-foot extension of Runway 16L/34R, runway safety area improvements, and site preparation of the SASA. These elements would require a total of approximately 23 million cubic yards of compacted fill with approximately 17.25 million cubic yards for an 8,500-foot new runway; 2.4 million cubic yards for extension of Runway 16/34R; 0.98 million cubic yards for the runway safety area improvements; and 2.38 million cubic yards to level the SASA in preparation for support facility construction. Cut and

[25] *South Aviation Support Area Final EIS*, Port of Seattle, 1994.

fill estimates for the aircraft apron area, additional taxiways, and relocation of S. 156th Way are not available at this time, but are not expected to be of the magnitude of the other airfield projects.

Preliminary evaluation of potential on-site borrow source areas indicates that 4 to 8 million cubic yards of the required borrow could be obtained from Port-owned properties on and adjacent to the Airport. Resource verification would be necessary to confirm availability, quantity, and quality of fill materials at each potential on-site borrow source area, however. The borrow potential of additional current or future Port-owned properties also may be evaluated. Additional fill could be excavated from the SASA property for construction of the new parallel runway. This material would have to be replaced, however, to develop the airfield level facilities of the SASA as currently proposed. Sixteen potential off-site borrow sources have been identified that could supply the remaining volumes of required fill.

Construction of terminals, airport support facilities, utilities, and roads would occur in developed areas that previously have been excavated and filled. Relatively minor amounts of fill would be required for their construction and could be supplied by off-site borrow sources.

As described in Section 11 "Wetlands", the disadvantage of using the on-site borrow areas could be the impact of about 2.4 acres of wetland. However, as is discussed in Section 23 "Construction", if these borrow areas are not used, an increase in off-airport truck trips would be required to import fill to Sea-Tac Airport.

2. Excavation and Fill Placement

The following sections summarize the excavation and fill placement associated with each of the major construction sites.

a. New Parallel Runway

The aerial extent of proposed runway excavation and construction is shown on **Exhibit IV.19-1**. The proposed new runway site would first be stripped of all vegetation and topsoil. Subsurface material over most of the site is primarily till and recessional outwash that has moderate to good bearing capacity, low to moderate compressibility, and is suitable subgrade material. Over-excavation of unsuitable subgrade materials beneath the proposed new runway, taxiways, and embankment toes would be required, however. Over-excavation would include 10 to 20 feet of soft soils in swales that cross the new runway and north safety area; two existing fills, ranging from 15 to 42 feet thick; and, potentially, soils in wetland areas. Temporary control of groundwater would be needed in the swale and wetland areas. Over-excavation materials would be either distributed over the infill area or disposed of at approved disposal sites.

Additional site preparation would include keying and benching along the existing embankment to create a stable fill base where the existing grades slope beneath the proposed new runway embankment. Streamflow within the swales that cross the proposed site would need to be intercepted and controlled to protect embankment fill stability. Subdrains should also be installed behind any reinforced earth slopes and walls.

The proposed new runway would require construction of an extensive fill embankment to establish the proposed runway and runway safety area grades. Upon completion, runway grades would range from 410 feet above MSL at the north threshold to 350 feet above MSL at the south threshold. To establish these grades, fill thickness would range up to approximately 160 feet at the maximum depth, with typical depths ranging between 30 and 100 feet. Cuts in existing grade of up to 20 feet would be required.

Unreinforced fill slopes no steeper than 2 horizontal to 1 vertical are recommended for most of the safety area embankment west of the proposed new parallel runway. The fill would be placed in layers using common construction techniques. Reinforced earth embankments, allowing embankment slopes of up to 55 degrees from the horizontal, could be used along portions of the west embankment, where practical, to minimize encroachment onto adjacent areas. Construction of reinforced embankments involves establishing a zone of moderately well-compacted fill with layers of steel or polymer reinforcement. Retaining walls would be used wherever practical to minimize encroachment on SR 509.

Fill zones may be used to maximize use of on-site fill and produce a new runway that would have acceptable strength, compressibility, and long-term fill settlement. Embankment settlement could result from settlement of the underlying native soils, settlement of embankment fill during placement due to self weight, and post-placement settlement of fill due to creep and inundation.

Four stockpile sites have been identified on Port property near the new runway site. These four sites, identified as Stockpile Sites AB, C, J, and O on **Exhibit IV.19-1**, have a total estimated stockpile capacity of 580,000 cubic yards.

b. <u>Runway Extension and Safety Area</u>

Construction of fill embankments would be needed for the proposed extension of Runway 34R and safety area. Approximately 3.38 million cubic yards of fill would be needed for embankment construction. Upon completion, the elevation of the runway and safety area would be about 340 feet above MSL. Site preparation, construction requirements, fill placement, fill settlement, and seasonal construction restrictions would be similar to those described for the new runway.

c. <u>SASA Site</u>

The SASA would require extensive earthwork to prepare the site for paving and construction of Airport support facilities. The finished area would be approximately 80 acres with a total paved area of about 56 acres. The footprint area would be leveled to grades of about 0.7 percent by excavating the higher eastern side of the site and filling the lower west side of the site. Des Moines Creek would be relocated to the east. Post-construction elevation would be about 450 feet above MSL. Fills up to 70 feet thick and cuts up to 60 feet would be necessary to achieve the proposed grades. Because groundwater has been observed at depths of less than 10 feet below ground surface, dewatering would be required in some areas during excavation.

Approximately 2.38 million cubic yards of material would be excavated, most of which could be used on-site as compacted backfill. About 0.22 million cubic yards of topsoil and other material not suitable for fill would need to be disposed of either on Port property for the runway safety area or off-site at a pre-approved disposal site.

A series of retaining walls would be constructed around the site. A reinforced earth wall is proposed for the west side of the site. The walls would have a maximum height of 90 feet, and would be constructed in tiers about 30 feet in height with a 30-foot setback to the next tier. A permanent tieback pile wall would be necessary on the east side of the site. The tieback walls would have a maximum height of 63 feet and would be nearly vertical. Import fill would be needed to construct the reinforced earth wall as on-site fill is unsuitable for this purpose because of its high moisture sensitivity.

d. Des Moines Creek Technology Campus

The technology campus would be constructed on 54 acres of the 90-acre site. This site is a large portion of the Borrow Area 1 already identified. As identified in the Draft EIS for the Des Moines Creek Technology Campus, two grading options are under consideration. Grading Option A would conform to the existing topography as closely as possible. Approximately 192,000 cubic yards of material would be excavated, most of which could be used on-site as compacted backfill. Approximately 10,000 cubic yards of excess material would need to be disposed of either on Port property or at an approved disposal site. Under Grading Option B, the hilly terrain of the site would be leveled and finished grades would more closely match the lower elevations of the northwest corner of the site. Approximately 529,000 cubic yards of material would be excavated; 11,000 cubic yards of this could be used on-site. Approximately 518,000 cubic yards of excess material would be generated. These cut and fill estimates assume that all on-site material is suitable for reuse. Most of the excavated material would be glacial till, however. Till has limited use for general site grading and cannot be used for structural backfill. Imported select fill would be required for backfill around footings, retaining walls, pipe trenches, and other structures.

During excavation, shallow groundwater likely would be encountered in wetland areas and in localized areas of perched groundwater above the till. Trenching and sump pumps could be used to control perched groundwater. Permanent drainage systems may be needed in wetlands and low-lying areas to maintain stability of fill slopes and retaining structures.

e. Airport Area

Construction of facilities within the airfield, terminal, and support facility areas would require minor amounts of earthwork relative to construction of other elements. Because construction would occur in nearly level, developed areas that have previously been excavated and filled, required amounts of excavation and fill, and consequent changes to existing topography, are expected to be small.

f. Borrow Source Areas

On-site borrow source areas likely would be used to the maximum extent possible to minimize off-site borrow source area utilization. Deposits on the sites were divided into soil units, and samples from each unit were analyzed to evaluate their suitability for use as fill material and to develop preliminary design criteria. In general, the majority of potential fill material from on-site borrow source areas would be derived from recessional outwash, till, and advance outwash deposits. Fill derived from advance outwash and recessional outwash deposits would likely be less moisture-sensitive than material derived from till deposits. The maximum borrow soil volume (in place) was estimated for each on-site source area. These estimates are based on a maximum cut of 10 feet above the water table or to the pre-Vashon drift across each area; a minimum 30-foot-wide buffer from adjacent property lines; and cut slopes at 2:1 (horizontal:vertical). Other assumptions specific to individual borrow source areas are discussed below.

The following borrow estimates are based on in-place soil volumes on the borrow sites. Fluff and compaction factors are expected to range from +12% to -9%, respectively, for material obtained from the on-site borrow source areas.

- *Area 1.* About 2.3 million cubic yards of material could be obtained using a uniform 15-foot cut and no material is removed from the DMCTC site. Deeper cuts of up to 45 feet on portions would result in the removal of up to 4.0 million cubic yards of material. Excavation of the low-lying area at the north end of the site was not included in the estimates because of the likely occurrence of shallow groundwater. The current plans for this site call for the removal of up to 500,000 cubic yards.

- *Areas 2.* About 330,000 cubic yards fill material could be obtained using a uniform 15-foot cut. Deeper cuts appear feasible and could provide up to 650,000 cubic yards of fill material.
- *Area 3.* Excavation depths of 0 to 30 feet at the south end of Area 3, and 0 to 55 feet at the north end could produce up to 2.9 million cubic yards of material.
- *Area 4.* About 300,000 cubic yards fill material could be obtained using a uniform 15-foot cut. Deeper cuts up to 30 feet may be feasible west of the proposed SR 509 right-of-way, which could result in the removal of up to 2.2 million cubic yards of material. Both estimates assume no material would be excavated within the SR 509 corridor.
- *Area 5.* About 1.1 million cubic yards of fill material could be obtained using a uniform 15-foot cut. Up to 1.75 million cubic yards of material may be excavated using a maximum cut of 35 feet in places. Petroleum hydrocarbon-contaminated fill that occurs on the site is included in these estimates.
- *Area 8.* About 20.7 acres of wetland occur on the site. Additionally, the site is located near the Lake Reba detention facility. To avoid impacts on wetlands and the lake, no material will be excavated from Area 8.

3. Hazard Areas

Excavation and construction would occur in areas that have been identified as seismic hazards by the City of SeaTac. Soils in seismic hazard areas are prone to liquefaction during an earthquake, which could result in vertical displacement of embankments and pavement. Two of these areas are located on the SASA. Geotechnical analysis of soils in these areas indicates that these soils would not liquefy during a seismic event and these areas, therefore, do not pose a seismic hazard. Two seismic hazard areas occur on the site of the proposed new parallel runway. Geotechnical investigations indicate these seismic hazards are loose, saturated sediment, about 5 to 20 feet deep, that likely would liquefy during a seismic event. During runway construction, the sediment would be removed and replaced with compacted fill. Seismic hazard areas also occur on Borrow Source Areas 1, 5, and 8. Excavated cut slopes in these areas would be prone to failure during a seismic event.

No landslide hazards have been identified in the study area, based on existing information sources. Fill material on the Seattle Christian School property within the SASA may be a landslide hazard, however. The types of material and placement method used to construct this fill should be investigated to evaluate its landslide potential.

Erosion hazards are identified in the northwest corner of the DMCTC site, along the western margin of Borrow Source Area 1 and along the northern margin of Borrow Source Area 2. These hazard areas are associated with steep ravines along Des Moines Creek. No development or borrow excavation would occur within these hazard areas and their associated buffer areas.

4. Erosion

Erosion of exposed soils in areas of excavation, fill, and stockpile would occur during construction. Erosion and sedimentation estimates for the new parallel runway, runway improvements, and on-site borrow source areas are listed in **Table IV.23-3,** and discussed in Chapter IV, Section 10, "Water Quality and Hydrology", and Section 23, "Construction Impacts", of this Final EIS. An Erosion and Sedimentation Control Plan would be designed and implemented to control erosion, dust, and waste disposal and minimize impacts.

(4) CUMULATIVE IMPACTS

The cumulative impact of the SeaTac Master Plan and other proposed projects within the vicinity would be an increased the amount of excavation, fill, and modification of existing topography within the vicinity of the Airport, and an increased potential for erosion. Many proposed projects, such as the Regional Transit Project, would require use of substantial fill, which, together with the Sea-Tac Master Plan Update airport improvements, would increase the borrow demand within the Region.

(5) MITIGATION

An Erosion and Sedimentation Control Plan, including measures specific to site conditions, would be designed and implemented to minimize erosion and sedimentation levels. The plan would include elements for site stabilization, slope and drainageway protection, sediment retention, and dust control on haul routes and borrow sites. Approval of the plan by the applicable local authority and the Washington State Department of Ecology would be required prior to project construction.

As stated in Chapter IV, Section 2 "Land Use", the application and implementation of City of SeaTac regulatory provisions to the Master Plan Update improvements is currently the subject of negotiation through interlocal processes between the Port and City.

If applicable as determined from the result of the interlocal negotiation process between the Port of Seattle and the City of SeaTac (not expected prior to issuance of the Final EIS), the City of SeaTac Environmentally Sensitive Areas Ordinances allow alterations to seismic hazard areas only if (1) site-specific subsurface investigations show the site is not a seismic hazard or (2) mitigation is implemented that renders the proposed development as safe as if it were not located in a seismic hazard area.[26/] Two seismic hazards occur on the site of the new parallel runway in relatively small areas of loose, shallow sediment. During runway construction, this sediment would be removed and replaced with compacted fill. If future subsurface investigations verify the occurrence of seismic hazards on Borrow Source Areas 1, 5, and 8, special measures to maintain cut slope stability during excavation in these areas may be required.

A landscaping plan would be developed for areas of excavation and construction. For the borrow source areas, the landscaping plan could include recontouring, seeding, and planting of trees and shrubs. Potential mitigation measures for aesthetic impacts of the proposed new runway are included in Chapter IV, Section 24 "Aesthetics and Urban Design" of this Final EIS.

26/ *Environmentally Sensitive Areas Ordinance*, City of SeaTac, 1994.

TABLE IV.19-1

Seattle-Tacoma International Airport
Environmental Impact Statement

FILL AND BORROW REQUIREMENTS (Million Cubic Yards)

Master Plan Update Construction Activity	Total Fill Requirements (Million Cubic Yards)	
	Minimum	**Maximum**
8,500 Ft. Runway	17.25	19.84
RSA Improvements	0.98	1.13
Relocation of S. 154th Street	0.13	0.14
Sub-Total	18.36	21.11
Runway 34R Extension	2.40	2.76
SASA Facilities	2.20	2.53
Sub-Total	4.60	5.29
Total Fill Required	**22.96**	**26.40**

On-Site Borrow Source	Available On-Site Fill (MCY)	
	Minimum	**Maximum**
Area 1	0.00	0.50
Area 2	0.00	0.65
Area 3	0.00	2.90
Area 4	0.00	2.20
Area 5	0.00	1.75
Area 8[1/]	0.00	0.00
Sub-Total	0.00	8.00
Common Excavation[2/]	2.90	3.10
Total Available Fill	**2.90**	**11.10**

1/ Material will not be excavated from this on-site borrow source due to the large quantity of wetland.
2/ Grading and excavation in the fill placement area will generate additional fill material.

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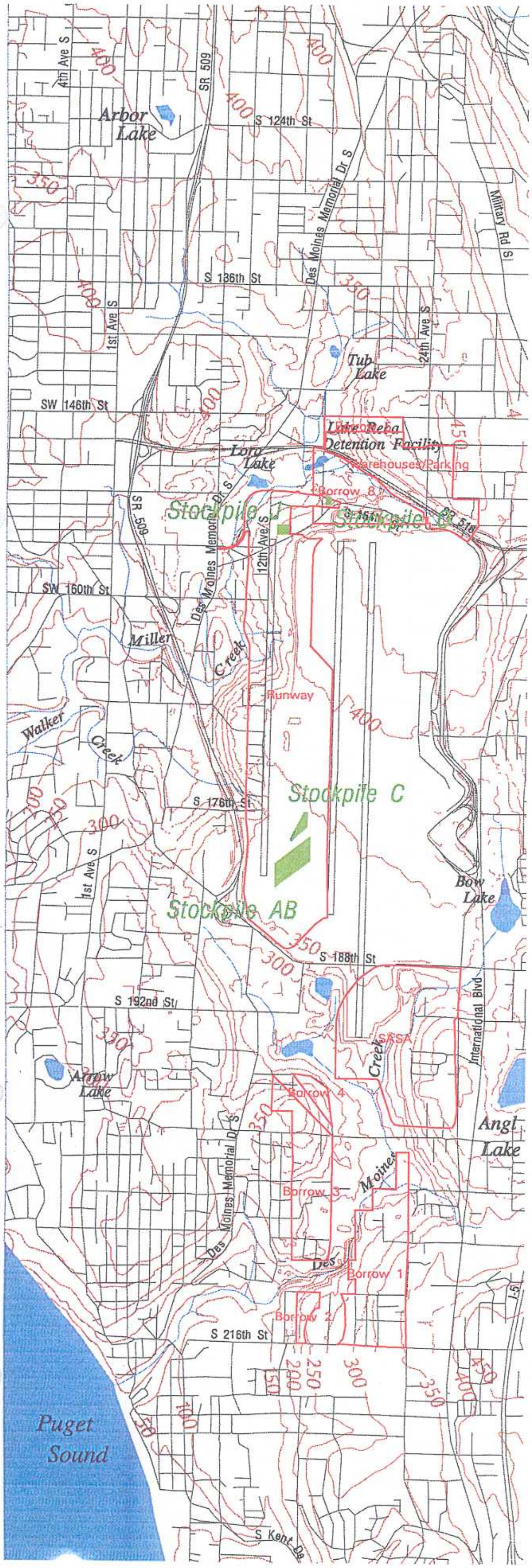
AR 003916

Seattle-Tacoma International Airport
Environmental Impact Statement
for the Master Plan Update

Exhibit IV.19-1

Topography and Master Plan Construction Impact Areas



Potential Construction Impact Area

Stockpile Area

Source: Gambrell Urban, Inc., Landrum & Brown, Inc. and Shapiro & Associates, 1995
P&D Aviation, 1994
HNTB, 1994

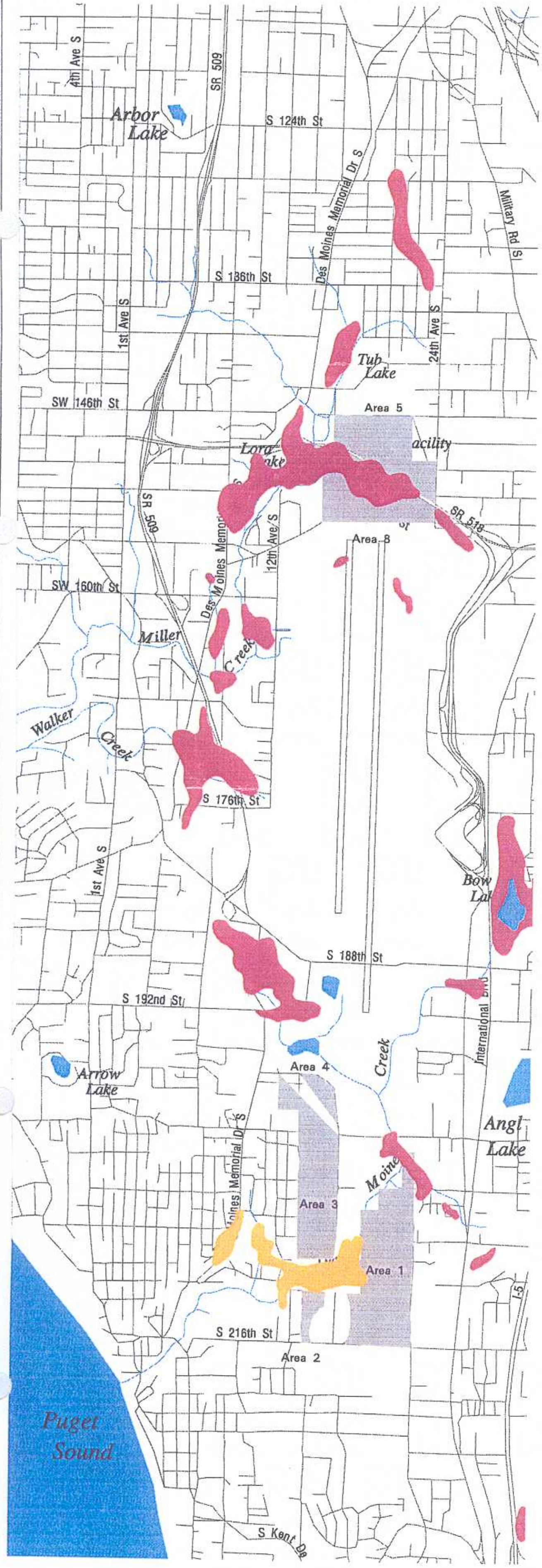
Scale 1" = 2,500'

0 2500 5000

SCALE IN FEET

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

April 10, 1995



Seattle-Tacoma International Airport Environmental Impact Statement for the Master Plan Update

Exhibit IV.19-2

Earth Hazard Areas

- Erosion Hazard Area
- Seismic Hazard Area
- Potential On-Site Borrow Sources

Source: Gambrell Urban, Inc. and
Shapiro & Associates, 1994
King County Sensitive Areas Map Folio, 1990
City of SeaTac Environ. Sensitive Areas Map, 1991
HNTB, 1994

N
S

Scale 1" = 2,500'

0 2500 5000

SCALE IN FEET

Projection: Lambert Conformal Conic
Coordinate System: State Plane NAD27

April 13, 1995

B

The Flight Plan Project

Final Environmental Impact Statement

October 1992

Puget Sound Regional Council

PSRC

Port of Seattle

AR 003919

October 6, 1992

Re: Flight Plan: Non-Project (Programmatic) Final Environmental Impact Statement (FEIS)

Dear Reader:

The central Puget Sound region is faced with growing demand for commercial air transportation services and a limited capacity at the existing Seattle-Tacoma International Airport (Sea-Tac). Without expansion of airport capacity or other steps to address the increase in mid- to long-range travel needs, the result will be delays for air travelers, which could ultimately affect the region's economy. The solution to this challenge must strike a balance between environmental impacts, quality of life factors, and the travel needs of the region's populace.

The Flight Plan Project has been a joint effort of the Puget Sound Regional Council and the Port of Seattle. The project was initiated by the Puget Sound Council of Governments (predecessor to the Puget Sound Regional Council) and the Port of Seattle to research airport system alternatives to meet the region's long-term air transportation needs. (On October 1, 1991 the Puget Sound Council of Governments (PSCOG) was dissolved and replaced by the Puget Sound Regional Council.) The PSCOG and the Port established the Puget Sound Air Transportation Committee (PSATC), which was composed of citizens, elected officials and private sector interests, to propose solutions to the region's air transportation needs. The Flight Plan's Draft Report, prepared by the Regional Council and the Port of Seattle and issued on January 7, 1992, included a non-project, draft environmental impact statement (DEIS) regarding the PSATC's advisory recommendations. Section 1.1.3 of this FEIS describes the changes from the DEIS incorporated into the final EIS.

The Regional Council and Port of Seattle then sponsored eleven public hearings to solicit comments from private citizens on the DEIS and draft proposal of the PSATC. Responses to the oral and written comments from the public review process are reflected in this Final Environmental Impact Statement as refinements and modifications to the presented alternatives, supplemental information and factual corrections. The public review comments are reproduced in three supplemental volumes to this FEIS. (These comments are responded to by cross-referencing from the letters in the supplements to the appropriate section of the FEIS or by cross-referencing to a set of supplemental responses contained in Appendix E.) Following the public review process, the PSATC adopted its final recommendation. See Section 1.5 and Appendix A.

It is important to note that there is no agency-preferred alternative in this non-project FEIS. The purpose of the FEIS is to present and compare system-level alternatives for meeting forecasted travel needs. Additional site specific information will be developed (and subsequently presented in project-level EISs) after a system-level alternative has been selected. The Regional Council does provide for an optional administrative appeal process for reconsidering the adequacy of its FEISs.

The following key issues are addressed in the FEIS.

1. What are the major implications and trade-offs between the regional alternatives?

Section 1.0 summarizes the implications and trade-offs of the system-level alternatives. Section 2.0 presents the problems statement; Section 3.0 describes the system-level alternatives; and Section 4.0 describes the significant environmental impacts and identifies potential mitigation measures.

2. What is the probable long-term demand for commercial transportation?

The Flight Plan Project addresses future commercial air transportation demand and capacity. The forecasts establish thresholds from which a preferred future can be selected from a family of alternative futures. However, in terms of making a system-level decision, it is not as important to know when these thresholds will be reched as it is to know that there will be capacity limitations in the future. Section 1.1 summarizes both the population and employment forecasts for the region and the air passenger and aircraft operation forecasts derived from the regional forecasts. Section 2.0 discusses in detail the demand forecasts and related points.

3. What are the alternative regional air transportation systems?

Alternatives range from no-action, to building a new airport, to phased distribution of service to Sea-Tac and other existing or new airport sites. Mitigation, demand management, and institutional elements may also be part of a comprehensive action package. Section 1.2 briefly presents the system-level alternative airport configurations; Section 3.0 describes them in detail. The evaluation methodology is described in Section 3.7.

4. What are the impacts with respect to noise, air quality, land use, and other community factors?

The environmental impacts of the system alternatives are summarized in Section 1.3. More detailed analyses for each assessment are presented in the corresponding parts of Section 4.0, including the discussion of potential mitigation measures and the identification of unavoidable adverse impacts.

5. How does commercial air transportation capacity planning relate to other regional planning activities?

Regional air transportation decisions must be compatible with other regional decisions regarding the economy, high capacity transit, high-speed ground transportation, intermodal transportation planning required under new federal legislation, and especially comprehensive growth management planning required under the state Growth Management Act. Two fundamental considerations in this planning are the use of common growth forecasts and the importance of airport site identification and preservation to meet long-term needs. Many of the planning and timing relationships are explored in Sections 3.8 and 4.4.6, and Appendix B.

The Regional Council is scheduled to adopt an amendment to the Regional Airport System Plan (RASP) for the long-term commercial air transportation capacity needs of the region in March 1993. Major considerations will be the Flight Plan FEIS, public comment, review by the Washington State Air Transportation Commission of the PSATC's demand and capacity assessment, research by the High Speed Ground Transportation Commission, and additional information to be developed by the Council between now and when it makes its decision. In addition, subsequent site and project level analyses and actions are required of several other agencies, depending upon the regional system-level action taken.

Sincerely,

Gerald D Dinndorf

Gerald D. Dinndorf, Responsible SEPA Official
Puget Sound Regional Council

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FACT SHEET

BRIEF DESCRIPTION

This non-project Final Environmental Impact Statement (FEIS) evaluates the impacts of five different airport system alternatives and a variety of options within each alternative to provide for the long-term commercial air transportation needs of the central Puget Sound region. The FEIS does not identify an agency preferred alternative.

TENTATIVE DATE OF IMPLEMENTATION

The Regional Council plans to submit an amendment to the Regional Airport System Plan (RASP) for long-term commercial air transportation capacity needs of the region to the Executive Board and General Assembly for approval in February and March 1993, respectively. The Port of Seattle Commission is scheduled to consider the PSATC recommendations this fall.

LEAD AGENCY

The Regional Council and the Port of Seattle are co-lead agencies for the FEIS, which is published in partial fulfillment of the requirements of the State Environmental Policy Act (SEPA)(Chapter 43.21C RCW) and the SEPA Rules (Chapter 197-11 WAC). The Regional Council holds nominal lead responsibility (WAC 197-11-944). The Regional Council is lead agency for the Regional Transportation Plan (the Regional Airport System Plan is a component). The Port of Seattle is the lead agency for decisions and actions at Seattle-Tacoma International Airport.

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Apogee Research

DRAFT EIS DATE OF ISSUE

7 January 1992

FINAL EIS DATE OF ISSUE	October 6, 1992
COMMENTS	The period for public comment on the Draft Environmental Impact Statement (DEIS) occurred between 7 January 1992 and 23 March 1992.
TIME AND PLACE OF PUBLIC HEARINGS	The Regional Council and Port of Seattle received public comments on the DEIS at eleven public hearings held during the public review period at the following locations: Everett, Mukilteo, Seattle, SeaTac, Bremerton, Tacoma, Lakewood, Olympia, Tumwater, Federal Way, and Arlington.
FINAL ACTION	The Regional Council plans to submit an amendment to the Regional Airport System Plan (RASP) for long-term commercial air transportation capacity needs of the region to its Executive Board in February and its General Assembly in March 1993. This date is subject to change. The Assembly's approval of the amendment constitutes the final action of the Council. The Port of Seattle Commission plans to submit the FEIS to its Commission in Fall 1992 .
SUBSEQUENT ENVIRONMENTAL REVIEW	The Flight Plan Project is considered to be a "nonproject proposal" (WAC 197-11-442). It describes a regional program, a broad package of proposed policies for implementing agencies to follow in meeting future commercial air transportation system needs. The sponsoring agencies recognize that subsequent siting and project-level environmental reviews will be necessary. The Regional Council and the Port of Seattle have not determined when these reviews will take place, but have addressed in the FEIS how all of this work relates to a range of regional and local planning activities in the service area.
COST	The FEIS is distributed to those agencies and others listed on the Distribution List (Appendix F), including public libraries throughout the region. Additional copies of the FEIS may be purchased from the Regional Council Information Center (206-464-7532) or the Port of Seattle Noise Remedy Office at the Maywood School (206-431-5913) for $10.00. Supporting documents can also be purchased for additional cost at these same locations.

1.0 SUMMARY and DECISION CONTEXT

The Final Environmental Impact Statement (FEIS) is divided into four major sections. These are: (1.0) the **Summary and Decision Context**; (2.0) the **Problem Statement: Air Capacity Issues**; (3.0) the **System-level Alternatives**; and (4.0) the **Affected Environment, Significant Impacts and Mitigation.**

The commercial air transportation capacity planning alternatives presented in this FEIS are discussed within the context of several other new regional planning activities affecting land use and surface transportation. Activities in these other areas contribute to the uncertainty of the long-term impacts, but also provide substantial opportunities for mitigation.

The system level alternatives included in the FEIS present a range of actions: capacity improvements at Seattle-Tacoma International Airport, the development of a multiple airport system, the replacement of Sea-Tac with a new airport, and the no action alternative. The major implications of these actions are summarized below:

- Improvements at the existing Sea-Tac International Airport focus on operational concerns. At present aircraft are limited to using a single runway during bad weather conditions. Actions to resolve this situation could also reduce other problems related to inefficient operations, such as near-term noise.

  There are three main options related to improvements at the present Sea-Tac site: (1) **broad system management**, (2) a new **dependent third runway**, and (3) a **remote airport** operated in tandem with Sea-Tac.

  1) A **broad system management** strategy at Sea-Tac includes (a) **demand management** strategies, (b) the development of **new technologies**, and (c) the use of **high speed rail** in the I-5 corridor. **Demand management** includes a range of pricing and regulatory techniques. Such management techniques may be effective in moderating the impact of increased commuter traffic at Sea-Tac and may defer the need for other actions for some time. **New technologies** can play an important role in making the most efficient use of existing airport facilities, but are not a solution to capacity needs. **High speed rail** would reduce the number of commuter flight operations in the I-5 corridor. The estimated cost for a rail system is $10 billion. Projections indicate that rail would reduce total forecasted operations by about eight percent in the year 2020.

  2) A new **dependent third runway** at Sea-Tac would allow two staggered streams of aircraft to land during bad weather. A third runway would increase capacity and reduce noise, since fewer operations would spread into early morning and later nighttime hours.

  3) A **remote airport** such as Boeing Field or Moses Lake (Grant County Airport) requires a ground link on dedicated right-of-way to work, and is most effective when there are large numbers of connecting passengers. Since Sea-Tac has a low number of connecting passengers, this alternative is not as effective in meeting capacity needs. A remote airport at Boeing Field would likely be used for commuter flights, while a remote airport at Moses Lake would likely be used for transcontinental or overseas international flights.

- **The multiple airport system** alternative includes Sea-Tac and supplemental passenger service airport(s) to the north and/or the south of Sea-Tac. The alternative adds new noise to the supplemental sites.

- **A replacement airport** dismantles the existing Sea-Tac Airport. The major trade-off is between reducing community impacts at the present site versus creating large air quality impacts on a regional basis. These air quality impacts would be due to the increased vehicle miles that would be traveled to reach a potential replacement site. Additional impacts include loss of open space and impacts to the natural environment.

- **The no-action** alternative brings economic risks and exposes the greatest number of people to moderately loud noise. Next to the replacement airport, this alternative produces the greatest amount of air pollutants. Economic impacts are not the subject of this FEIS, but should be weighed alongside the environmental impacts of the alternatives.

1.1 PROBLEM STATEMENT

The purpose of the Flight Plan Project is to plan for the future air transportation needs of the central Puget Sound region through the year 2020 and beyond. Without demand mitigation strategies, the increasing popularity of air travel and growing population of the region will create a demand that is forecasted to saturate the existing operational capacity at Sea-Tac Airport before the year 2000. (Efficient capacity is defined in Section 2.3, and illustrated in Figures 1-1, and 1-2.) Increasing demand without increasing airport capacity in the region will result in longer and longer delays for air travelers and ultimately will hurt the trade-oriented regional economy.

The Flight Plan Project addresses future commercial air transportation demand and capacity. Alternatives are evaluated against forecasted future demand, but are not dependent upon precise dates as to when these activity levels will be achieved. The need to make a regional decision regarding future regional commercial air transportation service is driven by both the demand forecasts and, equal to this, the possible loss due to inaction of available long-term alternative sites.

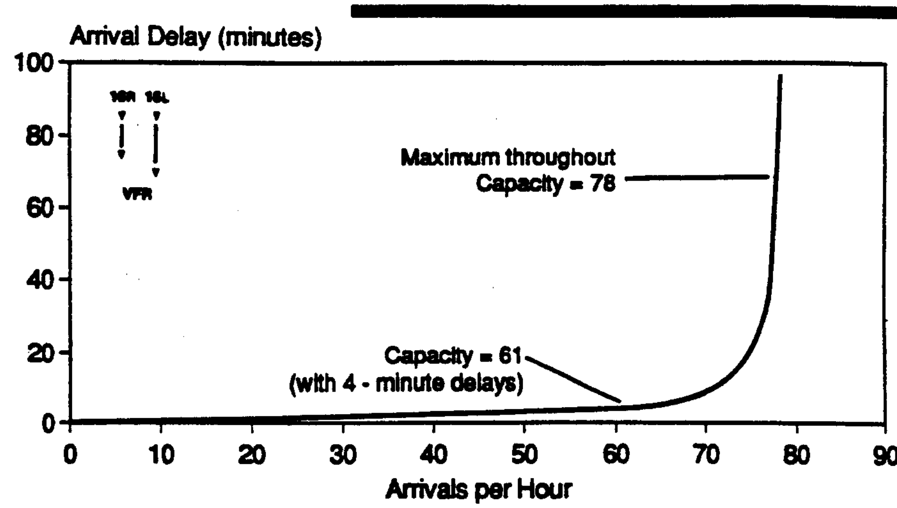
In addition, the relationship between commercial air transportation decisions and other growth management decisions needs to be understood. The current reduction in aircraft capacity at Sea-Tac Airport during poor weather conditions also is addressed. Finally, the relationship between commercial air transportation planning and other regional growth management decisions is discussed.

Regional Growth Forecasts

Regional population and employment forecasts developed during the Puget Sound Council of Governments' (PSCOG) VISION 2020 planning process were used in Flight Plan. VISION 2020 has subsequently been adopted as the Regional Growth and Transportation Strategy by the succeeding agency and current participant in the Flight Plan Project, the Puget Sound Regional Council (Regional Council). These forecasts for the four-county region (King, Kitsap, Pierce, and Snohomish counties) projected a 61 percent increase in population and a 72 percent increase in employment between 1988 and 2020. These numbers were used as input to the air travel demand forecasts produced during Phase I of

Figure 1-1

Airport Delay Curve, Current Runway Configuration

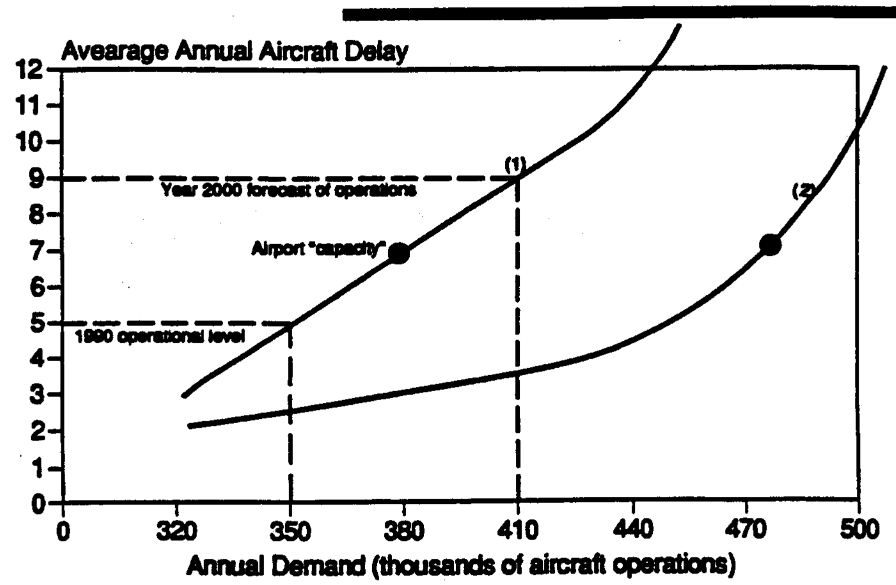


Source: Seattle-Tacoma International Airport Capacity Enhancement Plan, June 1991, Figure 11.

Note: As dramatic increases in delay continue, system management actions moderate this curve. These include adjustments by the airlines and delayed departures (to Seattle) at other airports. This is presented in Section 3.2.1.1.

Figure 1-2

Annual Demand
(thousands of aircraft operations)



Source: <u>Operational Analysis - Capacity Estimates for Airport Options. Flight Plan Options Subcommittee Working Paper.</u> Turner Collie & Broden Inc., February 22, 1991.

Notes: (1) existing runways
(2) new air carrier runway

the Flight Plan Project (ended in July 1990). The forecasts indicate strong regional growth over the next several decades. The current population of 2.7 million is forecasted to grow by 1.3 million for a total of 4.0 million in 2020.

Flight Plan Air Passenger and Aircraft Operations Forecasts

Commercial air passenger demands are forecasted by Flight Plan to increase more rapidly than population or employment. Passenger demand is forecasted to nearly triple between 1990 and 2020, from 16.2 million annual passengers to 45 million annual passengers. This is not only driven by population and employment growth, but also by rising overall per capita demand. A state commission is currently reviewing the Flight Plan forecasts. Their report is due December 1, 1992.

Between 1970 and 1990, passenger volumes more than tripled from 4.6 million annual passengers to today's level of over 16 million. This represented nearly a doubling in per capita demand. Due to anticipated increases of average commuter and heavy passenger aircraft size, the total aircraft operations (landings and takeoffs) needed to accommodate the forecasted passengers are expected to increase from 355,000 arrivals and departures in 1990 to 411,000 in the year 2000 and 524,000 in the year 2020. However, Sea-Tac only has adequate capacity to handle 380,000 aircraft operations per year with minimal delay and related impacts. Above this level, average delay will rise rapidly and could routinely exceed one hour. Sea-Tac with Broad System Management may serve to alter the actual dates when these activity levels will be reached, although the forecasts do include the use of larger aircraft.

With the current runway configuration, the airplane arrival delay increases rapidly beyond a certain level of operations. This is shown in Figure 1-1 for those times when aircraft are arriving and departing in a south direction (71 percent of the time, see Table 2-5). While many variables come into play, average annual delay can also be modeled for existing and possible runway configurations. Figure 1-2 shows that as annual operations increase, the average annual delay could nearly double between 1990 and 2000 (for example, rising from five minutes to nine minutes). It also illustrates that if a new air carrier runway were built (one component of several regional airport system alternatives presented in Section 3.2.2), delays would be held to a lower level (seven minutes) even as average annual operations increase (to 480,000). The average delay figures mask the individual flight delays of over one hour which can be expected during peak travel periods and during bad weather if no action is taken.

1.1.1 The Regional Airport System Plan (RASP) and the FEIS

The proposed action of the Puget Sound Regional Council and the Port of Seattle is to comprehensively address and resolve the commercial air transportation capacity issues. The solution should also acknowledge other community capacity measures.

One of the purposes of the Flight Plan project is to provide input for updating and amending the Regional Airport System Plan (RASP). The RASP is part of the Regional Transportation Plan (RTP) maintained by the Regional Council to meet the near- and long-term transportation needs of the region. The RASP was last amended in 1988. The airport system plan is important not only to the region, but also to the entire Pacific Northwest.

1.1.1.1 What is Flight Plan?

As part of the commercial air transportation capacity planning effort, in 1989 the Puget Sound Council of Governments and the Port of Seattle appointed and co-sponsored a broad advisory committee, the Puget Sound Air Transportation Committee (PSATC). The Committee was a 39-member volunteer group made up of citizens, local and state elected officials, representatives of the business and aviation communities, and environmental interests from King, Snohomish, Pierce, Kitsap and Thurston counties. The PSATC researched air transportation needs, identified a wide range of possible solutions, and developed a PSATC recommendation to the sponsoring agencies. Numerous documents and study products were developed for flight plan (including a draft final report and draft EIS). Those products were used to help develop this FEIS and are hereby incorporated by reference.

The PSATC study products, findings, and recommendations comprise the Flight Plan Project and are hereby incorporated by reference.

The PSATC recommendation was completed and transmitted to the sponsoring agencies on June 17, 1992. The Flight Plan work, of which the PSATC recommendation is a component, provides a long-term planning perspective for addressing capacity requirements and air carrier system capacity thresholds starting with the year 2000 and then well beyond (e.g., 2020 to 2050), with a range of alternative system-level solutions. The PSATC recommendation calls for a multiple airport system which includes a new dependent third runway at Sea-Tac.

In addition to a RASP amendment (in March 1993), the implementation of a commercial air transportation capacity decision will require amendments to the plans of the Port of Seattle and possibly to the master plans of other airport owners/operators (under the possible multiple airport system alternatives). The Flight Plan Project and the PSATC advisory recommendation are input to this regional decision process. The RASP is to be integrated with broader transportation and growth management planning activities now required under recent state and federal legislation. (These are identified and addressed in Section 4.4.6 of this FEIS.) Permit actions will be addressed in the project EISs and are not addressed in this FEIS.

1.1.2 Flight Plan Objectives and Relationships to the Regional Airport System Plan (RASP)

The proposed action of the Puget Sound Regional Council and the Port of Seattle is to comprehensively address and resolve regional commercial air transportation capacity issues. The solution should be a balance between complex and sometimes conflicting community goals such as community character and regional economic vitality. The RASP is one component of the Regional Transportation Plan maintained by the Regional Council, under federal and state statutes. The Flight Plan Project serves as input to possible amendments to the RASP and the RTP. These functional plans, in turn, are part of a broader comprehensive planning program initiated under Washington state's Growth Management Act (GMA). These planning efforts are related to other planning required of the Port of Seattle and other airport operators in the region.

1.1.3 Description of the Flight Plan Final Environmental Impact Statement (FEIS)

The State Environmental Policy Act (SEPA) requires public agencies to consider environmental impacts in making public policy decisions. The specific purpose of this non-project (Programmatic) Final Environmental Impact Statement (FEIS) is to evaluate the regional environmental impacts of various airport system alternatives (see Sections 1.2.1 and 3.0). This will enable regional decision makers to consider environmental issues along with economic, operational, and institutional issues when choosing a solution for our long-term air travel needs.

This is a non-project EIS.

Section 197-11-442 of the Washington Administrative Code (WAC) allows agencies to prepare non-project environmental impact statements (EISs). This is a non-project EIS and part of a phased environmental review process (WAC 197-11-060(5)). According to the SEPA rules (WAC 197-11-774), "'non-project' means actions which are different or broader than a single site-specific project, such as plans, policies, and programs." In other words, non-project studies (also referred to as "programmatic" studies) deal with general solutions or plans rather than specific actions at specific sites. Since Flight Plan was intended to examine general commercial air travel solutions (also called "system alternatives") instead of specific plans at given airport sites, this FEIS is prepared at the non-project (programmatic) level of analysis and represents the first level of study of our region's future air travel needs.

This Flight Plan non-project FEIS must be followed by a second level of specific siting and project-level analyses (e.g., project EISs) and actions by other agencies. One of the project EISs may be prepared jointly for Seattle-Tacoma International Airport by the Federal Aviation Administration (FAA) and the Port of Seattle, under the National Environmental Policy Act (NEPA). Further siting studies and site master plans for other airports may be required.

The likelihood of needing to reevaluate the regional alternatives in site-level studies is minimized since this FEIS retains more than one site option for each of the regional alternatives and for the Sea-Tac Airport component of these alternatives.

What Changes are Reflected in the FEIS?

The FEIS incorporates or refines information presented in the DEIS. Public review comments received at hearings and in writing between January 7, 1992, and March 23, 1992, have influenced the content of this comprehensive FEIS. Responses to comments include refinements and modifications to the presented alternatives, supplemental information and factual corrections.

The refinements and modifications made in this FEIS include:

- An agency "preferred" alternative is not yet identified. Although the PSATC's final recommendations are discussed in Section 1.5 and Appendix A, the purpose of this FEIS is to present and compare system-level alternatives for meeting our forecasted future air travel needs.

- A clear distinction is made between the general level of analysis done for this Flight Plan FEIS and the need for specific analyses to be done in subsequent project-level EISs once a system level alternative has been selected. For example, regionwide air pollution emissions are addressed in this FEIS, but site-level impacts are deferred to the project level.
- A range of capacity actions is presented for Sea-Tac, and multiple site options are considered for supplemental and replacement airports.
- The No Action alternative (Section 3.6) does not include imposed demand management actions, and a more developed demand management alternative has been added (Section 3.2.1).
- Supplemental information is provided on agency decision making (Section 1.2.2), institutional needs (Appendix B), project forecasts (Section2.2), impacts for the years 2000 and 2010 as well as 2020 (parts of Section 4.0), integration with other regional transportation and land-use planning activities (Section 4.4.6), mitigation (summarized in Section 1.3 and presented in Section 4.0), phasing of program elements (Section 3.8), and safety and energy (Sections 4.8 and 4.9, respectively).
- Comments received during the public review process are reproduced in three "Supplements" to this Non-Project FEIS. These comments are responded to by cross-referencing from the letters in the Supplements to the appropriate sections of the FEIS, or by cross-referencing to a set of supplemental responses contained in Appendix E.

1.2 ALTERNATIVES

Air transportation solutions examined in Flight Plan are general in nature and are referred to as "system-level" alternatives. They are designed to represent a range of non-site-specific solutions to the Puget Sound Region's future commercial air transportation needs. Analysis of system alternatives does not address all of the concerns with specific sites or specific site improvements, but represents rather a broad look at the question "What are our choices and how do they compare to one another?" However, in order to evaluate system alternatives, a range of test sites for each must be used. These test sites are referred to in Flight Plan as "site options." Project-level studies to be conducted following Flight Plan will look at the questions of where exactly should we implement a chosen system alternative (other than No Action) and specifically how will it be operated? Section 3.0 identifies the site options used for the System alternatives and Section 4.4 discusses potential airport related impacts.

1.2.1 System Alternatives and Agency Actions

All of the system-level alternatives acknowledge the importance of (a) demand management, (b) mitigation, and (c) timing, phasing and implementation of a selected regional airport system configuration decision, and institutional tools. The demand management alternative is listed as part the Broad System Management alternative and is addressed in Section 3.2.1. Some demand management strategies would be included in any future regional course of action. Possible mitigation actions are consolidated in Section 1.3. Timing, phasing, and institutional needs are addressed in Appendix B and 3.8.3.

The system-level alternative airport configurations are:

- **Sea-Tac Airport Capacity Enhancement Measures.**

  1) **Sea-Tac with Broad System Management:** This is an alternative that attempts to meet our region's future travel needs without building any new runways. It includes the use of demand management, new technologies, and high-speed rail (upgraded Amtrak, high-speed rail or magnetic levitation trains).

  2) **Sea-Tac with a new dependent third runway:** This runway would be able to accommodate both landings and takeoffs of commuter and jet aircraft.

  3) **Sea-Tac in conjunction with a remote airport:** A remote airport is a second airport such as Boeing Field or Moses Lake (Grant County Airport) that would be functionally linked and operated in tandem with Sea-Tac. (It would not be oriented toward local origin and destination traffic, as is the case with the supplemental airports in the Multiple Airport System alternatives.)

- **Two-Airport Multiple Airport System:** One supplemental passenger-service airport would either be located to the north or south of Sea-Tac. Sea-Tac would either retain its current airfield configuration or would be expanded.

- **Three-Airport Multiple Airport System:** Two supplemental passenger-service airports, one located north of Sea-Tac and one located south of Sea-Tac, would be developed. Sea-Tac would either retain its current airfield configuration or would be expanded.

- **Replacement Airport:** Sea-Tac Airport would be closed and a new, larger airport with three runways would be constructed in a new location.

- **No Action:** Sea-Tac would continue to be the region's only passenger-service airport. No capacity improvements related to commercial passenger service would be made to any Puget Sound area airports.

The PSATC recommended a phased three-airport multiple airport system including a dependent third runway at Sea-Tac. The importance of demand management and mitigation was researched and acknowledged, but not detailed in the final recommendation. This FEIS adds additional information on demand management and mitigation. The PSATC assumed that demand management and mitigation would be part of any alternative selected. The PSATC was also concerned with both the limited bad weather arrival capacity at Sea-Tac now, and the forecasted long-term operational needs of the region. See Section 1.5 and Appendix A.

1.2.2 Decisions by Public Agencies

A regional airport system will involve many interrelated actions by public agencies. The presentation of agency decisions, required in EISs, is very involved. An integrated decision calendar is provided in Section 4.4.6. An analysis of the consequences of only partially implementing any of the possible regional alternatives is presented in Section 3.8. If inability to implement all of a selected alternative results in a need to select a different regional alternative, this FEIS would be reviewed, augmented with an addendum or a supplement if necessary, and then used in making a second regional selection.

In summary, current statutes and authorities are adequate for public agencies to jointly accomplish the siting and operational elements of a regional air transportation package. However, if all of the affected agencies are not willing to jointly implement a regional alternative, this is not likely to occur. The Regional Council is scheduled to take action in March 1993 on an amendment to the 1988 Regional Airport System Plan (RASP). A complete presentation of public agency decisions and institutional needs is presented in Appendix B.

1.3 TRADEOFFS/ENVIRONMENTAL IMPACTS/POSSIBLE MITIGATION MEASURES

The environmental impacts of the system alternatives are summarized below and in Table 1-1. More detailed analyses for each topic is presented in the corresponding parts of Section 4 of this FEIS. A discussion of the tradeoffs and potential mitigation measures for the impacts follows. The goal of mitigation is to hold impacts to a minimum, rectify adverse impacts, reduce impacts over time, or in some way compensate for impacts. It is important to note that negative environmental impacts cannot always be mitigated. Site-specific EISs may reveal such impacts, with the result that a site or sites could be discarded as an alternative for air carrier capacity.

The Regional Council intends to identify the most appropriate and effective mitigation and abatement actions that might be addressed at the regional level, and how the actions might vary among the regional alternatives. This is scheduled to be done prior to the March 1993 action date mentioned in the cover letter to this FEIS and presented in Section 4.4.6.

- Noise: In all cases, modeling indicates that the use of quieter Stage 3 aircraft by the year 2000 will result in declining average daily nose levels over Sea-Tac. Supplemental Airport sites impact the fewest number of residents with moderately loud noise. However, the supplemental sites expose large numbers of people to new aircraft noise.

- Air Quality: Aircraft emissions are highest for alternatives that rely on existing capacity at Sea-Tac since aircraft delays result in higher levels of emissions. Alternatives that allow the airport to operate more efficiently reduce emissions. Vehicle emissions are least for those alternatives that reduce travel distance to airport sites.

- Transportation: Vehicle miles of travel are lower for alternatives that have airport sites that are closer to the users and are higher for alternatives that are more remote. Correspondingly, air quality and traffic impacts are generally lower for the close-in sites and higher for the more remote sites.

- Land Use/Natural Environment: The most significant land use impacts result from construction of new facilities or closure of existing facilities. Impacts to the natural environment are greater at undeveloped sites than at existing airports.

    - Construction of a new dependent runway at Sea-Tac ;would displace populations in neighborhoods immediately west of the airport.

I-1 ... (Year ...)*

ALTERNATIVE	NOISE (Section 4.1)	AIR QUALITY (Section 4.2)	SURFACE TRANSPORTATION (Section 4.3)	LAND USE (Section 4.4)	PUBLIC SERVICES AND UTILITIES (Section 4.5)	NATURAL ENVIRONMENT (Section 4.6)
Million Annual Passengers & Total Operations [Figures for supplemental & remote airport site options are commercial operations only]	Total affected population in thousands**	Total aircraft & vehicle emissions (tns/day). [Vehicular emissions % of regional vehicle emissions]	Daily Passenger-Miles & Peak-Hour Passenger			
NO ACTION 35.8 MAP 460,000 operations	55 LDN = 175 65 LDN = 25 80 SEL = 120	CO = 36 NOx = 8.7 HC = 7.8 [CO = 1.3 %] [NOx = 1.5 %] [HC = 1.4%]	DPM = 1.54 million PHP = 5,600	No significant changes to community character and no direct displacement of homes. Additional commercial and light industrial growth may occur as passenger levels increase.	All public services would require some expansion due to increased direct and induced activity levels. Impacts are not signficant and could likely be accommodated in capital improvement plans.	No direct impacts to wetlands, vegetation or wildlife.
SEA-TAC AIRPORT w/ System Mgmt (Demand management, high-speed ground, and new technologies) 38.0 MAP 380,000 operations	55 LDN = 135 65 LDN = 12 80 SEL = 120	CO = 25 NOx = 6.5 HC = 4.6 [CO = 1.3 - 1.4 %] [NOx = 1.5 - 1.6 %] [HC = 1.4 - 1.5 %]	Passenger miles and peak-hour passengers less than "w/ New Dependent Runway" option, but greater than "No Action" (passenger miles needed to access high-speed rail not included).	Impacts similar to "No Action."	Impacts similar to "No Action."	No direct impacts to wetlands, vegetation or wildlife.
w/ New Dependent Runway 41.8 MAP 480,000 operations	55 LDN = 162 65 LDN = 22 80 SEL = 120	CO = 26 NOx = 8.1 HC = 4.5 [CO = 1.3 - 1.4 %] [NOx = 1.5 - 1.6 %] [HC = 1.4 - 1.5 %]	DPM = 1.68 million PHP = 6,600	Approximately 230 or more homes displaced. Additional commercial and light industrial growth may occur as passenger levels increase.	Impacts similar to "No Action."	Some loss of wetlands and shrub-land habitat. Potential moderate encroachment into Miller Creek floodway.

* For year 2000 and 2010 environmental impacts, please see the referenced sections of this FEIS.

** LDN is the 24-hour, time-weighted annual average noise level. SEL is the Sound Exposure Level of an individual aircraft overflight.

NOTE: Mitigation measures are summarized in Section 1.3 and are discussed throughout Section 4.0.

ALTERNATIVE	NOISE	AIR QUALITY	SURFACE TRANSPORTATION	LAND USE	PUBLIC SERVICES AND UTILITIES	NATURAL ENVIRONMENT
w/ Remote Airport *Sea-Tac* 32 MAP 380,000 operations *Remote* 13 MAP 144,000 operations	*Sea-Tac* Impacts similar to lower end of "2-Airport System." *Remote* Impacts depend on types of aircraft in operation.	*Sea-Tac* Impacts similar to lower end of "2-Airport System." *Remote* Impacts depend on types of aircraft in operation.	*Sea-Tac* Impacts similar to lower end of "2-Airport System." *Remote* Impacts depend on amount of locally-generated origin and destination passengers. Ground link to Moses Lake would also cause impacts.	*Sea-Tac* Impacts similar to "No Action." *Remote* Community character could be significantly changed at Moses Lake. No character change at Boeing Field. No direct displace-ment of homes anticipated at either site.	*Sea-Tac* Impacts similar to "No Action." *Remote* Additional services necessary at Moses Lake. Services could be expanded at Boeing Field without significant impacts.	*Sea-Tac* Impacts similar to "No Action." *Remote* Conflicts may exist with waterfowl at Moses Lake. No significant impacts to natural environment at Boeing Field.
2-AIRPORT SYSTEM *[System impacts shown at right; site option impacts are shown below. Note: system ranges are not a direct sum of each range below.]*	55 LDN = 139 - 181 65 LDN = 12.1 - 20.2 80 SEL = 129 - 213	CO = 25 - 39 NOx = 7.3 - 9.8 HC = 4.8 - 6.4 [CO = 1.2 - 2.2 %] [NOx = 1.4 - 2.7 %] [HC = 1.4 - 2.6%]	DPM = 1.9 - 2.17 million			
Sea-Tac 32 - 41.8 MAP 380,000 - 480,000 operations *Supplemental* 3.2 - 13 MAP 33,000 - 271,000 operations	*Sea-Tac* 55 LDN = 135 - 137 65 LDN = 12 - 15 80 SEL = 120 - 121 *Supplemental* 55 LDN = 4 - 39 65 LDN = 0 - 2 80 SEL = 9 - 81 Noise impacts lower for outlying sites.		*Sea-Tac* DPM = .97 - 1.91 million PHP = 3,900 - 6,200 *Supplemental* DPM = .12 - 1.20 million PHP = 700 - 3,000	*Sea-Tac* Impacts similar to "No Action" or " w/ New Dependent Runway" depending on configuration chosen. *Supplemental* Impacts greater at undeveloped sites than at existing airports. Specific impacts vary by site, but are greater for 2 runway options than for 1 runway options.	*Sea-Tac* Impacts similar to "No Action" or " w/ New Dependent Runway" depending on configuration chosen. *Supplemental* Impacts greater at undeveloped sites than at existing airports. Specific impacts vary by site.	*Sea-Tac* Impacts similar to "No Action" or " w/ New Dependent Runway" depending on configuration chosen. *Supplemental* Impacts greater at undeveloped sites than at existing airports. Specific impacts vary by site, but are greater for 2 runway options than for 1 runway options.

ALTERNATIVE	NOISE	AIR QUALITY	SURFACE TRANSPORTATION	LAND USE	PUBLIC SERVICES AND UTILITIES	NATURAL ENVIRONMENT
3-AIRPORT SYSTEM *[System impacts shown at right; site option impacts are shown below. Note: system ranges are not a direct sum of each range below.]*	55 LDN = 149 - 180 65 LDN = 12.3 - 19.1 80 SEL = 164 - 252	CO = 23 - 32 NOx = 7.2 - 8.5 HC = 4.1 - 5.6 [CO = 1.1 - 1.7 %] [NOx = 1.3 - 2.0%] [HC = 1.2 - 1.7 %]	DPM = 1.51 - 2.05 million			
Sea-Tac 32 - 41.5 MAP 380,000 - 477,000 operations	*Sea-Tac* 55 LDN = 135 - 137 65 LDN = 12 - 15 80 SEL = 120 - 121		*Sea-Tac* DPM = .97 - 1.45 million PHP = 3,900 - 5,400	*Sea-Tac* Impacts similar to "No Action" or " w/ New Dependent Runway" depending on configuration chosen.	*Sea-Tac* Impacts similar to "No Action" or " w/ New Dependent Runway" depending on configuration chosen.	*Sea-Tac* Impacts similar to "No Action" or " w/ New Dependent Runway" depending on configuration chosen.
North Supplemental 2.2 - 7.6 MAP 35,000 - 210,000 operations	*North Supplemental* 55 LDN = 4 - 24 65 LDN = 0 - 1 80 SEL = 36 - 67 Noise impacts lower for outlying sites.		*North Supplemental* DPM = .15 - .51 million PHP = 800 - 1,600	*North Supplemental* Specific impacts vary by site, but are greater for 2 runway options than for 1 runway options.	*North Supplemental* Specific impacts vary by site.	*North Supplemental* Specific impacts vary by site, but are greater for 2 runway options than for 1 runway options.
South Supplemental 1.3 - 7.1 MAP 151,000 - 211,000 operations	*South Supplemental* 55 LDN = 1 -21 65 LDN = 0 - 1 80 SEL = 9 - 53		*South Supplemental* DPM = .15 - .57 million PHP = 800 - 1,600	*South Supplemental* Same as North Supplemental. Impacts greater at undeveloped sites than at existing airports.	*South Supplemental* Same as North Supplemental. Impacts greater at undeveloped sites than at existing airports.	*South Supplemental* Same as North Supplemental. Impacts greater at undeveloped sites than at existing airports.
REPLACEMENT AIRPORT 45 MAP 524,000 operations	55 LDN = 81 - 101 65 LDN = 3.8 - 4.7 80 SEL = 86 - 108	CO = 59 NOx = 14.1 HC = 8.3 [CO = 4.0%] [NOx = 4.9%] [HC = 4.6%]	DPM = 5.10 million PHP = 6,900	Significant decline in viability of commercial and light industrial uses could occur around Sea-Tac, depending on how it is redeveloped. Changes in land use at the replacement site would be very significant (including displacement of homes).	Substantial development of new or greatly expanded public services and utility infrastructure would be required.	Large impacts to wetlands, vegetation, and wildlife due to development of relatively undisturbed sites.

EARTH:
(Section 4.7)

Earth impacts are site dependent. All of the site options examined appear to have suitable soils for airport construction. The Replacement Airport alternative would require the largest amount of cut and fill, Sea-Tac with a new dependent runway would require a large, but lesser amount of imported fill, and one runway supplemental airports would require the least.

ENERGY:
(Section 4.8)

There are no significant differences between the alternatives in terms of energy consumption. The primary consideration relates to the differences in vehicle miles traveled (passenger miles under transportation above).

PUBLIC SAFETY:
(Section 4.9)

There are no significant differences in public safety among the alternatives presented above.

- Construction of a replacement airport would result in significant land use changes at the replacement site, and displacement of population.
- Closure of Sea-Tac would have a severe negative impact in the near term on the businesses around Sea-Tac.
- The use of Moses Lake would result in significant changes in community character.
- A replacement airport would result in large impacts to wetlands, vegetation, and wildlife due to development of relatively undisturbed sites.

1.3.1 Noise

Tradeoffs

One of the most significant conclusions of the noise analysis is that improved technology is making aircraft quieter. The Federal Government has mandated that older, noisier "Stage 2" aircraft will not be allowed to operate in the U.S. after the year 2003. Beyond this, the Mediated Noise Agreement in effect at Sea-Tac Airport sets a schedule for phase-out of Stage 2 aircraft by 2001. As more Stage 2 aircraft are replaced with the quieter Stage 3 type, the noise impacts from single airplane flyovers and noise measured on an average daily basis will be reduced. Maps of impacted areas are shown in Appendix C.

The noise analysis in this FEIS uses several measures in addition to the federally recognized 65 Ldn (day-night noise level). The 65 Ldn contour represents a compromise between noise impacts and mitigation costs.

Dispersal of airplane flight paths to new airports spreads noise from airplane flyovers over an increased population, in exchange for improved system operational capacity and efficiency. The year 2020 population within the 65 Ldn noise contour is greatest under No Action (25,000). The number within the more inclusive 55 Ldn contour could be 175,000 under No Action, and between 135,000 and 181,000 under the other alternatives. The number within the 80 sound exposure level (SEL) is 120,000 with No Action, and between 120,000 and 252,000 under the other alternatives. The locations of impacts vary with each alternative. (For the definition of Ldn and SEL, please refer to Section 4.1 and the Glossary.)

Noise impacts from Flight Plan actions could combine with ground noise or other factors at some sites. This is not included in the results of aircraft noise simulation models reported in this non-project FEIS. For example, in south King County and in Pierce County, the flight paths in and out of Sea-Tac interact with military operations at McChord by confining the military flights to lower altitudes. Also, at Sea-Tac Airport, noise from a possible third runway could be 1700 feet closer to residential communities west of the airport than is now the case.

Potential Regional and Site Specific Actions

- Continue implementation of the 1990 Noise Mediation Program at Seattle-Tacoma International Airport to achieve 100 percent Stage 3 aircraft by 2001 but also protect other reliever airport sites in the region.

- Amend the FAA Four-Post Plan (this Plan mandates a four-cornered pattern of airplane arrival and departure routes and climb rates for Sea-Tac Airport) in order to minimize low-altitude overflights of residential areas. Regional cooperation would be required, beginning with a collective recommendation to the FAA submitted through the Regional Council. (Regional Council, FAA)

- Accelerate and fund implementation of multifaceted noise mitigation, supported all or in part by current funding sources such as Passenger Facility Charges (PFCs). PFCs are a federally authorized surcharge that can be added to the cost of individual airplane tickets; See Appendix B.) This is a complex issue involving the Airport Noise and Capacity Act of 1990, the Federal Aviation Regulations (FAR) Part 150 Noise Control Program, reviewing noise mediation and compensation area boundaries, and limiting the encroachment of local land uses into impacted areas. (FAA, Port of Seattle and adjacent communities)

- Develop regionally consistent operational restrictions (e.g., affecting types of aircraft, late night operations, takeoff and climb-out procedures, steeper descents prior to final approaches, rolling takeoffs during late hours, preferential use of runways, and cumulative flight and ground noise). (FAA and airport operators)

  (Note: The noise analysis in Appendix C assumes local controls at the Supplemental airport sites. Long Beach and John Wayne Airports in California are two present examples. Noise limitations result in a larger assumed aircraft passenger load, and reduce the number of flights by approximately 30 percent.)

- Implement new technology such as Microwave Landing Systems (MLS) and possibly Global Positioning Systems (GPS) which might allow curved flight tracks and water approaches at Sea-Tac with improved accuracy and safety. The Flight Track Management System (FTMS) is operational, but is dependent upon equipment located on the airplane. The Airport Noise Operation and Management System (ANOMS) will improve airport noise enforcement capabilities. A test MLS project is currently under consideration for implementation at Sea-Tac in accordance with the noise mediation program.

- Install additional noise monitoring equipment off the airport sites, to verify information developed indirectly through modeling. Consider measured impacts as a basis for working with impacted communities. (Airport operators)

1.3.2 Air Quality

Tradeoffs

Under the different alternatives, ground transportation emissions in 2020 would be a small share of the regional total (1.8 to 2.5 percent of carbon monoxide, 3.4 to 8.1 percent of nitrogen oxides, and 3.1 to 6.9 percent of hydrocarbons). Dispersal of some ground traffic to supplemental airport sites results in fewer air pollution emissions at the regional level than if Sea-Tac remains the only passenger service airport. Site-level analysis will focus more on the local level and localized congestion, and the project-specific air quality requirements of the federal and state Clean Air Acts. Pollutant emissions rise dramatically as travel speeds decline.

Demand management steps that increase airline efficiency (average airplane capacity and load factors) and improved airport capacity moderate the increase in air pollutants from aircraft. Improved aircraft engines (Stage 3) dramatically reduce pollutants on a per aircraft basis from earlier technologies.

Potential Regional and Site-Specific Actions

- Implement federal statutes (the 1991 Intermodal Surface Transportation Efficiency Act--ISTEA, the 1990 Clean Air Act Amendments, and the Washington State Clean Air Act). Include airport surface transportation and access plans in the air quality State Implementation Plan, thereby ensuring that aviation capacity is not overlooked. (Regional Council, local governments and state agencies)

- Reduce aircraft delays and excessive idle/taxi times by controlling landing and departure times, utilizing "gate hold" procedures, and other steps to be identified and reviewed at the site level. (FAA, airport operators)

- Improve surface transportation network providing access to airport facilities. (Regional Council, local governments and state agencies)

- Select a regional airport system that minimizes automobile trip length and congestion.

1.3.3 Transportation

Tradeoffs

Unless the goal of greater urban densities includes very serious efforts to alter travel behavior and upgrade existing facilities, the accessibility of all urban services, including airports, will continue to deteriorate. In this case the supplemental airport sites offer a tradeoff between convenient airport locations for local service and resulting noise events beyond those otherwise experienced in the areas served (e.g., ground noise from the TRAMCO airplane maintenance facilities at Paine Field).

Ground transportation to the airports may account for 2 to 5 percent of total ground transportation in the region and a much larger share of peak travel near the airport(s).

Overall regional passenger mileage is the least for the multiple airport systems. This advantage is gained at the cost of greater local congestion, particularly at Sea-Tac and in the urban areas containing candidate supplemental airport facilities. This is among the issues to be detailed in the site-level studies called for by this FEIS.

The replacement alternative imposes the greatest ground mileage requirement, but avoids adding to congestion at airport sites in urban areas and reduces activity at the present Sea-

Tac location. The system management alternative offers the potential to substitute High-Speed Ground Transportation in place of some short-haul flights, probably north and south to Portland and to Vancouver, B.C., but its huge capital costs and the amount of traffic that could be served raises questions about its viability.

Potential Regional and Site-Specific Actions

- Through ISTEA, coordinate ground access for the selected alternative with High-Speed Ground Transportation (HSGT) (possibly over the long term), local rapid transit and (with local governments) GMA land-use actions. In this region, this includes, for air quality purposes, a Congestion Management System to be accomplished by the Regional Council, the state, and transit operators. (Regional Council, state Department of Transportation)

- Continue to implement broad transportation-system-management and transportation-demand-management programs within the region. (Employers and local governments)

- Work to expand and improve service presently provided by airport buses, transit buses, taxis, shuttles and limousines serving the region's airport(s), and aggressively examine the merits of remote passenger check-in terminals. (Port of Seattle, airport operators, private transportation companies)

- Assign high priority (in the Regional Transportation Plan and its funding elements, and state plans) to funding of airport-access facilities, and generally to local facilities impacted by siting of commercial airport services. (Regional Council, state Department of Transportation)

1.3.4 Land Use

Tradeoffs

The major land-use tradeoff is between the protection of widespread residential communities from aircraft noise at existing sites and the protection of sparsely developed areas outside of the urban growth areas from new airport development. Depending upon severity, aircraft noise from flyovers might contribute to pressures for residential development at the urban fringe because of land removed from residential development adjacent to the urbanized airport sites.

Secondary tradeoffs involve impacts on alternative sites within the developed parts of the region, specifically between Sea-Tac and supplemental airport sites, and between alternative supplemental sites north and south of Sea-Tac, respectively. Supplemental airport sites can serve as additional centers within the VISION 2020 regional growth strategy. The Growth Management Act does allow for new fully contained communities outside the initially designated urban growth boundary, provided that the respective county has established a process for reviewing proposals and that the proposal meets certain criteria.

The land-use impacts involve induced activities near existing or new airport sites, changes in property values for residential and other land uses, and the relationship between airport siting decisions and broader planning required by the state Growth Management Act. The greatest number of homes directly affected (acquired) occurs under the replacement alternative site options in Pierce County, and to a lesser degree, at Sea-Tac Airport in those alternatives involving a third runway. Total reduction in residential property values can be calculated in site-level studies, using methods in information begun in this non-project FEIS.

Potential Regional and Site-Specific Actions

- Develop and implement a regional policy on relocation assistance and compensation for areas directly displaced or subject to noise impacts, consistent with FAA guidelines. Non-federal agencies also have the latitude to go beyond what is funded under federal programs (i.e., mitigation within the 65 Ldn contour). (FAA, Regional Council, and airport operators)
- Encourage compatible land-use planning and regulation for areas subject to noise and transportation system impacts over the long term. Where appropriate, local governments can adjust local permitting in light of already existing noise impacts. (Countywide GMA planning)
- Directly address the issue of offensive and incompatible land uses and activities in areas adjacent to airports. (Countywide GMA planning policies, state legislation)
- Help finance, through FAR Part 150 and other sources, school sound insulation at least within the 65 Ldn contour, and purchase aviation easements from existing incompatible land uses. (Airport operators, local jurisdictions, and school districts)
- Work toward a comprehensive regional noise management program addressing traditional noise contours and flight track single-event noise. (FAA, Regional Council, and airport operators)
- Directly address airport siting in GMA countywide and multi-county planning policies. (Local governments)

1.3.5 Public Services, Utilities and Schools

The local infrastructure costs of growth are a topic to be systematically addressed as part of local comprehensive planning requirements under the GMA and project-level airport EISs. This FEIS is not required to provide a benefit/cost analysis for meeting the objectives of Flight Plan. General information on impacts is provided.

Tradeoffs/Environmental Impacts

The major concern is impacts at the site level. This analysis is deferred. The range of site options includes urban and relatively rural locations.

Potential Regional and Site-Specific Actions

- Local plans done under the GMA must meet statutory concurrency requirements of provision of services. (Local governments)
- Through state legislation, earmark some state-level revenues generated by statewide air travel capacity (involving siting of facilities of regional and statewide significance) to help local governments meet their concurrency requirements under the GMA. (Counties and the state)

- Include airport-related needs in the capital elements of plans done under the GMA, and possibly in the six-year capital element required of the state Office of Financial Management.

- For noise impacts on schools, please see Sections 4.1.2.1 and 4.1.2.6.

1.3.6 Natural Environment

The natural environment includes two categories of resources. These are wetlands and water, and plants and animals.

Tradeoffs/Environmental Impacts

The primary natural environment tradeoffs involve reducing the impact to undisturbed areas by developing airport facilities within the existing urban area. Although natural environment impacts may be reduced by doing this, impacts to humans in the form of noise and air pollution may be increased.

Potential Regional and Site-Specific Actions

- Deal with important site issues at the site level. Address hazardous waste and solid waste management concerns. Proper timing of construction activities might reduce direct wildlife impacts. Site clearing and grading should not be done during the spring and early summer. And for sites with threatened or endangered species of plants and animals, additional site specific biological assessment and mitigation work would be necessary. (Airport operators, local governments)

- Selection of sites that are already developed or otherwise disturbed would reduce the extent of natural habitat that would be lost.

- Within any given site option, the actual layout of the facilities could be planned to avoid the most valuable wildlife habitats. In particular, wooded areas and wetlands should be left undisturbed to the extent possible.

- Develop in VISION 2020 a regional natural systems element that is supportive of local comprehensive plans. (Local governments working through the Regional Council)

- Review water quality issues at the site level. (U.S. Fish and Wildlife Service, Ecology, Corps of Engineers)

- At the site level, address runoff volume and quality, and groundwater protection, in drainage plans. (Airport operators, local governments)

1.3.7 Earth

Tradeoffs/Environmental Impacts

A major concern to be addressed at the site level is the impact of earth preparation (cut and fill), both on natural systems and on local traffic. The Sea-Tac site requires the transport of a large amount of fill to the site if a third runway option component is part of the selected regional alternative. The replacement airport site involves the largest amount of site preparation (on-site cut and fill).

Potential Regional and Site-Specific Actions

Mitigation measures of impacts to earth movement will be addressed at the site level.

1.3.8 Energy

Energy consumption per capita varies between modes of transportation, but is comparable. Fuel prices influence choices between transportation systems and how much they are used. In addition, airport and air system management alternatives entail differences in energy consumption due to idling times on the ground and delays in the air.

Tradeoffs

Based on mileage, energy consumption traveling to and from the airport(s) is least for the multiple airport systems. However, the share that this energy saving is of total energy consumption for all ground travel in the region is insignificant. The replacement airport alternative is the most energy intensive due to the greater average travel distance involved.

The possibly significant energy tradeoff over the long term is between modes of transportation. These are High Capacity Transit (HCT), local rapid transit in the urban region, High-Speed Ground Transportation (HSGT) in major state corridors, and the private automobile. Energy efficiency is improving in all categories. Tradeoffs are also involved between different kinds of energy sources. It is beyond the scope of this air carrier FEIS to document these relationships between different modes of transportation. As planning evolves, this may be a task to be assigned to the state Energy Office.

Potential Regional and Site-Specific Actions

- Implement new mandated federal and state transportation planning requirements. (Regional Council and local governments)
- Implement the multimodal aspects of the federal ISTEA legislation. (Regional Council, the state, and local governments)
- Work toward greater airport capacity and efficiency of operations, and continue to develop multimodal passenger and cargo handling capabilities. (Port of Seattle)

1.3.9 Public Safety

Safety trends are improving yearly for air carrier and commuter aircraft. Accidents are due to several causes. Safety data are not significant in ranking regional airport system alternatives. Airspace reconfiguration (related to safety) is addressed as part of Sections 1.3.10 and 4.10. The No Action alternative does reduce the margin of safety as flights increase in number.

Tradeoffs/Environmental Impacts

Air travel safety is improving every year for both commuter and jet aircraft. Safety actions involve personnel, technology and operations. Improved navigational and airplane equipment can increase the capacity of existing facilities. Mitigation of some alternatives involves moderate reconfiguration of airspace, depending upon the system plan selected. The FAA 1990 Four-Post Plan--which can be amended--trades improved efficiency (involving safety) for a widened dispersal of flight track noise over the region. This arrival and departure pattern was put in place by the FAA and addressed in a federal Environmental Assessment.

Potential Regional and Site-Specific Actions

Safety will be addressed in the project-level studies; e.g., height clearances of surrounding buildings. A variety of improvements nationally and locally are evident in training, equipment, and procedures. See also Section 1.3.10.

1.3.10 Airspace Management and General Aviation

Following selection of a regional airport system alternative, regional airspace can be modified to accommodate this action and to provide mitigation. Additionally, general aviation needs can be addressed.

Tradeoffs/Environmental Impacts

A broad regional task force should be formed to systematically resolve airspace issues within the region. Key issues include the interaction between possible multiple airports, the interactions with military and with general aviation, and noise impacts.

Potential Regional and Site-Specific Mitigation Actions

- Convene local governments, the general aviation community and the public to refine the general aviation element of the Regional Airport System Plan. (Regional Council, Federal Aviation Administration)
- Limit practice Instrument Flight Rules (IFR) approaches by general aviation aircraft during peak IFR traffic periods. Divert practice IFR approaches to relief airports located outside of heavy air traffic areas. (The adopted 1988 Regional Airport System Plan recommends these actions, consistent with local airport master plans.)
- Continue to give priority to air carrier IFR operations over general aviation and commuter service during peak periods in heavily used airspace.
- Work toward the regional consensus necessary to distribute regional air traffic including traffic from military operations. This might moderate net noise impacts as air carrier service increases in the region. (For example, relocation of the National Guard unit from Paine Field to either Whidbey Island Naval Air Station or Fort Lewis, co-location and operation of smaller Air Force planes at Fort Lewis, and limiting C-141 touch-and-go training to Moses Lake.)

1.4 PUBLIC PARTICIPATION AND REVIEW PROCESS

The Flight Plan Project public review process included informational steps and a formal public review process. The formal process applied to both the draft proposal of the PSATC and the non-project DEIS of the sponsoring agencies. The informational steps included a newspaper supplement distributed through 15 newspapers in the greater Puget Sound region, newsletters, slide shows, briefings, press releases and media contacts, focus groups, public opinion surveys, and the use of a full-time public involvement coordinator. Open houses and scoping meetings were held in November of 1990.

Following the selection of a PSATC draft preferred alternative (4 December 1991), the public review process involved eleven formal public hearings and receipt of written public comments during an extended 75-day public review period (7 January 1992 through 23 March 1992). The most frequent comments are reflected in the revised format and content of this FEIS. Over 2,100 written comments were received and nearly 650 people gave verbal testimony. All of the written comments and verbatim transcripts of the hearings are reproduced in three "Supplements" to this FEIS. "Supplement 1" contains comments and hearings from Snohomish and Island Counties, "Supplement 2" contains comments and hearings from King County and areas outside the Puget Sound region, as well as comments from state agencies, and "Supplement 3" contains comments and hearings from Pierce, Kitsap, and Thurston Counties.

Issues raised in the comments on the DEIS and the PSATC's draft recommendations are responded to in one of three ways: 1) by cross-referencing from the letters in the comment Supplements to the appropriate section of the FEIS which addresses the concern, 2) by cross-referencing to a set of specific supplemental responses which are presented in Appendix E, or 3) with the note "comment acknowledged."

The public also has the opportunity to broadly address air carrier issues and other related growth management issues in the public review processes established in each county under the GMA. Future planning processes of the Regional Council--including amendment of the Regional Airport System Plan (RASP)--also will involve further public participation.

The Regional Council provides a process for requesting the Responsible Official to reconsider the adequacy of this FEIS. The process is optional. Failure to use it does not preclude use of any other appeal rights. But using the process does improve the ability of the Regional Council and ultimately the entire community, to make the best decision possible based on the best information available.

A request for reconsideration must be received by the Regional Council within thirty days of the issuance of this FEIS. The request will be considered either by the Responsible Official or, at his or her option, by a Hearing Examiner who shall make recommendations to the Responsible Official. The process is further set out in PSRC's SEPA Resolution Section 18(6).

A judicial challenge to the adequacy of the FEIS must be commenced within ninety days of the second newspaper notification of a "Notice of Action Taken". Amendment of the Regional Airport System Plan by the Regional Council would prompt the publication of a "Notice of Action Taken."

State law also provides for judicial challenges to the substantive decisions made under authority granted by SEPA. Appeals regarding the use of SEPA's substantive authority must be filed within this same 90 day period.

If significant new information about the proposal or its impacts becomes available, a supplemental EIS may be required. See WAC 197-11-600(3)(b). If a person believes that a supplemental EIS is required, the person has an obligation to inform the Responsible Official and give him or her a chance to consider the request. See PSRC SEPA Resolution Section 18(7) for the procedures for requesting a supplemental EIS. Failure to use this administrative process for requesting a supplemental EIS may preclude the right to bring a judicial appeal on the issue.

1.5 PUGET SOUND AIR TRANSPORTATION COMMITTEE (PSATC) FINDINGS AND RECOMMENDATIONS

The Puget Sound Air Transportation Committee (PSATC) devoted two-and-one-half years of study and extensive public review to the region's commercial air transportation needs. They developed a mission statement, reviewed alternatives, and prepared a final recommendation. Documentation of their work is provided in three reports cited throughout this FEIS: Phase I: Forecasts (July 1990), Phase II: Development of Alternatives (June 1991), and the Phase III: Draft Final Report (January 1992). The Draft Final Report included several appendices documenting the PSATC decision criteria. One of these appendices was the agency DEIS.

This section presents the PSATC vision statement, recommendations and findings. The complete statement of PSATC Findings and Recommendations is included as Appendix A. The reader is encouraged to read Appendix A for a thorough discussion of PSATC findings.

1.5.1 Vision Statement

The Flight Plan vision statement identified a broad range of PSATC goals. The PSATC Vision Statement was approved by the sponsoring agencies. The summary reads as follows:

We have an integrated air, land, and sea transportation system that will serve the region's travel worldwide to the year 2050 and thereafter. The transportation system enhances the livability and environmental integrity of the Pacific Northwest, is convenient and accessible to its users, promotes the economic vitality of the state, and serves as a gateway to all domestic and world markets. This transportation system is recognized worldwide as a leading model of transportation development.

1.5.2 Final Recommendation

The PSATC final recommendation of 17 June 1992 is summarized as follows:

Whereas, the complete work of the PSATC stresses the region's need to prepare to meet future demand and acknowledges the importance of:

(a) reasonable demand management techniques,

(b) mitigation measures,

(c) phasing of regional and site-specific decisions and actions addressing airport operational capacity and the impact and benefits to the served community;

Now therefore be it resolved, that the Puget Sound Air Transportation Committee has completed its deliberations; and hereby transmits its findings and recommendations to the

Puget Sound Regional Council and the Port of Seattle, calling for the phased implementation of a Multiple Airport System including the addition of:

- a dependent air carrier runway at Seattle-Tacoma International Airport before the year 2000, and
- the introduction of scheduled air carrier service to Paine Field before the year 2000, and
- the identification of a two-runway supplemental airport site in Pierce County for development by the year 2010 in collaboration with the military, and failing that, the identification of a suitable location in Thurston County.

During its two-and-one-half years of work, the PSATC developed and examined the alternatives presented in this FEIS (See Section 3.0). Variations of the Multiple Airport System alternatives reflected in this FEIS are narrowed from the longer list studied by the PSATC. The alternative recommended by PSATC is one option within the "Three Airport System" alternative. Differences between the presentation of regional alternatives in this FEIS and the earlier DEIS are identified in Section 1.1.3.

1.5.3 Findings Relative to the Other Alternatives

The PSATC evaluated their final recommendation and compared it to the other alternatives. The evaluation in Appendix A considers operational, economic, and environmental factors. With regard to the recommended alternative, the PSATC discussion highlights three criteria: environmental quality and livability, regional economic vitality, and integrated transportation systems (all components of the PSATC vision statement).

The alternatives comparison focuses on several evaluation points reviewed by the PSATC during the entire Flight Plan Project. Much of their work was assisted by expert panels convened specifically to address economic factors, demand management, forecasting and institutional issues. Perspectives developed by the PSATC are indicated here, but should be read in their entirety (Appendix A).

- The No Action alternative results in increasing airline delays and declining service as passenger levels continue to rise, and will hurt the region economically. Air quality and noise impacts (within the federally recognized mitigation boundaries) are also worse under No Action than under several of the other alternatives.
- The PSATC concluded that demand management is a short-term strategy, and that it does not add to current capacity. Similarly, high speed ground transportation (a component of the Broad System Management alternative, together with demand management and improved airplane and airport technology) would not address the major share of forecasted air passenger demand and also involves very high capital costs.
- Construction of a third runway at Sea-Tac, by itself, would not be able to meet the capacity needs of our region to the year 2020. Sea-Tac operated in conjunction with a remote airport is either impractical or very costly, depending upon whether Boeing Field or Moses Lake is considered.

- The three-airport system is reported as offering greater benefits over the long term than the two-airport system.

- The replacement airport alternative is rejected because of the ground travel distances involved, the impact on the regional urban pattern and the natural environment, and high capital costs.

- The recommended specific multiple airport system is compatible with the proposed regional high capacity transit system.

C

U.S. Department
of Transportation

FINAL
SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT

FOR THE

Federal Aviation
Administration

PROPOSED MASTER PLAN UPDATE DEVELOPMENT ACTIONS

AT

Port of Seattle

SEATTLE-TACOMA INTERNATIONAL AIRPORT

Volume 1 - Main Text and Appendices A through C-1

This statement is submitted for review pursuant to the requirements of Section 102(2)(C) of the National Environmental Policy Act of 1969 (42 U.S.C. 4321 et seq): E.O. 11990, Protection of Wetlands; E.O. 11998, Floodplain Management; 49 USC Subtitle VII; 42 U.S.C. 7401 et seq; Department of Transportation Act Section 4(f) - 49 USC 303 (c); 49 U.S.C. 47101 et seq; Washington State Environmental Policy Act (RCW 43.21C); and other applicable laws. This Supplemental Environmental Impact Statement (SEIS) is a combined National Environmental Policy Act and Washington State Environmental Policy Act (SEPA) document. With regard to SEPA requirements, this Supplemental EIS represents the third step of a phased environmental review which began with publication of the 1992 Flight Plan Final EIS, which assessed alternatives for addressing regional aviation needs, and the issuance of the Final EIS for the Master Plan Update. This Final Supplemental EIS also contains a final conformity analysis, as required by the Clean Air Act amendments.

The Port of Seattle, operator of Seattle-Tacoma International Airport, has prepared a Master Plan Update for the Airport. The Plan shows the need to address the poor weather operating capability of the Airport through the development of an 8,500 foot long third parallel runway (Runway 16X/34X), separated by 2,500 feet from existing Runway 16L/34R, with associated taxiways and navigational aids. Other needs include: extension of Runway 34R by 600 feet; establishment of standard Runway Safety Areas for Runways 16R/L; development of a new air traffic control tower; development of a new north unit terminal, Main Terminal improvements and terminal expansion; parking and access improvements and expansion; development of the South Aviation Support Area for cargo and/or maintenance facilities; and relocation, redevelopment, and expansion of support facilities. The EIS assesses the impact of alternative airport improvements, including installation of navigational aids, airspace use, and approach and departure procedures. With the exception of the 34R runway extension, the proposed improvements would be completed during the 1997-2010 period, with initial 5-year development focused on the proposed new parallel runway, and existing passenger terminal, parking and access improvements. The proposed improvements and their alternatives would result in wetland impacts, floodplain encroachment, stream relocation, impacts to locally significant historical sites, social, noise, water, and air quality impacts.

This Supplemental EIS was prepared to address the environmental impacts that could result if the most recent growth in aviation activity levels continues.

Responsible Federal Official:
Mr. Dennis Ossenkop
Federal Aviation Administration
Northwest Mountain Region
1601 Lind Ave, S.W.
Renton, Washington 98055-4056

SEPA contact:
Ms. Barbara Hinkle
Health, Safety and Environmental Management
Port of Seattle
P.O. Box 68727
Seattle, Washington 98168

Date: May, 1997

Federal Aviation Administration
Northwest Region
1601 Lind Ave, SW
Renton, Washington 98055

Port of Seattle
Seattle-Tacoma International Airport
P. O. Box 68727
Seattle, Washington 98168

May 13, 1997

Dear Reader:

Officials of the Central Puget Sound Region have been faced with developing a plan to meet the future transportation demands in the Region, that exist now and will continue to grow in the future. The Master Plan Update for Seattle-Tacoma International Airport has confirmed earlier studies which indicated that poor weather conditions currently produce significant delays and that the present airside, terminal, and landside facilities will no longer be able to efficiently accommodate air travel needs. The Master Plan Update identifies the need for a third runway at Sea-Tac Airport, in addition to numerous terminal and landside improvements necessary to accommodate the future growth in air travel in the region.

In April 1995, a Draft EIS for the proposed Master Plan Update improvements at Seattle Tacoma International Airport was prepared for these improvements. Public comments were received through August of 1995. The Final EIS, titled "*Final Environmental Impact Statement for Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*" including the draft air quality conformity determination, was issued on February 9, 1996. The draft conformity determination document was available for public and agency review and comment through June 1996. This document is a supplement to the February, 1996 Final EIS.

A Draft Supplemental Environmental Impact Statement (Draft Supplemental EIS) was prepared as a result of the Federal Aviation Administration (FAA) and Port of Seattle (Port) review of recent growth in air travel demand at Sea-Tac Airport. During 1994, 1995, and 1996, air travel demand at Sea-Tac grew at a 7% annual growth rate, which is substantially greater than the national average. As a result, the 1996 annual aircraft operations levels at Sea-Tac Airport (395,200 operations) exceeded the Master Plan Update forecast for the year 2005. In addition, the FAA's fiscal years 1996 and 1997 Terminal Area Forecast (TAF) for Sea-Tac anticipates faster growth rates than were used in the Master Plan Update. As a result, the Port prepared a new forecast for Sea-Tac Airport that reflects current population and income growth in the Puget Sound Region, as well as the most recent forecast of how air travel ticket fares could change in the future. The new data indicates that demand at Sea-Tac by 2010 could be 17 percent higher than was forecast by the Master Plan Update.

This Supplemental EIS examines the impact of the new forecast and other data on:

- Project Purpose and Need
- Alternatives
- Affected Environment (noting changes that have occurred since issuance of the Final EIS)
- Environmental Consequences of the new data

This Environmental Impact Statement has been a joint effort between the Federal Aviation Administration (FAA) and the Port of Seattle, with the FAA taking the lead in preparation of the technical analysis and report production.

The Draft Supplemental EIS (DSEIS) and updated draft clean air act conformity analysis were released on February 14, 1997 with the announcement of a 45-day public and agency comment period. A public hearing was conducted on March 4, 1997 and the close of the public comment period occurred on March 31, 1997. Simultaneous with the 45-day comment period conducted in accord with the National Environmental Policy Act, a 30-day comment period was initiated on the conformity analysis. Based on public and agency comment, the air quality conformity comment period was extended until March 31, 1997.

Federal Aviation Administration
Northwest Region
1601 Lind Ave, SW
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Seattle, Washington 98168

This Final Supplemental EIS reflects comments received at the hearing and during the comment period. Appendix F contains a summary of the comments received and detailed responses. As noted in that appendix, changes to Chapters 1 through 5 were made where appropriate. Based on public comments, an index was added as Chapter 6. Appendix G contains the public comments.

As is noted in Appendix F, the most notable changes made in preparing the Final Supplemental EIS relate to responding to issues and comments raised concerning the air quality analysis and revised draft air quality conformity analysis. While the emissions inventory has been corrected and amended in response to the comments, conformity with the State Implementation Plan has been demonstrated based on two analyses: the emissions inventory showing that project related impacts do not exceed the de-minimis levels; and the dispersion analysis showing that the project will not create new exceedances or exacerbate any actual or modeled exceedances. In response to the agency comments concerning the draft, a final conformity analysis has been prepared and a 30-day public comment period is being conducted on only this portion of the Final Supplemental EIS. Comments concerning this analysis are to be submitted by June 23, 1997 to Mr. Dennis Ossenkop, ANM-611, Federal Aviation Administration, Northwest Region, Room 540, 1601 Lind Ave, S.W., Renton, Washington 98055-4056

Federal Approval Declaration

After careful and thorough consideration of the facts contained herein, and following consideration of the views of those Federal agencies having jurisdiction by law or special expertise with respect to the environmental impacts described, the undersigned finds that the proposed Federal actions are consistent with existing national environmental policies and objectives as set forth in Section 101(a) of the National Environmental Policy Act of 1969.

Lowell H. Johnson — 5/13/97

Lowell H. Johnson
Manager
Northwest Mountain Region Airports Division

Date

FACT SHEET

Project Title:	Master Plan Update Development Actions at Seattle-Tacoma International Airport.
Description of Project:	The proposed Master Plan Update improvements at Sea-Tac Airport would reduce existing poor weather aircraft operating delay and accommodate forecast growth in passengers, cargo, and aircraft operations. Port of Seattle staff have recommended Alternative 3 - North Unit Terminal with a new 8,500 foot long parallel runway. Proposed airport improvements would include: • Third parallel runway with a length of up to 8,500 feet located about 2,500 feet west of existing Runway 16L/34R, and associated taxiways, safety areas, relocated utilities, and navigational aids • 600 foot extension southward of Runway 34R • Standard Runway Safety Areas for existing Runways 16R and 16L • Terminal improvements and expansion, including the development of a North Unit Terminal • Parking and access improvements and expansion • Development of the South Aviation Support Area • Relocation, redevelopment, and expansion of support facilities
Project Sponsor:	Port of Seattle
Lead Agencies:	The Federal Aviation Administration (FAA) and the Port of Seattle are joint lead agencies for the purpose of the National Environmental Policy Act (NEPA) and State Environmental Policy Act (SEPA) Environmental Impact Statement (EIS). The Port of Seattle contact is: Ms. Barbara Hinkle, Health, Safety and Environmental Management Division, Port of Seattle, P.O. Box 68727, Seattle, Washington, 98168. The FAA responsible official is: Mr. Dennis Ossenkop, Northwest Mountain Region, Airports Division, Federal Aviation Administration, 1601 Lind Avenue, S.W., Renton, Washington 98055-4056.
Cooperating Agency:	The U.S. Army Corps of Engineers is a cooperating agency under NEPA.
Licenses, Permits and Other Approvals Potentially Required:	*Federal*: FAA Record of Decision, Air Quality Conformity Determination; DOT Section 4(f); and approval of the Airport Layout Plan; U.S. Army Corps of Engineers Section 404 permit; *State*: Department of Ecology Water Quality Certification and National Pollutant Discharge Elimination System Permit for Stormwater; Dam Safety Approval; Department of Fisheries and Wildlife Hydraulic Project Approval; Temporary Modification of Water Quality, Department of Natural Resources Forest Practices Permit and Surface Mining Reclamation Permit, Governors Clean Air and Water Certification; *Local*: Puget Sound Regional Council Review; Port of Seattle Commission project decisions; City of SeaTac comprehensive plan and zoning process, clearing and grading permits, floodplain filling permits, demolition permits, and others.
Principal Authors and Contributors to the Final Supplemental EIS:	This NEPA/SEPA Supplemental EIS was prepared under the direction of the Federal Aviation Administration and Port of Seattle. Technical analysis was provided by: Landrum & Brown, Incorporated Shapiro and Associates, Inc. INCA Engineers, Inc. Gambrell Urban, Inc. Parametrix, Inc. Synergy Consultants, Inc.

FACT SHEET (Continued)

Date of Issue: May 13, 1997

Comment Period: A public comment period is not being conducted on the Final Supplemental EIS. However, this report contains the Final Conformity Analysis, and a 30-day public and agency comment period is being conducted on this portion only of the report. Comments must be submitted by June 23, 1997 to Dennis Ossenkop. Federal Aviation Administration, Airports Regional Office, Room 540, 1610 Lind Avenue, SW, Renton, WA 98055-4056.

Public Meetings: During preparation of the Draft and Final EIS, two scoping meetings were held and two public hearings. An additional public hearing was held on March 4, 1997 concerning the Draft Supplemental EIS. Copies of the hearing transcript and comments received on the Draft Supplemental EIS are provided in Appendix G; responses to applicable comments are provided in Appendix F.

Approximate Date of Final Action by Lead Agencies: In accordance with the National Environmental Policy Act, the issuance of the Final Supplemental EIS followed by a 30-day cool down period, which will end on June 23, 1997. After compliance with applicable requirements, the FAA will then issue a Record of Decision. Similarly, the Port of Seattle action approving the Master Plan Update is expected in May 1997.

Approximate Date of Implementation: Limited terminal development, cargo area expansion, development of an On-Airport hotel, expansion of employee and public parking, expansion of terminal facilities, and existing terminal entrance roadway improvements could be initiated as early as 1997. The new runway, and associated navigational aids and taxiway development, could be completed by 2005.

Availability of Copies: Copies of the Final Supplemental EIS are available for inspection at:

Federal Aviation Administration, Airports Regional Office, Room 540, 1610 Lind Avenue, SW, Renton, WA

Port of Seattle, *Aviation Planning*, 3rd floor, Terminal Building, Sea-Tac Airport, and *Pier 69* Bid Office, 2711 Alaskan Way, Seattle

Puget Sound Regional Council, Information Center, 216-1st Avenue, Seattle

Beacon Hill Library, 2519 - 1st Avenue, South, Seattle

Boulevard Park Library, 12015 Roseberg South, Seattle

Seattle Public Library, 1000 - 4th Avenue, Seattle

Magnolia Library, 2801 - 34th Ave W, Seattle

Rainier Beach Library, 9125 Rainier Avenue S., Seattle

Bothell Regional Library, 9654 NE 182nd, Bothell

Burien Library, 14700-6th SW, Burien

Des Moines Library, 21620-11th South, Des Moines

Federal Way Regional Library, 34200-1st South, Federal Way

Foster Library, 4205 South 142nd, Tukwila

Kent Regional Library, 212 - 2nd Ave N, Kent

Vashon Ober Park, 17210 Vashon Highway, Vashon

Tacoma Public Library, 1102 Tacoma Ave S., Tacoma

University of Washington, Suzallo Library, Government Publications, Seattle

Valley View Library, 17850 Military Road South, SeaTac

West Seattle Library, 2306 - 42nd Ave SW, Seattle

Bellevue Regional Library, 1111 - 110th Ave NE, Bellevue

Columbia Library, 4721 Rainier Avenue S., Seattle

Holly Park Library, 6805 - 32nd Avenue South, Seattle

Douglas-Truth Library, 2300 E. Yessler Way, Seattle

To Purchase A Copy: This document is available for public reproduction at Kinko's located at Kent-Des Moines Way and International Blvd./SR 99. Phone (206) 878-5043.

Locations of Other Documents: The Flight Plan EIS issued in 1992, and the Draft and Final EIS for the Master Plan Update Development Actions, technical reports, background data, adopted documents, and material incorporated by reference in this Supplemental EIS are, unless otherwise stated in this EIS, located at:

Federal Aviation Administration, Airports Regional Office, Room 540, 1601 Lind Avenue, SW, Renton, WA

Port of Seattle, Aviation Planning, 3rd Floor, Terminal Building, Sea-Tac Airport

Puget Sound Regional Council, Information Center, 216-1st Avenue, Seattle

**FINAL SUPPLEMENTAL
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PROPOSED MASTER PLAN UPDATE

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CHAPTER 1

INTRODUCTION AND SUMMARY

1. INTRODUCTION

In the May of 1996, the Northwest Mountain Region Office of the FAA identified the availability of the fiscal year 1996 Terminal Area Forecast (TAF) for Seattle-Tacoma International Airport (Sea-Tac Airport), prepared by its headquarters Office of Policy and Plans. In December 1996, the FAA Office of Policy and Plans released the fiscal year 1997 TAF. The 1996 and 1997 TAFs show airport activity (passengers and operations) growing at a rate faster than predicted by the Master Plan Update. Aviation demand forecasting is often incorrectly perceived as a science, where all variables are predictable and known. However, as is shown by comparing any forecast to conditions that actually occur during the period that was forecast, forecasting is more an art than a science. As a result, precise forecasting for specific future years, particularly years more than 10 years in the future in the volatile air travel industry, is very difficult.

As airport master plans are conducted, forecasts are the foundation upon which a future plan is built. In the forecasting process, projected air travel demand is assigned to specific time periods. Due to the need to base these assumptions on a number of variables, airport master plan improvements are typically associated with a level of activity instead of a precise year, as was the approach taken in the Sea-Tac Airport Master Plan Update. The Final EIS recognized the difficulty in forecasting and presented three possible scenarios of how growth might differ from the Master Plan Update forecast. Appendix R of the Final EIS (located in Volume 4) identified the possible environmental impacts associated with the three scenarios, which included a slower growth scenario and two faster growth scenarios. The new forecast prepared by the Port of Seattle (hereafter referred to as "the Port") for the year 2010 are slightly higher than was examined for the faster growth scenarios (17.9 million enplanements versus 17.3 million enplanements) contained in the Final EIS.

As a consequence, the Port and FAA evaluated the FAA's TAF data: 1) to determine it's reliability and 2) to examine the impacts of demand growing faster than the Master Plan Update. Based on this review and the development of the new Port forecast, the FAA and the Port then agreed that additional environmental analysis was warranted to assess the impacts of the Master Plan Update improvements relative to the higher passenger and operations forecast.

The purpose of this report is to document the additional data that has arisen since publication of the Final EIS, including new aviation demand forecast information and to identify the resulting environmental impacts from this new data. This report contains the following chapters:

- Chapter 1 - this introduction and summary
- Chapter 2 - Impact on Project Definition and Purpose and Need
- Chapter 3 - Alternatives
- Chapter 4 - Affected Environment
- Chapter 5 - Environmental Consequences

The following sections of this chapter summarize the detailed information presented in Chapters 2 through 5.

The Draft Supplemental EIS was released for agency and public review in February 1997 with a 45-day comment period. Simultaneously, a 30-day comment period was initiated concerning the updated draft air quality conformity analysis; the air conformity comment period was extended until March 31, 1997 to coincide with the overall comment period. The Final Supplemental EIS was prepared reflecting the comments received. **Appendix F** contains a summary of the comments while **Appendix G** contains the comments. **Table F-2** (located in Appendix F) provides an index to the comments.

2. NEW FORECASTS AND IMPACT ON PURPOSE AND NEED

The analysis contained in this additional environmental analysis document reflects an updating by the Port of Seattle of the Master Plan Update forecast. The new Sea-Tac forecast prepared by the Port is 17% greater (in terms of both passengers and operations) than the forecast prepared for the Master Plan Update in 1994.[1] These new forecasts are anticipated to exceed the operational capability of the existing airfield between 2005 and 2010. Therefore, a review of forecast issues and their relationship to the purpose and needs identified by the Master Plan Update was conducted.

TABLE 1-1

COMPARISON OF DEMAND FORECASTS
(Master Plan Update, FAA TAF, and new Port of Seattle forecast)

Unconstrained Aviation Demand Forecast Comparison

	1995	2000	2005	2010
Operations				
Master Plan Update	N/A	379,200	392,500	405,800
FAA 1997 TAF	386,536	433,470	478,050	528,200
New Port of Seattle	386,536	409,000	445,000	474,000
Enplaned Passengers				
Master Plan Update	N/A	11,900,000	13,600,000	15,300,000
FAA 1997 TAF	11,386,000	13,920,000	16,290,100	18,950,000
New Port of Seattle	11,386,000	13,700,000	15,700,000	17,900,000

N/A = Not available

Table 1-1 provides a comparison of the Master Plan Update forecast, the FAA's fiscal year 1997 Terminal Area Forecast, and the new Port of Seattle forecasts. For the year 2010, the FAA's TAF is approximately 10% greater than the Port's operations forecast and 17% greater than the Master Plan Update forecast. The TAF enplanement forecast is also 6% greater than the Port's forecast and 23% greater than the Master Plan Update forecast for the year 2010.

[1] Chapter II of this report acknowledges a difference between the new Port and fiscal year 1997 FAA TAF forecasts. The Port forecast was reviewed and accepted by the FAA regional office and deemed appropriate for use in planning at Sea-Tac.

A) Aviation Demand and Activity Forecast

In preparing the updated forecast for Sea-Tac Airport, two specific conditions were examined:

- Demand Forecast -- "With Project" forecast: this forecast represents an unconstrained level of demand for air travel within the Puget Sound Region. It represents the total passengers that wish to fly assuming that sufficient facilities are available to accommodate the demand. This level of activity is presumed to occur with the "With Project" alternative;
- Activity Forecast - Constrained "Do-Nothing" forecast -- this forecast represents the level of activity that the existing facilities at Sea-Tac Airport are capable of accommodating due to constraints in the airport system. These constraints could result in less than the total demand being satisfied, if demand exceeds the capability of the system.

In preparing the forecasts, first the demand for air travel was identified. The extent of the constraints associated with the existing airfield, terminal facilities, support facilities, and landside/roadway system were then identified. Then the passengers and resulting aircraft operations forecast were prepared based on the capabilities of the system to serve that level of activity. **Table 1-2** lists the Do-Nothing and "With Project" enplanement and operations forecast.

TABLE 1-2
COMPARISON OF THE NEW PORT OF SEATTLE FORECAST
"With Project" to Do-Nothing

	With Project			Do-Nothing		
Operations	**2000**	**2005**	**2010**	**2000**	**2005**	**2010**
Annual	409,000	445,000	474,000	409,000	445,000	460,000
Peak Month	38,600	41,800	44,000	38,600	41,500	42,100
Peak Month/Avg Day	1,246	1,352	1,423	1,246	1,341	1,360
Avg Annual Day	1,121	1,219	1,299	1,121	1,219	1,260
Peak Hour	78	94	99	78	82	82
Enplaned Passengers						
Annual	13,700,000	15,700,000	17,900,000	13,700,000	15,700,000	17,900,000
Peak Month	1,540,000	1,730,000	1,940,000	1,540,000	1,730,000	1,940,000
Peak Month/Avg Day	49,500	55,700	62,400	49,500	55,700	62,400
Avg Annual Day	37,534	43,014	49,041	37,534	43,014	49,041
Peak Hour	5,210	5,740	6,300	5,210	5,460	5,930

Source: P&D Aviation, December 1996.

Chapter 2 of this report contains a description of the FAA fiscal year 1997 Terminal Area Forecast and the new forecasts prepared by the Port. Because the Port forecasts are prepared at a level of detail that enables the analysis of environmental conditions, they were used to assess the environmental impacts that could result if demand grows as forecast. **Appendix D** identifies likely impacts in the year 2020 based on an extrapolation of activity and impacts in year 2010. The FAA's TAF does not provide the level of detail needed for environmental analysis such as noise impacts or surface transportation conditions. Because the Port's forecast reflects, where appropriate, Sea-Tac specific conditions, and was produced at a detailed level, with information such as the aircraft fleet mix and peak hour conditions, it was used for this Supplemental Environmental Impact Statement analysis.

Because demand would not exceed the maximum annual airfield capability of the Airport until around 2008, Sea-Tac would likely accommodate all of the forecast demand for air travel until that time. By 2005, 94 operations could be accommodated in the peak hour if additional airfield capability were available. Due to the existing constraints, it would likely not exceed 82 operations. In all years, there would likely be a slight difference in aircraft operations levels between what a constrained or unconstrained airfield could accommodate because of the hourly levels of activity. On a peak month average day (PMAD) basis, the constrained operations in 2010 would be about 5% less than the unconstrained (unconstrained at 1,423 operations and 1,360 constrained operations). However, due to an anticipated flattening of the peak, where the peak month average day will look more and more like an average day.

To accommodate the constrained level of activity, a number of congested and inefficient conditions would result:

- Gates would be used for an average of 5.0 to 5.5 flights a day. This type of gate usage would resemble today's PMAD. As is shown by this analysis, without implementation of the Master Plan Update improvements, the peak month is likely to represent a less distinct peak in the future (congested conditions would become more of an everyday condition);
- Some growth in the number of passengers per narrowbody equivalent gates[2/] per year would occur as a consequence of the expected growth in average aircraft size, average load factors, and the number of passengers per gate per day;
- Remote aircraft parking and passenger loading would occur, as is used at locations such as Los Angeles, Dulles, and (until the recent improvements were completed) at Pittsburgh or O'Hare; and
- Much of the terminal space (ticketing, gates, and baggage claims) would operate at levels-of-service F as measured by the International Civil Aviation Organization (where A is the most efficient/least congested and F is the most inefficient/congested). As conditions become constrained, passengers would avoid ticket check-in areas (through advance ticket purchases, and electronic ticketing, etc.), rely on carry-on baggage and/or would arrive at the Airport sooner. It is assumed that ground travel time would increase 25% to 50%. Thus, the time passengers would spend in the terminal area would increase from 30 minutes to 45 minutes.

B) Purpose and Need

The following four purpose and need statements were defined in the February, 1996 Final Environmental Impact Statement:

(1) Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay;

[2/] Narrowbody equivalent gate is a measurement system used to account for the difference in sizes between gates that accommodate larger, widebody aircraft versus the smaller, narrowbody aircraft.

(2) Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim;

(3) Provide Runway Safety Areas (RSAs) that meet current FAA standards; and

(4) Provide efficient and flexible landside facilities to accommodate future aviation demand.

The only significant new purpose and need information that has been made available since publication of the Final EIS is the Port's initiation of correcting the Runway Safety Area for 34R (thus, the only remaining corrections are for 16L and 16R) and the new forecasts that show a potential need to accelerate, sooner in time, the terminal and landside facilities.

Relative to the proposed third runway, this analysis evaluated a longer construction schedule in contrast to the accelerated schedule presented in the Final EIS. Therefore, this Supplemental EIS evaluates the commissioning of the third runway in late 2004, with construction hauling occurring between 1997 and 2002.

Increased demand and/or the other new data would not affect the need to bring the runway safety areas up to standard, nor would it affect the proposed extension of Runway 34R.

The proposed Master Plan Update terminal and landside improvements were identified to address growth in passenger, cargo, and aircraft operations up to 19 million annual enplanements. As the updated forecasts now anticipate that 19 million enplanements would be reached soon after 2010 (instead of 2020), the timing of facilities could change, if the growth in activity continues as predicted by the new forecasts. As a result, the projects that were slated to be implemented by 2005, could be needed by 2000. Similarly, projects slated to occur by 2015 could be needed by 2005 and projects slated to occur between 2016-2020 could be needed by 2010.

Three changes in the proposed improvements have been identified. These changes, described in Chapter 2, reflect improvements in parking and surface transportation conditions to address issues associated with airport landside requirements.

3. ALTERNATIVES

The Final EIS examined the alternatives shown in **Table 1-3**. No new significant information has come to light concerning any alternative that has not already been discussed by this Supplemental EIS, such as timing of demand. The new demand forecasts, and operating capability of the existing and future airport facilities would not affect the viability of any alternative considered in the Final EIS.

As a result of the faster growing air travel demand, and the resulting increased demand for parking at Sea-Tac, a re-examination of alternatives for public, rental car, and employee parking was conducted. This review showed that the parking locations identified by the Master Plan Update continued to represent the preferred location for parking. However, as was discussed earlier, the quantity of new parking in each construction phase would increase to accommodate the higher demand.

Concurrent with its approval of the third runway on August 1, 1996, the Port of Seattle Commission directed Port staff to give additional consideration to use of new technologies to satisfy poor weather operating needs. In response to this request, the Port convened a technology

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conference at the SeaTac Hilton on September 25, 1996. Speakers at the conference included the Federal Aviation Administration, NASA, Alaska Airlines, Airline Pilots Association, Boeing, Air Transport Association, consultants, and a company developing new technologies. This investigation concluded that technologies, based on the global positioning system (GPS) and flight management system (FMS), will provide aviation system capacity relief in the future. However, no technologies were identified that would alleviate the need for the new runway or change the viability of other closer spaced options due to the 2,500 foot spacing requirement between runways that is attributed to wake vortex conditions.

TABLE 1-3

SUMMARY OF ALTERNATIVES CONSIDERED

(1) Improve The Poor Weather Airfield Operating Capability In A Manner That Accommodates Aircraft Activity with an Acceptable Level of Aircraft Delay.

- Use of Other Modes of Transportation
- Use of Other Airports or Construction of a New Airport
- Activity/Demand Management
- Runway Development at Sea-Tac
- Use of Technology
- Delayed or Blended Alternative
- Do-Nothing/No-Build

(2) Provide Sufficient Runway Length to Accommodate Warm Weather Operations Without Restricting Passenger Load Factors or Payloads For Aircraft Types Operating to the Pacific Rim.

- Extension of Runway 16L/34R
- Extension of Runway 16R/34L
- Development of a new runway with a 12,500 foot length
- Delayed Alternative
- Do-Nothing/No-Build

(3) Provide Runway Safety Areas (RSAs) that Meet Current FAA Standards.

- Use of Declared Distances with displaced runway thresholds;
- Clearing, grading
- Delayed Alternative
- Do-Nothing/No-Build [3/]

(4) Provide Efficient and Flexible Landside Facilities to Accommodate Future Aviation Demand

- Use of Other Modes of Transportation
- Use of Other Airport/Development of A New Airport
- Activity/Demand Management
- Landside Development at Sea-Tac Airport
- Delayed or Blended Alternative
- Do-Nothing/No-Build

3/ Technically, the literal Do-Nothing is not an option for addressing the RSA issues. The Port of Seattle has two options for addressing RSAs, both of which require some action: grade and develop the requisite distance off the ends of the runways or establish declared distance procedures. The Do-Nothing alternative presented in the EIS and this Supplemental EIS analysis reflects the non-development action (declared distances).

4. AFFECTED ENVIRONMENT

Since the issuance of the Final Environmental Impact Statement in early February 1996, a number of actions have been taken within the region related to Sea-Tac Airport. The purpose of **Chapter 4** is to summarize these actions and identify if, or how, the actions affect the Master Plan Update improvements.

Key actions include:

- The final decision of the Expert Panel on Demand/System Management and Noise;
- The PSRC amendment to the Metropolitan Transportation Plan approving the third runway at Sea-Tac;
- The Port of Seattle Commission Approval of the Master Plan Update;
- Port and FAA approval and initiation of the Runway Safety Area for 34R corrections;
- Port of Seattle discussions with Seattle Water concerning the development of the employee lot north of SR 518; and
- Other actions, including local municipal land use actions.

In its final order of March 27, 1996, the majority (two members, with one dissenting opinion) of the Expert Panel on Demand/System Management and Noise concluded that "although the Port of Seattle has scheduled, pursued, and achieved an impressive array of noise abatement and mitigation programs, the Port has not shown a reduction in real on-the-ground impacts sufficient to satisfy the noise reduction condition imposed by Resolution A-93-03." The Panel concluded "that the Port could have done more, and that, had it done so, the additional improvement probably would have made a material difference in real, on-the-ground noise impacts, turned a marginal improvement into a meaningful one, and therefore affected the final outcome of this proceeding." In conclusion, the Panel offered a list of recommended noise reduction measures to be considered.

At its April 25, 1996 meeting, the PSRC's Executive Board agreed to use the recommendations in the Panel's March 27, 1996 Final Decision on Noise Issues as the basis for deciding what additional noise reduction measures should be part of including a proposed third runway at Sea-Tac Airport as an amendment to the Metropolitan Transportation Plan (MTP). Resolution A-96-02, amending the Metropolitan Transportation Plan (MTP) to include a third runway at Sea-Tac Airport with specific noise reduction measures based upon the recommendations of the Expert Panel, was approved by the PSRC General Assembly on July 11, 1996.

A number of actions have been taken by the Port of Seattle since issuance of the Final EIS. Actions related to the Master Plan Update improvements include:

- Issuance of a Mitigated Determination of Non-Significance (MDNS) and Determinations of Non-Significance (DNS) - a MDNS was issued for the 34R RSA and a DNS was issued for the Federal Express facility expansion. Both projects will be completed in 1997.
- Passage of Resolution 3212 - On August 1, 1996 the Port of Seattle Commission approved a resolution that: 1) found the EIS is adequate and meets the requirements of SEPA; 2) adopted the Master Plan Update and Airport Layout Plan (ALP); 3) approved the third parallel runway

and associated improvements; 4) agreed to undertake the PSRC Resolution A-96-02 Section I mitigation; 5) authorized participation in a multi-agency air quality monitoring program and 6) directed staff to monitor and evaluate changes in airport activity and how the changes might affect environmental conditions and mitigation. In addition, the Commission instructed staff to evaluate new technologies to satisfy poor weather operating constraints.

Three primary actions have been undertaken by other parties:

- Hearing conducted by U.S. Congressional Aviation Subcommittee - On March 18, 1996 then Congressman Randy Tate, a member of the House Aviation Subcommittee of the Transportation and Infrastructure Committee, held a hearing at the Des Moines Field House on the proposed third parallel runway at Sea-Tac Airport. Testimony was provided by three panels, each consisting of three individuals. Congressional members of the subcommittee then questioned the panel members.
- Local Land Use Actions - Land use planning activities have continued to be undertaken within the jurisdictions in the immediate airport area. Most notably, the PSRC's MTP will require the local jurisdictions to amend or adopt transportation components of their comprehensive plans that are compatible with the Updated MTP.
- Lawsuits and SEPA Appeals - the Airport Communities Coalition brought a lawsuit against the Port and PSRC concerning the PSRC approval of the MTP. The Airport Communities Coalition and the City of SeaTac also filed appeals under the State Environmental Policy Act (SEPA) challenging the Port Commission approval on August 1, 1996.

5. IMPACT ON ENVIRONMENTAL CONSEQUENCES

Chapter 5 of the Supplemental EIS presents the impacts of the new forecasts and new information on key environmental characteristics that would be affected.

5-1 Surface Traffic Analysis

Continued regional population growth will impact the surface transportation system in the vicinity of Sea-Tac Airport regardless of the improvements undertaken at the Airport. The surface transportation analysis, using the new forecast shows the following:

- Total Airport traffic is expected to increase from approximately 72,500 vehicles per day in 1994, to approximately 114,000 vehicles per day for the Do-Nothing Alternative (Alternative 1) or approximately 113,300 vehicles per day for the Preferred Alternative (Alternative 3) in the year 2010. The differences between the Do-Nothing and the Preferred Alternative traffic volumes relate to the availability of on-site parking available through each alternative an how the availability of parking affects vehicular access to the Airport.

- No significant surface transportation impacts have been identified for the Preferred Alternative in comparison to the Do-Nothing Alternative for any of the evaluated intersections and freeway ramp junctions.

- The Preferred Alternative would generate an additional 95 PM peak hour trips in the year 2010 over the Do-Nothing Alternative.

- Impacts associated with Alternative 2 (Central Terminal) and Alternative 4 (South Unit Terminal) were also considered and showed that the surface transportation impacts of these alternatives would be the same as the Preferred Alternative.
- The transportation improvement project that would have the greatest impact on conditions in the Airport area is the construction of the State Route 509 Extension and South Access.

Appendix C-1 presents a detailed summary of the surface transportation analysis, and **Section 5-4** presents the construction related surface transportation impacts.

5-2 Air Quality

Like the Final EIS, this Supplemental EIS evaluated the air quality impacts associated with the Master Plan Update improvements through a review of:

- Aircraft emissions inventory in tons per year for comparison to the State Implementation Plan;
- Local areawide dispersion analysis of Airport and non-Airport sources for comparison to the Ambient Air Quality Standards (AAQS); and
- A local roadway intersection dispersion analysis for comparison to the AAQS.

This analysis confirmed the results of the Final EIS, which showed that even with a higher demand forecast, that aircraft emissions would be below the 1995 SIP levels regardless of whether the improvements are undertaken at Sea-Tac Airport. The dispersion analysis shows that even with the higher demand forecast that the predominant air pollution source in the Airport environs are surface transportation vehicles.

The intersection dispersion analysis was conducted to examine conditions in the Airport area that would be affected by the proposed improvements. This analysis shows that, with the worst case modeling assumptions, the AAQS for Carbon Monoxide could be exceeded regardless of whether improvements are completed at Sea-Tac Airport due to high volumes of surface traffic on International Boulevard (SR 99). With the higher air travel demand forecast and the changes in the proposed Master Plan Update improvements described in Chapter 2 of the Supplemental EIS, the intersection analysis shows that the improvements associated with any of the "With Project" alternatives would result in pollutant concentrations equal to or less than would occur in the Do-Nothing.

Because the demand forecast has increased and changes were made in the phasing and definition of the proposed improvements, a Final Conformity Analysis was prepared and is available in **Appendix B**. Included in **Appendix B (Attachment A)** are responses to comments concerning the draft air conformity analysis presented in the February, 1996 Final EIS. Comments concerning the February 1997 Updated Draft Conformity Analysis are summarized in **Appendix F**.

The analysis contained in this Final Supplemental EIS reflects responses to these comments and a thorough quality assurance review of the data input to the models. While some estimates of future air emissions have changed over the levels presented in the Draft Supplemental EIS, the conclusions of the Draft remain the same and are supported by the revised analysis contained in this Final Supplemental EIS.

5-3 Noise Exposure

Using the new forecasts, noise exposure contours were prepared for the Do-Nothing and Preferred Alternative to show areas impacted by aircraft noise of 60 DNL, 65 DNL, 70 DNL, and 75 DNL (Day-Night Average Sound Level). As was shown in the Final EIS, noise exposure impacts are expected to be less than current impacts, as follows:

Year	65 DNL and Greater Noise Exposure Impacts Population	Housing	Area (sq. mi)
Existing (1994)	31,800	13,620	12.23
Do-Nothing Alternative (Alternative 1)			
2000	11,310	4,820	6.81
2005	10,450	4,450	6.61
2010	11,940	5,060	7.08

Year	65 DNL and Greater Noise Exposure Impacts Population	Housing	Area (sq. mi)
"With Project" (Alternatives 2, 3, and 4)			
2000	11,310	4,820	6.81
2005	10,440	4,400	6.85
2010	13,220	5,520	7.69

Note - the area above includes all land, including airport property within the contours

The 65 DNL and greater noise exposure contours associated with the new forecast are about 12% greater than the noise contours prepared using the Master Plan Update forecast in the Final EIS. The new noise contours for the year 2010 would exceed the boundaries of the Port's existing Noise Remedy Program boundary by several blocks on the northwesterly edge of the Noise Remedy Program Boundary. In addition, a number of residential areas would experience a 1.5 DNL increase in noise (when comparing the "With Project" to the Do-Nothing) in year 2010. **Section 5-6 "Land Use Impacts"** describes the impact of the noise on noise sensitive land uses.

5-4 Construction Impacts

Since publication of the Final EIS, new information has arisen that has lead to construction related changes:

- Third parallel runway haul duration - the Final EIS analyzed a 3-year haul, with the runway being available for use in the year 2000. This Supplemental EIS analyzes a 5-year haul, with the runway available for use in late 2004. Under this new construction schedule, the peak of hauling would occur in year 2000, with the haul complete in 2002. While day-to-day truck traffic levels could vary, the lengthening of the haul duration could reduce the number of average daily truck trips;
- Additional haul routes have been identified - the Final EIS examined the primary haul routes that are anticipated to be used. Based on a further examination of barge/rail transfer opportunities, several additional routes were identified.
- Examination of two temporary interchanges - In addition to the identification of additional haul routes, two temporary, construction-only interchanges were identified: from SR 518 near 20th Avenue South and from SR 509 near South 176th Street.

No changes in the total quantity of fill material have been identified since publication of the Final EIS, yet this Supplemental EIS examines a greater quantity of fill excavated from On-Site Borrow Source 1 and no excavation from On-Site Borrow 5.

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Based on the new construction schedule, the minimum use of on-site material option (that maximizes off-site material use and, thus, truck haul), would result in 66 one-way truck trips during the average hour adjusted for peaking, in contrast to the 109 trips examined by the Final EIS. This Supplemental EIS examined the impact of 109 one-way trips on I-5, SR 509, and SR 518 and 66 one-way trips on other possible haul routes. While the Final EIS identified several hours of operation constraints at various intersections along the arterial, this reduced level of truck trips could minimize these effects.

Section 5-4 "Construction Impacts" of this Supplemental EIS summaries the new construction impact evaluation and presents an updated/revised surface transportation analysis, noise, air quality, visual conditions, social impacts, and a detailed listing of overall possible construction best management practices.

5-5 Biotic Communities, Floodplains, and Wetlands

Chapter IV of the Final EIS (located in Volume I) presents the impacts of the Master Plan Update improvements relative to biotic communities (including creeks), wetlands, floodplains. Since the issuance of the Final EIS, information concerning two key areas has been produced:

- Submission of the wetland fill Joint Aquatic Resource Permit Application (JARPA) Section 404 permit application to the U.S. Army Corps of Engineers and further definition of wetland mitigation and Miller Creek relocation mitigation; and
- Survey of raptors in the area of the third runway.

Section 5-5 of this Supplemental EIS contains a discussion of the wetland impacts and a summary of the detailed mitigation plan.

In December 1996, the Port submitted a application to the Army Corps of Engineers for a permit to fill wetlands at Sea-Tac Airport associated with the Master Plan Update improvements in compliance with the Clean Water Act, Section 404. The 404 permit application submitted to the Corps of Engineers includes a completed Joint Aquatic Resources Project Application (JARPA) form, in a report entitled "JARPA Application for Proposed Improvements at Seattle-Tacoma International Airport" dated December 1996.

The Final EIS noted that about 10.4 acres of wetland would be filled in order to complete the proposed improvements. Since issuance of the Final EIS, the Port has refined its evaluation of the projects affecting wetlands, including identification of about 2 additional acres of wetland impacts, and documented its review of in-basin mitigation options, and further defined plans for development of a wetland mitigation site in Auburn.

Based on a refined evaluation of the wetlands, the following impacts were identified:

Project Element	New Data	Final EIS
Runway impacts		
Embankment	5.46	5.48
Borrow Source impacts	1.92	2.38
Runway Safety Areas 16L/R	2.34	Included above
Runway 34R Extension	0.00	0.00
Terminal/Landside		
N. Employee Parking lot	0.81	0.81
Development in SASA	1.70	1.70
Total	12.23	10.40

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To mitigate for the unavoidable impacts to wetlands, the Port proposes to create new wetlands on a 47-acre site of an approximately 69-acre parcel located within the city limits of Auburn, Washington. Wetland mitigation at the Airport, within the watersheds where the impacts may occur, is not feasible for three reasons: (1) most of the area surrounding the Airport is developed, and not enough available land exists in the watershed to create compensatory mitigation wetlands without relocation of additional business and residences; (2) the FAA has indicated that "wildlife attractions" within 10,000 ft of the edge of any active runway is not recommended; and (3) wildlife control activities in wetlands near the airport would conflict with wetland habitat mitigation goals. However, the hydrologic functions the wetlands perform would be replaced at the airport site with the proposed storm water management facilities, and relocation of the drainage channels, and relocation of affected portions of Miller Creek.

In addition, the Port performed a follow-up review of the westside of the airfield to determine if raptors (such the red-tailed Hawk) were nesting in the area. This survey indicated that no nests are occurring, but that raptors forage in the airport area.

5-6 <u>Land Use Impacts</u> (Land Use Compatibility, DOT 4(f), Archaeological/Cultural/ Historic Sites)

As is indicated in **Section 5-3**, aircraft noise impacts are expected to be greater with the new (higher) forecasts for both the Do-Nothing and "With Project" alternatives. The greater noise exposure area would result in greater impacts to population, residences, and other noise sensitive facilities, including schools, nursing homes, hospitals, libraries, parks, churches, and historical sites.

As was noted earlier, a comparison of the "With Project" conditions to the Do-Nothing indicates that the Master Plan Update improvements would result in residential areas experiencing 1.5 DNL or greater increases in aircraft noise exposure. The areas that would experience 1.5 DNL or more increases are located in the west side acquisition area or directly under the north and south approach path to the runway for a distance of about 3 miles to the north and a mile and a half to the south of the third runway. Much of this area overlies the existing Noise Remedy Program boundary, where residences are currently in the process of being sound insulated. While impacts in all future years would be less than current exposure, upon commissioning of the third parallel runway, the contours are expected to lie within the boundaries of the existing Noise Remedy Program in 2004/2005. However, as demand for air travel grows, the noise contours would begin to increase in size. By 2010, residential areas outside the existing Noise Remedy Program boundary would be expected to be exposed to 65 DNL and greater noise levels, an increase of 1.5 DNL or greater than levels under the Do-Nothing condition. By 2010, this area would include about 170 residences.

In addition, about 10 noise sensitive facilities (four schools and three locally significant historic sites - one site is both a school and historic site) are within the 65 DNL noise contour and could experience a 1.5 DNL or more increases in noise when comparing the "With Project" to the Do-Nothing. The properties where the use may be incompatible with the forecast noise are:

1. Sea-Tac Occupational Skills Center (S102) would experience an increase of 4.41 DNL in 2010;
2. Woodside Elementary School (S105) would experience an increase of 3.1 DNL in 2010;
3. Sunny Terrace Elementary School (S106) would experience an increase of 5.2 DNL in 2010;

4. Sunnydale Elementary (S21/A16) would experience a 2.8 DNL increase in year 2010
5. Albert Paul House (A57) would experience an increase 3.9 DNL in 2010;
6. Coil House (N16) would experience an increase of 1.9 DNL in 2010; and
7. Bryan House (A29) would experience an increase of 5.0 DNL in 2010.

Section 5-6 presents a detailed description of the noise sensitive facilities. Future noise, with and without the proposed improvements would be less in the future at all of these sites with the exception of the Bryan House.

Because locally significant historic sites could be exposed to greater noise with the proposed improvements a DOT 4(f) evaluation (located in this Supplemental EIS beginning on Page 5-6-12) was performed, and provides a basis for determining that no 4(f) impacts would occur. Section 106 consultation is underway with the State Historic Preservation Officer (SHPO) to determine if these sites are eligible for inclusion in the National Register of Historic Places.

The following land use related mitigation is proposed:

<u>Mitigating Significant Noise Impacts on Public Facilities and Locally Significant Historic Sites</u> - Impacts on the residential and school/educational use facilities will be mitigated by acoustical insulation that would allow their uses to be compatible with increased noise levels. Two of the schools are currently not being used for educational uses, and future plans for these buildings need to be confirmed with the Highline School District. Port Commission Resolutions 3125 and 3212 and the 1993 Update to Sea-Tac's Part 150 Noise Compatibility Program contain Port intentions to expand the Airport's insulation programs for public buildings. The Port has been discussing school insulation with the Highline School District, and through Resolution 3212 has agreed to commit $50 million to the insulation of schools. Depending upon the District's designation of the long-term use of the two impacted schools and on the District's desire to have these buildings insulated, they would undergo insulation treatment as needed for compatibility independent of a formal school or public building insulation program. The residences would be addressed by the existing Noise Remedy insulation program if the owners agree. Because of their historic value, these facilities could require custom treatment to avoid significant alternation of the architectural style. In pursuing sound insulation of these structures, the Port's Noise Remedy Office will work with a historian to preserve such characteristics.

<u>Provide Directional Soundproofing</u>: Residences that were insulated prior to 1992 may need additional directional soundproofing to mitigate noise generated from a new flight path from the operation of the proposed new third runway. To mitigate noise caused by the proposed airport improvements, these facilities would be further insulated. The Port of Seattle estimates that some 60 to 70 houses were evaluated and/or insulated prior to 1992 and could require additional soundproofing at a cost of about $6,000 to $10,000 per residence. The additional sound insulation measures that could be required include new windows, new doors, and thicker walls.

<u>Acquisition in the Approach Transitional Area</u> - In recognition of the fact that the standard Runway Protection Zone (RPZ) dimensions do not always provide sufficient buffer to the satisfaction of nearby residents, the FAA has indicated that funding could be available to airport operators acquiring "up to 1,250 feet laterally from the runway centerline, and extending 5,000 feet beyond each end of the primary surface.[4] Based on the configuration of current airport land, local streets, and residential development patterns, the approach and

[4] FAA Memorandum, Action: Land Acquisition - eligible Runway Protection, Object Free Area and Approach and Transitional Zones, dated April 30, 1991.

transitional area selected for use as a potential mitigation area includes the standard Runway Protection Zone and a rectangular extension of the RPZ outward another 2,500 feet.

The acquisition of properties within the approach transitional areas north and south of the proposed runway may serve as a feasible and appropriate mitigation measure. This measure would involve the acquisition of all residential uses, and any vacant, residentially zoned properties which cannot be compatibly zoned, within selected areas both to the north and the south of the new runway ends. Commercial land uses, which make up most of the eligible area to the south, need not be acquired and may remain in place on both runway ends.

In the northern approach transitional area, 82 single-family residential parcels, 2 apartment buildings (with 28 units), and 2 mobile home parks, with 96 units, would be acquired. To the south, 71 single-family residential parcels and 6 apartment buildings (with 32 units) would be acquired. Based on the current assessed value of these 309 residential homes and multi-family buildings, it is estimated that the cost of acquisition and relocation would be approximately $35 million.

As was noted in the Final EIS, input from the affected residents is necessary to design and initiate an acceptable relocation program. Such input was solicited during the Draft EIS's 90-day public comment period and through display boards, which were created and used at the June 1, 1995 Public Hearing for the express purposes of soliciting feedback from the affected residents concerning this action. As is shown in Appendices R and T of the Final EIS, few comments concerning the program were received. Therefore, as the probable impact of low flying aircraft would not be experienced until the opening of the proposed new parallel runway, this option will receive further consideration during the forthcoming Sea-Tac Airport FAR Part 150 Update, which the Port anticipates undertaking during 1997. It is anticipated that during the Part 150 Update, the Port would further explore this action with the specific residents within the Approach Transition Area, and, if the residents so desire, establish a program including relocation objectives, timing and funding priorities.

<u>Sound insulation of residences affected by 1.5 DNL or greater within 65 DNL noise exposure</u> - Approximately 1,000 residents living in 460 housing units would be impacted by 65 DNL in 2010 as a result of the proposed improvements in comparison to the Do-Nothing alternative. About 170 of these homes within 65 DNL would be exposed to a 1.5 DNL higher noise levels as a result of the proposed improvements and are not already subject to the Port's existing Noise Remedy Program. No residential areas outside the existing Noise Remedy Program boundaries would experience 1.5 DNL increases in year 2005 as a result of the proposed improvements.

The Port will develop an implementation strategy to sound insulate these 170 additional homes within the 65 DNL noise contours as part of the Part 150 Noise Compatibility Plan study effort that will be initiated in 1997. The purpose of delegating finalization of the implementation approach for this action to determination during the Part 150 is to ensure that consideration is given to the proposed Approach Transition Area acquisition and the relationship of that area to the existing Noise Remedy Program boundary, as well as the westerly expansion of the Noise Remedy Program to accommodate this added insulation.

Port Resolution 3125 dated November 1992 states "Port staff is also directed to develop and implement an plan to insulate up to 5,000 eligible single family residences in the existing noise remedy program included on the waiting list as of December 31, 1993, before commencing construction of the proposed runway. The remaining eligible single family residences on the waiting list are to be insulated prior to operation of the proposed runway. In addition, the Port commits to complete insulation of all single-family residences that become eligible for insulation as a result of actions taken based on the site-specific EIS and are on the waiting list as of December 31, 1997, prior to commencing operations of said runway."

For the purpose of the Resolution, the term "eligible" is all single family properties located within the Noise Remedy Boundary, as established by the Port's 1985 Part 150 Study, with the exception of homes built after appropriate building codes were enacted after the Part 150 Study in 1985. As a result of this resolution and on-going implementation of the Part 150 Study, residents located in the Noise Remedy Boundary have come to expect the Port to complete the program, regardless of future airport facility improvements. Therefore, included as mitigation for implementing the third parallel runway, the Port agrees to insulate these single family residential areas regardless of the existing or future noise exposure.

5-7 Other Environmental Issues

Section 5-7 of the Supplemental EIS summarizes the environmental impacts associated with the remaining environmental issues. The new information, and the new forecasts, are not anticipated to result in a notable change in the impacts in the following areas. As a result, the findings in the Final EIS were summarized in this section.

1. Prime and Unique Farmland,
2. Social Impacts,
3. Human Health,
4. Induced Socio-Economic Impacts,
5. Water Quality,
6. Coastal Zone Management and Coastal Barriers,
7. Wild and Scenic Rivers,
8. Public Services and Utilities,
9. Earth,
10. Solid Waste,
11. Hazardous Waste and Materials,
12. Energy Supply and Natural Resources, and
13. Aesthetics and Urban Design.

Since publication of the Final EIS in February 1996 and the Draft Supplemental EIS in February 1997, two additional studies have been completed concerning water resources in the Airport vicinity. Section 5-7 of the Final Supplemental EIS summarizes the conclusions of these studies and the effects on the analysis presented in the Final EIS and Supplemental EIS.

Numerous appendices are included in this Supplemental EIS. **Appendix A** contains responses to comments on the February, 1996 Final EIS. **Appendix B** contains the final air conformity analysis. **Appendix C** contains a detailed presentation of the technical analysis presented in Chapter 5. **Appendix D** provides an evaluation of year 2020, based on conditions presented in Chapter 5.

As was noted previously, **Appendix F** contains a summary of the comments received on the Draft Supplemental EIS and responses to those comments. **Appendix G** contains the comments received concerning the Draft Supplemental EIS and updated draft air conformity analysis.

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CHAPTER 2

IMPACT ON PROJECT DEFINITION AND PURPOSE AND NEED

The need for airport master plan improvements are identified and scheduled based on the relationship of existing and future demand to the level of service afforded by the existing facility. Therefore, if activity levels grow slower than was forecast, facilities could be scheduled before they are needed. Conversely, if demand grows faster than anticipated, facilities could be needed sooner than the schedule indicates. The Master Plan Update improvements for Sea-Tac Airport were identified based on a forecast of aviation activity (enplaned passengers and aircraft operations), in which enplaned passengers were anticipated to grow at a rate of 2.4% per year and operations at a rate of 0.8% per year. Terminal and landside facilities were to be phased-in in a manner that would make facilities available in time to address the demand.

As is shown by the analysis presented in this chapter, aviation demand is forecast to increase above the levels predicted by the Master Plan Update. The new Port of Seattle forecast indicates that aircraft operations are anticipated to reach 474,000 annually by 2010, a level that is about 17 percent greater than the Master Plan Update forecast. Enplaned passengers are anticipated to reach 17,900,000 by 2010 or nearly 5-8 years sooner than was forecast by the Master Plan Update. These new forecasts are based on new information concerning air fares and Puget Sound Region per capita income. As these forecasts exceed the operating capability of the existing airfield, a Do-Nothing forecast of 460,000 annual operations was identified.[1/] These forecasts serve as the basis for evaluating the environmental issues presented in Chapter 5.

Based on the new forecast, the purposes and needs identified by the Master Plan Update were examined. As the Master Plan Update improvements were identified to address specific needs in specific timeframes, the primary effect of this accelerated demand is that terminal and landside facilities could be needed earlier than originally anticipated. The need for the third parallel runway would not be affected by the accelerated demand because its primary purpose is to address existing airport constraints, to reduce delay, and to improve the reliability of the existing airfield during poor weather (a condition that occurs 44% of the year).

This chapter presents:

- New Aviation Demand Forecasts
- Effects of New Aviation Demand Forecasts on Purpose and Need
- Impact of the Forecasts on the Master Plan Update Improvement Projects
- Long-Term Development Capability of Sea-Tac Airport

The environmental impacts of a demand forecast that is higher than predicted by the Master Plan Update is presented in Chapter 5 of this report.

1/ The Flight Plan Study, referenced by the Master Plan Update Final EIS, identified a maximum operating capability of the existing airfield at 460,000 operations. This Supplemental EIS reaffirmed this constraint.

1. NEW AVIATION DEMAND FORECASTS

Aviation demand forecasting is often incorrectly perceived as a science, where all variables are predictable and known. However, as is shown by comparing any forecast to conditions that actually occur during the period that was forecast, forecasting is more an art than a science. As a result, precise forecasting for specific future years, particularly years more than 10 years in the future in the volatile air travel industry, is very difficult. It is not uncommon for forecasts to show more or less airport activity for a particular year than actually occurs. When forecasts turn out to be different than the subsequent actual experience, it is sometimes the amount of future growth which does not match reality, but much more often is the difficulty in forecasting the precise timeframe in which specified amounts of growth will occur. Although forecasts for near-term years may not match actual experience, typically those differences are relatively small. For more distant years, forecasting is much more uncertain. This uncertainty is inherent in the nature of forecasting and the nature of the air travel industry and cannot be cured by changing forecasting techniques. Multiple forecasts performed at the same time may reach different conclusions, but there is no reliable way of determining which is more likely to be correct than another. The FAA and the Port of Seattle have performed the most reliable forecasts they can, given this uncertainty. Several forecasts performed for different purposes have been compared and their conclusions are within a reasonable range.

This section summarizes the new forecasts that have been prepared since issuance of the Final EIS.

A. Revised Forecasts

In December 1996, the Federal Aviation Administration headquarters Office of Policy and Plans issued its fiscal year 1997 Terminal Area Forecast (TAF) for Seattle-Tacoma International Airport that showed that forecast demand could grow significantly faster than was predicted by the Master Plan Update. In response to these forecasts, and in an attempt to validate the work of the FAA, the Port of Seattle prepared a new (updated) demand forecast. **Table 2-1** contrasts the two demand forecasts. The Port's new forecast, while slightly lower than the FAA's forecast, shows that demand could grow faster than was previously identified, based on several new or updated information.

TABLE 2-1

COMPARISON OF DEMAND FORECASTS
(Master Plan Update, FAA TAF, and new Port of Seattle forecast)

Unconstrained ("With Project") Aviation Demand Forecast Comparison

	1995	2000	2005	2010
Operations				
Master Plan Update	N/A	379,200	392,500	405,800
FAA 1997 TAF	386,536	433,470	478,050	528,200
New Port of Seattle	386,536	409,000	445,000	474,000
Enplaned Passengers				
Master Plan Update	N/A	11,900,000	13,600,000	15,300,000
FAA 1997 TAF	11,386,000	13,920,000	16,290,100	18,950,000
New Port of Seattle	11,386,000	13,700,000	15,700,000	17,900,000

N/A = Not available

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The following subsections summarize the methodology and results of the new FAA and Port forecasts.

1) FAA Terminal Area Forecasts

Each year the FAA prepares a Terminal Area Forecast (TAF) for the busier airports in the country. These forecasts are prepared for FAA purposes, such as "developing its program plans and in assessing the level of resources needed to meet anticipated demand for its services."[2] While FAA also indicates that these forecasts could be used by local airport authorities in airport planning activities, the information is not prepared at a refined level (such as by fleet mix or peak periods) to enable their use in evaluating environmental impacts at a major air carrier airport. In addition, the FAA's TAF does not reflect existing facility constraints or proposed future airport improvements. **Table 2-2** lists the FAA's fiscal year 1997 TAF for Sea-Tac.

TABLE 2-2
FISCAL YEAR 1997
FAA TERMINAL AREA FORECAST

Federal Aviation Administration Terminal Area Forecast

Year	Annual Operations	Enplaned Passengers
1995	386,536	11,386,500
2000	433,474	13,920,000
2005	478,053	16,290,000
2010	528,205	18,950,000

Source: Federal Aviation Administration, December 1996.

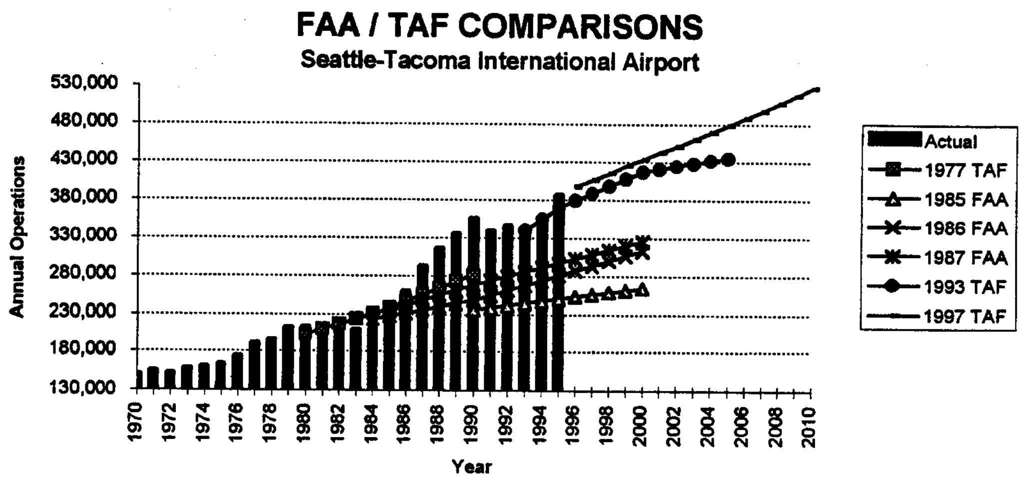
The TAF was prepared using a linear multiple regression technique based on actual data through the year 1995.[3] The fiscal year TAF for Sea-Tac is predicated on the following:

- Domestic air fares are anticipated to continue to decline at a rate of 1.2% while international airfares are anticipated to increase;
- Domestic air carrier passengers are anticipated to grow at an annual growth rate of 3.4% while international passengers are anticipated to grow at 0.6% per year;
- The domestic air carrier load factor (actual percentage of passenger occupying available seats) was assumed to remain constant at 65.3%;
- Air carrier seats per departure could increase from 153.4 in 1995 to 158.6 in 2010, based on recent year changes at Sea-Tac;
- Commuter passengers were forecast as a function of FAA's forecast of national trends in domestic enplanements;
- Commuter operations could increase at a rate of 3.8% per year, with an average seats per departure increasing from 30 in 1995 to 47.1 in 2010.

[2] *Terminal Area Forecasts - Fiscal Years 1992-2005*, FAA, July 1992, Preface page
[3] FAA internet file: http://api.hq.faa.gov/apo_pubs.htm - table of contents - page 3, Forecast Process

The FAA prepares a Terminal Area Forecast each year, based on the most recent information on how factors that affect the demand for air travel are changing. Thus, it is important to consider how accurate the FAA's TAF process has been in the past at predicting growth in air travel. **Exhibit 2-1** shows a comparison of past TAF forecasts to actual annual aircraft operations. As is shown, TAF forecasts for Sea-Tac during the mid 1980s significantly underestimated actual activity levels.

EXHIBIT 2-1



The graph above compares actual activity with forecasts that were prepared in earlier years. As this chart shows, the actual activity shows a greater deviation from the forecast further out in time, reflecting the inherent difficulties in forecasting.

2) Port of Seattle Updated Forecasts

In preparing updated forecasts for the Airport, the Port examined two specific conditions:

- Demand Forecast -- "With Project" forecast: this forecast represents an unconstrained level of demand for air travel within the Puget Sound Region. It represents the total passengers that wish to fly assuming that sufficient facilities are available to accommodate the demand. This level of activity is presumed to occur with the "With Project" alternative;
- Activity Forecast - Constrained "Do-Nothing" forecast -- this forecast represents the level of activity that the existing facilities at Sea-Tac Airport are capable of accommodating due to constraints in the airport system. These constraints could result in less than the total demand being satisfied, if demand exceeds the capability of the system.

In preparing the forecasts, first the demand for air travel was identified. The extent of the constraints associated with the existing airfield, terminal facilities, support facilities, and landside/roadway system were then identified. Then, the passengers and resulting aircraft operations forecast were prepared based on the capabilities of the system to serve that level of activity. At the point where demand exceeds the capability of a constrained system, a lesser amount of activity could be accommodated by the existing facilities (referred to as the Do-Nothing condition) versus after completion of the Master Plan Update improvements (referred to as the "With Project").

The forecasts analyzed by this Supplemental EIS reflect projected air travel demand of nearly 18 million enplaned passengers that is now predicted to occur by 2010. The Master Plan Update predicted air travel demand and identified terminal and landside improvements to address 19 million enplanements, which was predicted to occur in 2020. It is an important distinction to make that the Master Plan Update improvements were identified to accommodate a *demand*, that was once thought might occur in year 2020. Based on the new forecasts, demand could likely approach 19 million enplanements between 2010 and 2015 (about 7-8 years sooner). As this report demonstrates, greater degrees of uncertainty exist concerning the timing and amount of demand in the outlying years, as the aviation industry appears to be emerging from a decade of high volatility. Because of the uncertainty, this analysis addresses impacts through the year 2010. Appendix D presents an analysis of possible environmental impacts in 2020, based on an extrapolation of conditions in 2010.

A detailed discussion of the preparation of the new Port of Seattle Forecasts are discussed in *Working Paper 1 - Unconstrained Aviation Forecast Update* and *Working Paper 2, Constrained Aviation Forecast Update, Forecast Update, Capacity Analysis and Landside Evaluation for Seattle-Tacoma International Airport*, prepared by P&D Aviation dated January 1997. This report is incorporated by reference and is available for public review during normal business hours at the FAA offices in Renton, Washington, and the Port of Seattle Offices at Sea-Tac Airport. The following summarizes the methodology and results of the two Port forecasts.

(a) Demand Forecast -- With Project Forecast

In updating the prediction of future aviation demand, the variables that affect demand were examined. The following primary characteristics were updated:

- passenger airfares,
- demographics of the Puget Sound Region, including population and per capita income was updated from 1992 PSRC data to 1994 PSRC data; and
- actual airport activity.

In preparing the new demand forecast for Sea-Tac Airport, the same forecast model that was used in the Master Plan Update was used. However, the Master Plan Update model was updated to reflect current activity and current growth tends. To estimate the largest component of passenger activity (domestic passengers), this model relies on two principal variables: personal income in the Puget Sound Region, and average domestic airfares.

The Master Plan Update forecast used projections of per capita income prepared by the Puget Sound Regional Council (PSRC) through the year 1992. In 1994, the PSRC updated the per capita income projection for the region, assuming that it would increase at a slightly slower rate than was previously anticipated. By itself, this new assumption would likely produce less demand for air travel.

During the Master Plan Update, many in the aviation industry anticipated that average air fares would begin to increase as a result of tremendous financial losses and airline consolidations that had been experienced during the late 1980s and early 1990s. However, the Port's new forecasts assume that airfares are likely to continue to decline. In the last several years, there has been an increase in new-entrant, low-cost airlines which has produced greater competition for passenger service. The FAA and other industry forecasters now expect the current trend toward declining airfares to continue. The Port's new forecast assumes that airfares would continue to decline at a rate of 1.2% annually through the year 2007. However, between 2005 and 2010, the Port anticipates that average airfares could decrease but at a slower rate. Based on published reports,[4] average Sea-Tac airfares per passenger mile have declined slightly faster than the average U.S. airfare due to competition created by Southwest Airlines and other low cost operators at Sea-Tac. Current airfares at Sea-Tac are about 17% less than the U.S. average. Thus, it is anticipated that this margin would shrink before 2010, as more eastern U.S. markets are penetrated further by low-cost carriers.

While a slightly slower per capita income assumption would result in slightly less passenger demand, the decreased air fare assumption produces an anticipated increase in demand for air travel. Thus, domestic enplanements are anticipated to increase from 10.6 million in 1995 to 15.7 million in 2010 -- an annual growth rate of about 2.5%. **Table 2-3** summarizes the new "With Project" forecast.

TABLE 2-3

UPDATED DEMAND FORECAST
"With Project" Conditions

	Actual 1995	Forecast 2000	Forecast 2005	Forecast 2010
Enplaned Passengers:				
Domestic	10,600,000	12,400,000	14,000,000	15,700,000
International	800,000	1,300,000	1,700,000	2,200,000
Total Enplanements	11,400,000	13,700,000	15,700,000	17,900,000
Origin and Destination EPS	7,900,000	9,450,000	10,800,000	12,250,000
Aircraft Operations:				
Air Carrier	222,000	262,000	298,000	328,000
Air Taxi/Commuter	138,000	116,000	114,000	110,000
All-Cargo	16,000	20,000	22,000	25,000
Gen. Aviation/Military	11,000	11,000	11,000	11,000
Total Operations	387,000	409,000	445,000	474,000
Tons of Cargo	408,000	509,000	621,000	732,000
Average Day Operations	1,060	1,121	1,219	1,299
Peak Month/Average Day	1,198	1,246	1,352	1,423
Peak Hour Operations	75	78	94	99

EPS = Enplanements

Source: Port of Seattle and P&D Aviation. The Demand forecast represents the unconstrained demand seeking air travel from Sea-Tac. However, as the new parallel runway would not be completed until 2005, the year 2005 peak hour and peak month average day reflect constrained demand.

Because this projection represents an unconstrained level of activity, which could be accommodated efficiently with the proposed Master Plan Update improvements, it was used to assess the impacts of the "With Project" condition presented in Chapter 5.

[4] For example, the General Accounting Office GAO/RCED-96-79 "Airline Deregulation: Changes in Airfares, Service, and Safety at Small, Medium-sized, and Large Communities" April 1996.

(b) Activity Forecast -- Do-Nothing Forecast

The 1996 Final EIS indicated, based on the 1992 Flight Plan Study evaluation, that the annual service volume of the existing airfield is approximately 380,000 operations, but that a greater level of activity could be accommodated assuming users are willing to withstand greater inefficiencies (i.e., delay). The Flight Plan found that the capacity of the existing airfield could be expanded to about 460,000 annual operations as hourly peaks are spread (either through delay or flight scheduling). Using the Master Plan Update forecasts, demand was not projected to be high enough to exceed this constraint [The Master Plan Update forecast 19 million annual enplanements carried on 441,000 operations in year 2010]. However, based on the unconstrained demand identified by the new forecasts, the existing airfield is not capable of accommodating more than 460,000 annual aircraft operations, which is now anticipated to occur by the year 2008.

The review of activity constraints first focused on the individual capability of the airfield and the terminal/landside. As is shown in the following summary, the airfield has hourly operating constraints, which are higher than the constraints of the terminal and landside system. As a result, it is believed that passenger behavior would evolve as congestion mounts, without a loss in demand until the maximum airfield operating capacity is exceeded. Such an evolution would result in passengers incurring additional time accessing the Airport (either through congestion on the roadway system, difficulty in finding parking at the Airport, waiting in ticket check-in lines, etc.). This is the historical trend of busy, congested airports throughout the world. As a result, airfield capacity represents the greatest constraint in accommodating passenger demand.

This analysis identified an activity forecast that would likely occur if no improvements were made in the existing airport facilities, based on the following information concerning Sea-Tac Airport constraints:

Airfield Constraints - Based on the updated forecast, a review of the constraints of the existing airfield was performed.[3] This review considered: delay, airline scheduling flexibility, and passenger demand for air travel. Early studies conducted concerning Sea-Tac's existing capacity, identified 380,000 operations as the annual service volume of the Airport. This level of activity has been interpreted as an ultimate limit on the level of activity that could be accommodated by the two parallel runways. However, as is shown by current actual activity levels, demand for air travel at Sea-Tac produced nearly 387,000 operations in 1995 and 395,200 in 1996. The 380,000 annual service volume represents the threshold where inefficiencies in the airfield operating system become highly visible. As activity has exceeded the annual service volume, delay has increased.

During the FAA's 1995 Capacity Enhancement Update, delay during various operational modes was evaluated. That study confirmed the earlier capacity study, that found significant delays occur at Sea-Tac Airport during poor weather due to the close spacing between the existing parallel runways. **Table 2-4** lists projected delay associated with two forecast activity levels evaluated by the 1995 FAA Capacity Enhancement Update.

The 1992 Flight Plan Study Environmental Impact Statement found that the maximum theoretical capacity of the existing airfield is 460,000 operations, assuming that operations are extended into the late evening and early morning, and

[3] *Working Paper 2, Constrained Aviation Forecast Update, Forecast Update, Capacity Analysis and Landside Evaluation for Seattle-Tacoma International Airport*, P&D Aviation, January 1997.

that greater levels of delay would be experienced. As the demand for air travel is now forecast to exceed this maximum capacity, the issue of maximum capacity was reconsidered as part of this Supplemental EIS. As is shown by the following paragraphs, the Flight Plan Study maximum capacity analysis was reaffirmed as 460,000 annual operations.

TABLE 2-4

AVERAGE ALL-WEATHER DELAY

	Average Delay (minutes) Existing Airfield			
Operations	Arrival	Departure	Estim. Taxi	Average Operation
345,000	7.7	1.3	0.1	4.5
425,000 *	22.2	2.6	0.2	12.4
525,000 *	63.7	11.6	0.4	37.7

ARRIVAL DELAY

	Average Arrival Delay (minutes) Existing Airfield					
Operations	VFR1	VFR2	IFR1	IFR2/3	IFR4	All-Weather
345,000	1.0	11.4	21.7	21.7	333.2	7.7
425,000 *	1.6	41.8	71.2	101.0	524.5	22.2
525,000 *	3.1	163.6	181.3	219.4	711.9	63.7

Source: FAA Capacity Enhancement Update, Data Package No. 12, June, 1995.
* Assumes full implementation of the 2.5 nautical mile separation.

Exhibit 2-2 contrasts the results of the 1995 Capacity Enhancement Plan Update with actual current delay data, as reported by the FAA's Airline Service Quality Performance (ASQP) data. The ASQP is data collected by the airlines and reported to the FAA as a measure of the airline's on-time performance. As is shown, the computer model (SIMMOD) predicted levels of delay (identified by the curve) correspond to the actual delays reported by the ASQP data. Also shown on this chart are three ranges of activity-to-delay relationships, based on the existing fleet mix: 1) practical capacity as defined by the National Plan of Integrated Airports System (NPIAS) at 4-6 minutes of delay; 2) severely congested delay, as identified by the NPIAS at 9 minutes; and 3) a theoretical maximum capacity, assuming a constant fleet mix, based on delay actually that occurred at the busier airports.

To identify a more realistic maximum capacity level, delay at busier U.S. airports was examined. It is reasonable to assume that if delay could reach these extreme levels at other capacity constrained busier airports, that it could also reach those levels at Sea-Tac. Using the FAA's Airline Service Quality Performance (ASQP) data, the average total delay (in minutes) experienced at 10 of the busiest U.S. airports was considered. During the first eight months of 1996, the greatest levels of delay were experienced at two of the New York area airports (Newark and JFK) with 16.79 and 17.24 minutes of total average delay. The corresponding delay level at Sea-Tac was 10.72 minutes. As is evidenced by the New York airports, where demand exceeds capacity (and JFK where a Federally imposed rule caps peak hour activity), demand has grown; with the growth in activity, delay has increased. Assuming that airlines chose to satisfy the demand at Sea-Tac, delay would increase commensurably with the present airfield. Activity levels at Sea-Tac could range from 425,000 to 450,000 based on the existing fleet mix and demand profile, assuming that 15-20 minutes of delay experienced at these other U.S. airports.

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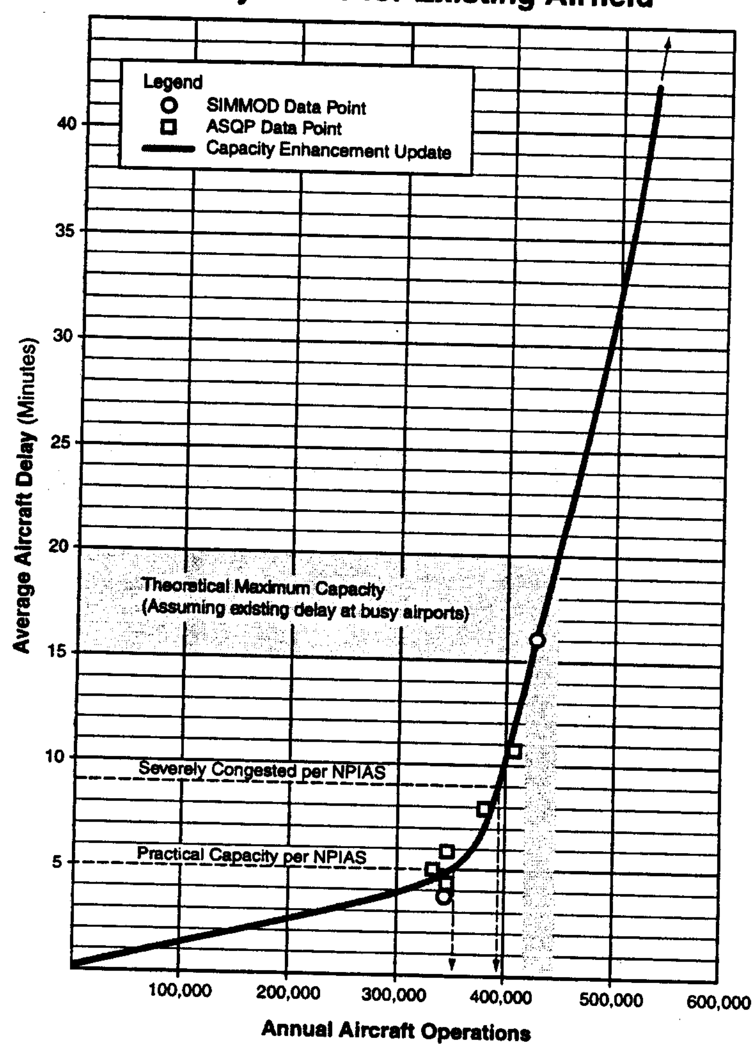
Based on data produced during the FAA's Capacity Enhancement Plan, the average weather weighted level of hourly operations that could be accommodated by Sea-Tac's existing airfield was calculated as 82.5 operations (arrivals plus departures) per hour. This hourly capacity would be higher during VFR1 conditions and lower during VFR2 and IFR conditions. To calculate an extreme capacity of the existing airfield at Sea-Tac, this hourly capacity could be multiplied by the number of hours in a day, and days in the year. Theoretically, 481,800 operations would be accommodated, reflecting that air travel demand is typically concentrated into a 16 hour period (6 am to 9 p.m.) based on today's fleet mix and passenger demand profile.

EXHIBIT 2-2

Delay Curve for Existing Airfield



During Visual Flight Rule conditions, about 99 operations an hour can be accommodated on the existing airfield. However, when weather worsens to

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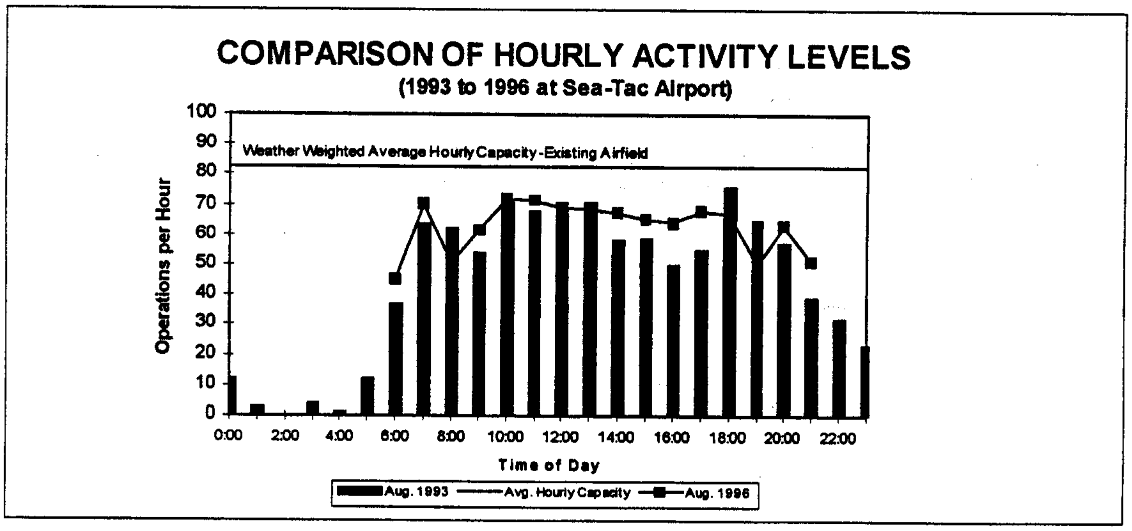
VFR2,[6] the operating capacity decreases 43% to 57 operations an hour. When weather further worsens to IFR 1/2 conditions, the hourly capacity decreases to about 50 operations (a decrease of 50% from VFR1). **Exhibit 2-3** shows the existing hourly activity levels relative to the all-weather existing hourly capability.

EXHIBIT 2-3



The unconstrained forecast indicates that over the next 10-15 years the average seat size of aircraft operating at Sea-Tac would increase from 155 seats in 1993 to 161, 166, and 170 seats per aircraft in 2000, 2005, and 2010, respectively. The percentage of aircraft with 170 seats or more is anticipated to increase from 32.2% in 1993 to 42% by 2010. Because there would be more larger aircraft in the fleet in the future, requiring greater separation, capacity would be reduced. Based on the 481,800 maximum capacity, the greater separation requirements of larger aircraft would likely result in a three to four percent reduction in capacity. The reduced separation standard, due to B757 wake vortex issues, was enacted in mid 1996,[7] and is not reflected in the hourly capacity of 82.5 operations per hour. FAA anticipates that this rule would reduce existing hourly capacity by about two percent.

Adjusting the maximum hourly operations capacity at Sea-Tac for fleet mix and traffic separation requirements, places the hourly weighted operations capacity between 456,000 and 464,000. Therefore, the mid-point of 460,000 reflects a revalidated maximum existing airfield capacity. This level of aircraft operations would translate to about 17.8 million enplanements. The ability to accommodate more than 460,000 annual operations with the existing airfield is limited by the traveling public's desire to fly at certain times. These phenomenon are discussed in detail in Appendix R of the Final EIS.

<u>**Terminal/Landside Constraints**</u> - As was noted in the Final EIS, the terminal and landside facilities represent less of a constraint than the existing airfield. Terminal and landside facilities, similar to the airfield, can deteriorate with lower levels of service, and still service the traveling public. Passenger trip behavior would

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[6] VFR2 or worse weather (IFR) occurs 44 percent of the year. Source of hourly operating capacity, FAA Capacity Enhancement Study

[7] "Wake Vortex Analysis Preliminary Results (Annotated Slides)" CAASD by Mitre Corporation, July 1996.

evolve, as has occurred in the past at other busy airports, where efficient terminal and landside facilities are not available.

In evaluating the terminal/landside constraints at Sea-Tac, focus was placed on several components: gate usage, passenger check-in/ticket space, baggage claim, terminal drives, and parking. In 1995, Sea-Tac's 75 gates served an average of 253,330 passengers per narrow body equivalent gate (NBEG).[8] In comparison, Los Angeles International Airport (LAX) accommodated 358,170 passengers per gate and San Diego accommodated 366,970 passengers per gate. Other airports, such as Pittsburgh and O'Hare, before their current/most recent improvements, processed passengers per gate significantly higher than theses rates, closer to 430,000 - 450,000 passengers per NBEG. In addition, airports achieve these levels through the use of remote aircraft parking or hardstands, such that passengers are bussed from a central terminal to a remote aircraft parking location, using existing pavement. When air travel demand at Sea-Tac reaches 19 million enplanements (now forecast to occur after the year 2010), the average NBEG would reach 422,200 passengers/NBEG. Clearly, by comparing Sea-Tac to conditions at other airports prior to recent expansion programs is an indication that severely congested gate and terminal conditions are not sustainable over a long period. Thus, constraints at the gates and terminal would likely prevent this level from being reached. With remote hardstanding (a paved aircraft parking area where passengers are bussed from the terminal to the aircraft) of aircraft, it is assumed that 398,000 passengers per NBEG would be served at Sea-Tac. This would correspond to about 17.9 million enplanements.

The capacity of the terminal is also a function of the passenger ticketing or check-in areas. Variability in passenger check-in space is a function of check-ins that occur at the terminal curbside, check-in at the gates and airline clubs, security requirements on check-in, as well as the most recent inauguration of electronic ticketing. In 1995, about 4,600 peak hour enplanements, with 3,200 originating passengers, occurred at Sea-Tac and were served in about 29,000 square feet of lobby space. This would translate to 13 square feet per originating passenger. This equates to a level-of-service of D (adequate level of service, condition of unstable flow, unacceptable delay for short periods; adequate level of comfort),[9] based on International Civil Aviation Organization terminal guidelines. When Sea-Tac reaches 17.9 million enplanements, about 6,300 peak hour enplanements or 4,410 originating enplanements, are expected to occur. This would translate into 6.6 square feet per passenger -- or LOS F (inadequate level of service, severe congestion). As a likely result, increased pressure would occur for passengers to check-in at locations other than the terminal lobby, such as at the gate locations. While the use of other existing check-in locations would increase the passenger per square footage of lobby space, the conditions would likely still produce a LOS F. As a consequence, the delays and length in the ticket counter queues would increase such that the total travel time (time the passengers leave their home/hotel/office until they board a flight) would increase, resulting in passengers having to plan to arrive earlier at Sea-Tac in order to avoid missing their flights. This would not produce significant changes in travel behavior, but would continue to flatten the peaking characteristics of passenger access to Sea-Tac. Baggage claim space requirements are typically less of a constraint to capacity as delays in obtaining baggage do not result in passengers missing flights. However, like the ticket check-in process, passenger total travel time would increase as they await

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8/ The NBEG is a measure of gates which normalizes the number of gates reflecting the differences in sizes between a widebody gate and a narrowbody gate, using a 150 seat aircraft as a reference.

9/ The scale of level-of-service ranges from LOS A, which is the most efficient/least congested, to LOS F, which is most congested/least efficient.

baggage on return trips. In turn, passengers using Sea-Tac would be more likely to carry bags on-board flights rather than wait in line to check bags.

In the future, the regional roadway system is anticipated to continue being congested regardless of the improvements at Sea-Tac Airport, as was shown in the Final Environmental Impact Statement. The Airport and regional roadway system are already operating at congested levels of service during peak operating periods. The Airport's existing curbside roadway system would reach critical capacity between noon and 1 p.m. when Sea-Tac reaches 14 million enplanements (around the year 2000), with the upper roadway system being at capacity first. When the Airport's curbside reaches capacity, passenger behavior would likely change. This could include: passengers and visitors arriving earlier for flights; passengers driving directly to the parking garage, instead of being dropped-off at the curbfront; checking-in passengers may have visitors drop them off at the deplanement level (lower level) curbfront; passengers would use off-site parking facilities and drop-off features; and visitors may not accompany passengers to the Airport.

As a result, passengers would be likely to spend an even greater quantity of time in the airport system, as roadway and parking travel time uncertainty increases. The landside modeling assumed that existing mean arrival and departure times for Sea-Tac passengers and visitors is about 30 minutes. With increased congestion in the terminal and landside system, this was assumed to increase to 45 minutes. More simply stated, to ensure that passengers do not miss their flights, they would be likely to leave their origination location earlier to assure that time is allowed in the roadway system and that sufficient time exists to park and get to the gate.

One question raised by the increasing level of terminal/landside congestion and lower level of service, is how this might affect passenger desires to drive versus fly. As is shown in the Final EIS (Page II-1 through II-5), other modes of transportation are not a feasible alternative, even with increasing roadway congestion, because less than 5% of passengers are traveling to locations within a reasonable driving distance. In addition, the amount of delay incurred on the regional roadway system would not likely be offset by the difference in the overall travel time of driving versus flying.

The passenger forecast noted in this analysis represents the number of people who are seeking air travel. As this forecast represents the demand for travel, passengers would likely increase their ground trip travel time by 15 minutes or less because of a less efficient airport system in the Do-Nothing condition. This would reduce the peak hour number of passengers accessing the Airport, from 6,300 in an unconstrained demand to 5,930 passengers with facility constraints.

Based on these constraints, a Do-Nothing forecast was prepared, as shown in **Table 2-5.**

As is found when comparing the unconstrained forecast ("With Project") to the constrained forecast (Do-Nothing), Sea-Tac is anticipated to accommodate the entire annual passenger demand for air travel assuming the levels of activity currently forecast to occur through the year 2010. While the annual demand for air travel would be accommodated, because demand would exceed the operating capabilities of the Airport system, peak hours of aircraft operations would begin to flatten and during peak hours, the hourly demand would not be satisfied. Instead, slight shifting of flights and passengers would occur, especially as demand approaches the airfield constraint of 460,000. **Table 2-6** presents the comparison of the Unconstrained ("With Project") demand to the Constrained (Do-Nothing) activity levels for the peak hour, peak month/average day (PMAD), peak month, and for the year.

Because air travel demand would not exceed the maximum annual capacity until around 2008, Sea-Tac would likely accommodate all of the forecast demand for air travel until that time. It is important to note that the peak hour of demand is being affected today by the constraints of the existing airfield. As is shown in **Table 2-6**, 88 operations could be accommodated during the peak hour if additional airfield capability were available. However, due to the constraints, it would likely not exceed 78 operations. In all years, there would likely be a slight difference in the aircraft operations levels during the peak month between what a constrained or unconstrained airfield could accommodate, because of the hourly levels of activity. Peak hour operations, if unconstrained by facilities, could reach 99 operations an hour by 2010. However, if constrained by airport facilities, peak hour operations would not exceed the present airfield capability of 82 operations per hour. On a peak month average day (PMAD) basis, constrained operations in 2010 would be about 5% less than the unconstrained (unconstrained at 1,423 operations and 1,360 constrained operations). Based on the estimated spreading of operations during the PMAD, peak hour enplanements in 2010 are projected to decrease from 10.1% of PMAD enplanements to 9.5%.

TABLE 2-5

UPDATED ACTIVITY FORECAST
"Do-Nothing" Conditions

	Actual	Forecast		
	1995	2000	2005	2010
Enplaned Passengers:				
Domestic	10,600,000	12,400,000	14,000,000	15,700,000
International	800,000	1,300,000	1,700,000	2,200,000
Total Enplanements	11,400,000	13,700,000	15,700,000	17,900,000
Origin and Destination EPS	7,900,000	9,450,000	10,800,000	12,250,000
Aircraft Operations:				
Air Carrier	222,000	262,000	298,000	320,000
Air Taxi/Commuter	138,000	116,000	114,000	104,000
All-Cargo	16,000	20,000	22,000	25,000
Gen. Aviation/Military	11,000	11,000	11,000	11,000
Total Operations	387,000	409,000	445,000	460,000
Tons of Cargo	408,000	509,000	621,000	732,000
Average Day Operations	1,060	1,121	1,219	1,260
Peak Month/Average Day	1,198	1,246	1,341	1,360
Peak Hour Operations	75	78	82	82

Source: Port of Seattle & P&D Aviation. This forecast represents the demand that could be accommodated by the current airport facilities - which, due to the constraint, is less than the total demand.
EPS = Enplanements

To accommodate the constrained level of activity, a number of congested and inefficient conditions would result:

- Gates would be used for an average of 5.0 to 5.5 flights a day. This type of gate usage would resemble today's peak hour, which would be expected to occur more frequently, as more hours of the day approach the current peak conditions;

- Some growth in passengers processed by each narrowbody equivalent gates per year would occur as a consequence of the expected growth in average aircraft size, average load factors, and increased number of departures per gate per day;
- Remote aircraft parking and passenger loading would occur, as is used at locations such as Los Angeles, Dulles and (until the recent improvements were completed) at Pittsburgh or O'Hare.
- Much of the terminal space (ticketing, gates and baggage claims) would operate at levels-of-service F. As conditions become constrained, passengers would avoid ticketing, through advance ticket purchases, electronic ticketing, rely on carry-on baggage and/or would arrive at the airport sooner. It is assumed that ground travel time would increase 25% to 50%. Thus, the time passengers would spend in the terminal area would increase from 30 minutes to 45 minutes.

The Northwest Mountain Region Office of the FAA has reviewed the new Port forecasts and underlying assumptions and accepted them for use in local planning activities, such as this additional environmental analysis. Because the Port forecasts were prepared at a detailed level (peak period, peak hour, fleet mix, etc.), these forecasts were used to assess the environmental impacts associated with the higher level of aviation demand.

TABLE 2-6

COMPARISON OF DO-NOTHING TO "WITH PROJECT" ACTIVITY LEVELS

	With Project			Do-Nothing		
Operations	2000	2005	2010	2000	2005	2010
Peak Hour	78	94	99	78	82	82
Peak Month/Avg Day	1,246	1,352	1,423	1,246	1,341	1,360
Peak Month	38,600	41,800	44,000	38,600	41,500	42,100
Annual	409,000	445,000	474,000	409,000	445,000	460,000
Avg Annual Day	1,121	1,219	1,299	1,121	1,219	1,260
Enplaned Passengers						
Peak Hour	5,210	5,740	6,300	5,210	5,460	5,930
Peak Month/Avg Day	49,500	55,700	62,400	49,500	55,700	62,400
Peak Month	1,540,000	1,730,000	1,940,000	1,540,000	1,730,000	1,940,000
Annual	13,700,000	15,700,000	17,900,000	13,700,000	15,700,000	17,900,000
Avg Annual Day	37,534	43,014	49,041	37,534	43,014	49,041

Source: P&D Aviation, Working Papers #1 and #2, January, 1997.

Year 2000 "With Project" reflects the Do-Nothing activity levels, as the third parallel runway would not be available.

It is important to note that airport master plans are typically undertaken every 7-10 years; for airports with faster than average growth, master plans are often undertaken every 3-5 years. Therefore, it is anticipated that the Port of Seattle would likely undertake a new master plan for Sea-Tac near the year 2000. Because the Master Plan Update did not identify demand greater than 38 million annual passengers (MAP), facilities to accommodate a greater level of demand were not identified. However, to visualize how the proposed facilities could accommodate a greater level of demand, the final section of this report discusses the longer-term development capability of Sea-Tac. Included in this discussion are the likely constraints of the Master Plan Update improvements on future demand. **Appendix D** contains an evaluation of impacts in year 2020, based on an extrapolation of conditions in 2010.

B. Comparison of Forecasts

As this chapter describes, a number of forecasts have been prepared to date for Sea-Tac Airport. **Table 2-1** contrasts the 1996 and 1997 TAF, the Master Plan Update forecast and the new Port of Seattle forecasts. Comparison of the results and methodologies used in developing the forecasts shows that key assumptions concerning per capita income, air fares, and the costs associated with air fares, such as fuel prices have a dramatic effect on demand for air travel. If ticket prices were to increase, demand would not grow as quickly as now predicted and the forecasts prepared by the Master Plan Update would likely be more representative of that condition. However, more recently, aviation forecasters anticipate that competition would likely keep airfares low over the foreseeable future. Assuming consistent assumptions regarding per capita income, lower air fares would generate greater demands for air travel, making the forecasts prepared for this analysis probable.

To facilitate a review of the forecasts prepared for this analysis, a detailed comparison of the new forecasts was made relative to the FAA's 1997 Terminal Area Forecast and to the forecasts prepared for the Master Plan Update.

Exhibits 2-4 and 2-5 compare the Master Plan Update forecasts with the new Port forecasts and to the FAA's 1997 Terminal Area Forecast. For the year 2010, the FAA's TAF is approximately 10% greater than the Port's unconstrained operations forecast and 17% greater than the Master Plan Update forecast. The TAF enplanement forecast is also 6% greater than the Port's unconstrained forecast and 23% greater than the Master Plan Update for year 2010.

The primary differences between these forecast are:

- Differences between the Master Plan Update and the new Port of Seattle forecasts are:
  1. Personal income, as forecast by the Puget Sound Regional Council (PSRC) is now expected to be about 1.8% less than was forecast at the time the Master Plan projections were prepared for the year 2010.
  2. Domestic airfare per passenger mile was assumed by the Master Plan Update to increase from 12.27 cents (1993) to 14.28 cents by 2010. The new Port forecasts, based on FAA and industry assumptions, is anticipated to decrease from 10.34 (1995) to 9.63 cents per passenger mile by 2010.
  3. The Master Plan Update forecasts were prepared in 1994, based on actual activity levels through 1993. The new Port forecast reflects activity through mid-1996. From 1993 to 1995, annual activity at Sea-Tac increased 21% as measured by enplanements, or 14% as measured by aircraft operations. In 1996, activity continued to increase at the same rate.

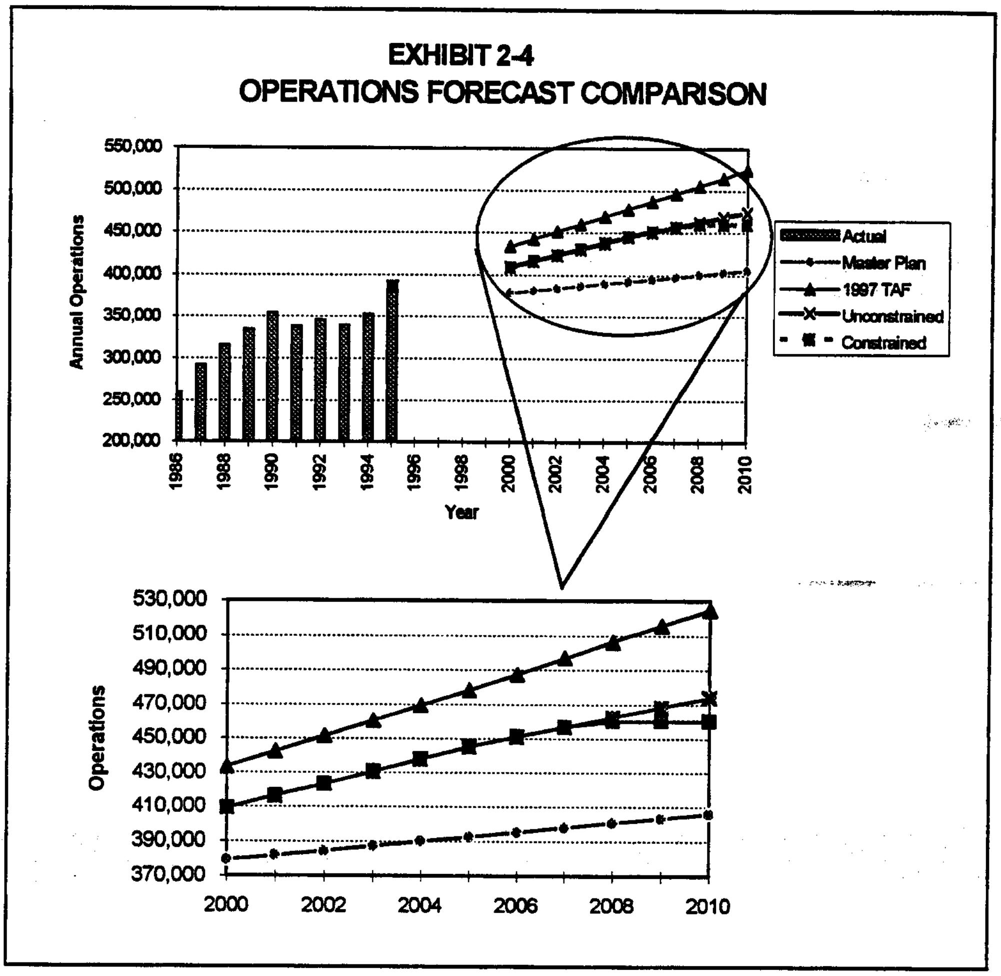


EXHIBIT 2-4
OPERATIONS FORECAST COMPARISON
Annual Operations
550,000
500,000
450,000
400,000
350,000
300,000
250,000
200,000
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
Year
Actual
Master Plan
1997 TAF
Unconstrained
Constrained
Operations
530,000
510,000
490,000
470,000
450,000
430,000
410,000
390,000
370,000
2000
2002
2004
2006
2008
2010

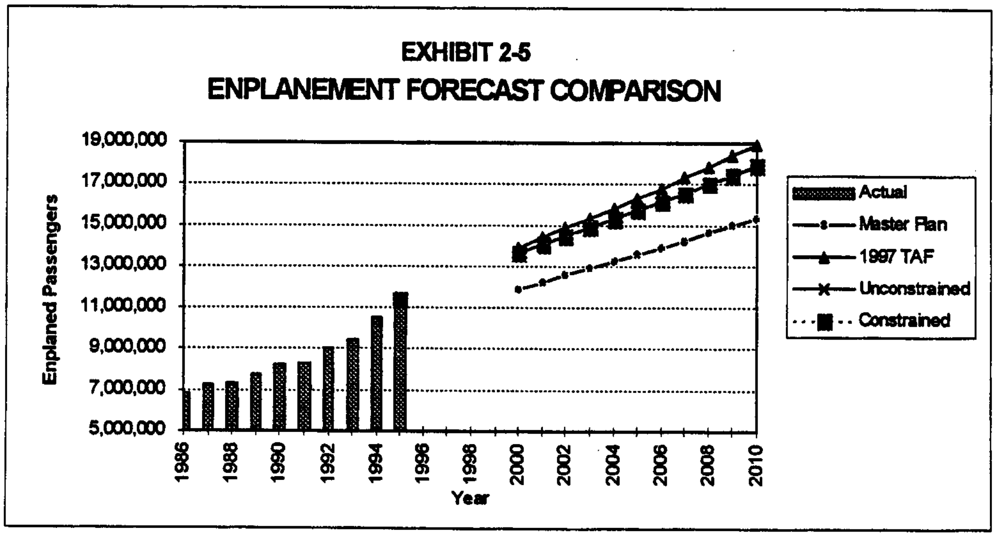


EXHIBIT 2-5
ENPLANEMENT FORECAST COMPARISON
Enplaned Passengers
19,000,000
17,000,000
15,000,000
13,000,000
11,000,000
9,000,000
7,000,000
5,000,000
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
Year
Actual
Master Plan
1997 TAF
Unconstrained
Constrained

AR 003992

4. These forecast assumptions result in an increase in passenger demand forecasts from 11.9 million in 2000 to 13.7 million enplanements and from 15.3 million to 17.8 million enplanements by 2010. Aircraft operations were forecast by the Master Plan Update to reach 379,200 operations by 2000 and 405,800 by 2010. The updated forecast are 8% greater (409,000) than the Master Plan for 2000 and 17% greater (474,000) for the year 2010.

- Differences between the new Port forecast and the FAA TAF are:

  1. The FAA TAF assumes that domestic air fares nationwide would continue to decline at a rate of 1.2% while international airfares are anticipated to increase. While the new forecasts assume that airfares are going to continue to decline, research shows that Sea-Tac airfares have been declining faster than the US average. The Master Plan Update assumed that because Sea-Tac's fares had already been affected by the lower cost operators, that the decrease would not be as great between 2005 and 2010 as the US average.
  2. Consistent information was used concerning per capita income of the region.
  3. As was indicated earlier, the FAA TAF for 2010 is 10% greater than the new Port forecast for operations and 6% greater for enplanements. The Port's forecast reflects a greater growth in air carrier seats per departure than the FAA's TAF, accounting for the primary difference between the two forecasts of aircraft operations. The Port's forecast uses 1 seat per departure increase per year, whereas the FAA's uses 0.35 seats per departure. The Port's seat per departure forecast reflects a review of airline acquisitions/order information for the airlines using Sea-Tac, FAA national forecast assumptions, as well as forecasts prepared by McDonnell Douglas.
  4. The FAA TAF assumed that the air carrier load factors would remain at 65.3%, while the Port forecast assumed that the load factor would increase from 65% to 66% by 2010.
  5. The FAA TAF assumed that commuter seats would increase from 30 seats per departure to 47.1 seats by 2010. The FAA TAF commuter forecast reflects national assumptions concerning commuter activity. Based on discussions with Horizon and United Express, the Port's new forecast assumes that commuter seats would grow from 30 to 39 by 2010. The Port's forecast reflects Horizon's orders for aircraft that would be classified as air carrier, and thus would exceed the seat classification used for the commuter designation. As a result, these larger Horizon aircraft would contribute to the seat assumptions for domestic air carriers, which operate aircraft with 60 seats or more. This commuter assumption difference results in a greater number of aircraft operations in the TAF relative to the number of enplaned passengers.

  Despite these differences, the FAA Northwest Mountain Region has reviewed and accepted the Port's new forecast for local planning purposes.

2. PROJECT PURPOSE AND NEED

The following four purpose and need statements were defined in the Final Environmental Impact Statement:

(1) Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay;

(2) Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim;

(3) Provide Runway Safety Areas (RSAs) that meet current FAA standards; and

(4) Provide efficient and flexible landside facilities to accommodate future aviation demand.

Each of these purpose and need statements were formed based on particular issues that were identified by the Master Plan Update. Upon examination, each of these needs were found to have separate utilities -- as the needs were separate and distinct.

Relative to the new forecasts and any new information that has come to light since the publication of the Final EIS, the purpose and need was reviewed and are discussed in the following sections.

A. <u>Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay</u>.

No new information concerning weather conditions has arisen since the Final EIS was published. Sea-Tac Airport continues to operate in an inefficient manner during poor weather conditions, defined as VFR2 (Visual Flight Rule Conditions, where ceiling is between 2,500 feet and 4,999 feet and visibility is more than 3 miles) and IFR (Instrument Flight Rule conditions - where ceiling is less than 2,500 feet or visibility is less than 3 miles). Poor weather occurs 44 percent of the year, reducing the arrival acceptance rate from 60 arrivals in good weather to 48 arrivals in VFR2 or 24 arrivals in IFR2, 3 or 4.

The Final EIS presented eight actions that had been undertaken by the FAA to reduce delay between 1989 and 1996. Thus, the preferred alternative is the development of a new 8,500-foot long runway, located about 2,500 feet west of existing Runway 16L/34R. As described in the Final EIS, a number of ways exist to quantify delay, based on the purpose of the quantification. One measure identified in the EIS, is the FAA's Air Traffic Operations Measurement System (ATOMS). This measurement quantifies the number of aircraft operations that experience 15 minutes or more of delay in any one of the four air traffic operating segments. For Sea-Tac, data through August 1996, confirms that ATOMS measured delay has substantially decreased since 1989 and has stabilized. As is described in on Pages II-12 through II-17 of the Final EIS, delay has been reduced as far as it can through other non-development actions.

The airlines also measure the efficiency of their operation at various airports by an on-time performance, and is referred to as the Airline Service Quality Performance (ASQP) measure. For Sea-Tac, while the number of aircraft operations delayed over 15 minutes have declined over the 7 year period, the airlines average on-time performance record has continued to worsen. ASQP data for Sea-Tac between 1994 and 1996 shows a steady degradation in the on-time performance by the reporting airlines. In 1994, over 80% of the arrivals to Sea-Tac were on time. By 1996 (January-September), average on-time performance had declined to about 69%. The ASQP data, while it does not identify the cause of the delay, is consistent with the FAA's evaluation during the Capacity Enhancement Update, which projected delay to continue to increase as aircraft operations increase.

B. Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim.

No new information concerning the length of runway needed to serve the Pacific Rim during warm weather periods has arisen. Based on the projected demand, the runway extension would be needed after 2010. For evaluation purposes, this project was assumed to be available in year 2010.

C. Provide Runway Safety Areas (RSAs) that meet current FAA standards.

Since the issuance of the Final EIS, the FAA has issued a record of decision for correcting the runway safety area for Runway end 34R. Upon approval, construction was initiated during the summer of 1996 and the embankment will be completed in August 1997.

Because of the need to relocate 154/156th Street South around the end of these runway safety areas and because the westerly alignment of the road would depend upon approval of the third parallel runway, the alignment of the road was evaluated in several manners:

- RSA Option 1: Alignment shown in the Final EIS (relocated around 16L, 16R and new runway 16X)
- RSA Option 2: Alignment just around 16L and 16R, and connecting back to the present alignment as soon as operationally feasible

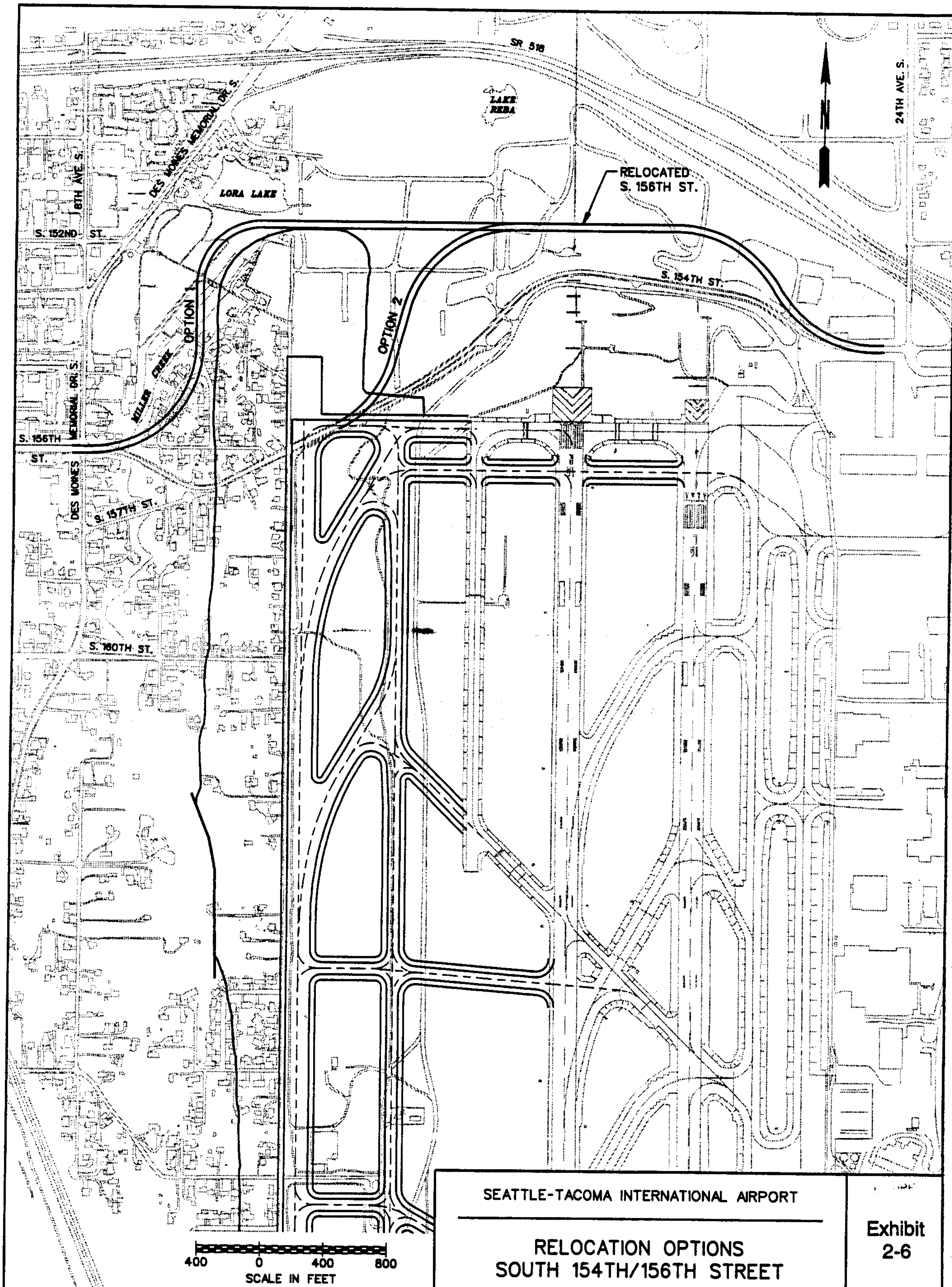
Exhibit 2-6 shows the alignments of these options. Option 1 would serve as an interim alignment until the third parallel runway is undertaken. Chapter 5 of this report summarizes the environmental consequences of these alternatives.

D. Provide efficient and flexible landside facilities to accommodate future aviation demand.

No new significant information concerning the terminal and landside facilities needed to accommodate the forecast growth in air travel was identified, with the exception of additional parking needs in the later phases of the Master Plan Update. One of the assumptions of the Master Plan Update is that facilities would be built just-in-time to accommodate growth that occurs. As a result, the timing in which several facilities would occur would be altered, which is described in the following section.

3. IMPACT OF NEW FORECAST ON THE MASTER PLAN UPDATE

During the Master Plan Update, the construction of new or expanded facilities were identified to address specific needs. The third parallel runway is proposed to address an existing operational constraint that exists during poor weather -- the limitation to a single arrival stream during poor weather. Likewise, the upgrades in the Runway Safety Areas (RSAs) are proposed to bring these areas up to current FAA safety standards. The 600 foot extension of Runway 34R and the proposed terminal and landside improvements were proposed to address growing air travel



SEATTLE-TACOMA INTERNATIONAL AIRPORT

RELOCATION OPTIONS
SOUTH 154TH/156TH STREET

Exhibit 2-6

demand. As a result, if demand were to grow faster than forecast by the Master Plan, or an updated forecast, additional terminal and landside facilities could be needed sooner.

Table 2-7 lists the individual elements of the Master Plan Update, by purpose and need, as they were assessed in the Final Environmental Impact Statement and indicates the assumptions of this additional analysis.[10] The additional environmental analysis, while primarily focusing on how the higher levels of aircraft and passenger traffic affect environmental conditions, also must reflect the following:

- Changes in the timing in which the Master Plan Update improvements would be needed, based on faster growing demand; and
- Changes in the projects, reflecting refinements in the proposed improvements.

The following section summarizes these effects.

A. Changes in the Phasing/Timing of Facilities

As was noted in the Final Environmental Impact Statement, projects were identified to address the purpose and need. Similarly, the discussion of purpose and need also identified the timing of the need being addressed.

- Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay. As was identified in Chapter I of the Final EIS, the disparity between good weather operating capability and poor weather operating currently occurs. The Final EIS identified that the third runway could be operational in 2000. This operational schedule was predicated on a 2.5 year construction haul to place the 17 million cubic yards of fill, with a 4 year embankment construction. Upon re-examination, Port staff now recommend that the third runway be operational by 2005. This schedule reflects a 1 year initiation of acquisition, hauling of fill for 5 years, a 1 year for the fill to settle, and 1 year to construct the runway.

  Reconsideration of the completion date of the new runway is a reflection of the examination of financial resources in light of accelerated need for terminal/landside facilities in addition to the runway. As this document identifies, as passenger demand increases, terminal and landside improvements will be necessary at Sea-Tac. For most passengers, their first experience with the airport system, is in the terminal and landside portions of the system. Whereas today, inefficiencies occur due to the poor weather related airfield system, in the future it would be the entire passenger system and sooner than was predicted by the Master Plan Update. Recognizing the terminal and landside needs, and the competition that could exist between funding for the runway and these other improvements, a slower runway construction schedule was examined. Based on these issues, Port of Seattle staff developed construction phasing plans that balance the terminal/landside facility requirements and funding issues, with the timing of completion of the runway.

  The five-year delay in the commissioning of the third parallel runway would cause significant inconvenience to the traveling public and additional costs to airport users. As described in the February, 1996 Final EIS, poor weather delay costs travelers time and aircraft operators incur additional operational costs. Delay at Sea-Tac in 1993 resulted in

[10] All "With Project" alternatives would require the Phase 1 development shown in Table 2-7. All differences in later phases would depend on the terminal configuration (i.e., North Unit Terminal, South Unit Terminal).

TABLE 2-7
Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

MASTER PLAN UPDATE IMPROVEMENTS - PHASING

Project	Changes in Phasing or Projects Definition
New Parallel Runway and associated operational procedures and taxiways	
Acquisition of land for the new parallel runway	*1996-2000 As the runway moves to the 2nd phase, acquisition is now separately identified*
Relocation of ASR and ASDE	*1996-2000*
Relocation of S.154/156th around 16X end	*1996-2000 Not previously separately identified*
Temporary construction interchange off SR-509 and SR-518	*Previously assumed Not previously separately identified*
Construction of the new parallel runway	*1997-2004 First year of operation 2005*
Extension of Runway 34R by 600 feet	*2010*
Clearing and Grading For the Runway Safety Areas	
Development of the RSA embankments	*1996-2000*
Relocation of S.154/156th around 16L and 16R RSAs	*1996-2000 Not previously separately identified*
Terminal and Landside Improvements	
1996-2000 (Phase I)	
Expansion of Concourse A, *including expansion of Main Terminal at A*	No Change - *clarification of action*
Improvements to the Main Terminal roadway and recirculation roads, *including a partial connection to the South Access Roadway and a ramp roadway from the upper level roadway to the airport exit*	No Change - *clarification of action*
Overhaul and/or replacement of the STS	No Change
Expansion of the main parking garage to the South,. *North and East*	*Phase II and III expansion of the main garage was moved to this phase.*
Construct first phase parking lot north of SR 518 for employee use (3500 stalls).	*Moved from Phase III (2006-2010) to Phase 1 (1996-2000*
Construction of the overnight aircraft parking apron	*Not previously separately identified*
Construction of the new air traffic control tower/TRACON	No Change
Removal of the displaced threshold on Runway 16L	*Not previously separately identified*
Relocation of Airborne Cargo due to new Control Tower	No Change
Expansion or redevelopment of the cargo facilities in the north cargo complex	No Change
Development of a new snow equipment storage facility between RPZ and 34L and 34X	No Change
Site preparation at SASA site for displaced facilities	No Change
Removal of the Northwest Hangar - replacement in SASA	No Change
Development of a ground support equipment location at SASA	*Previously assumed, but not separately listed*
Development of GA/Corporate aviation facilities in SASA or north airfield location	*Previously listed as 2001-2005*
Development of a new airport maintenance building *and demolition of existing facility*	*Moved from Phase II (2001-2005) to Phase I (1996-2000)*
Development of on-airport hotel	No Change
Development of the Des Moines Creek Technology Campus	No Change

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TABLE 2-7

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MASTER PLAN UPDATE IMPROVEMENTS PHASING

2001-2005 (Phase II)	
Dual taxiway 34R	No Change
Improved access and circulation roadway improvements at the Main Terminal, *provide upper roadway transit plaza at Main Terminal*	No Change *Plaza moved from Phase III (2006-2010) to Phase II (2001-2005)*
Additional expansion of the main parking garage	No Change
Expansion of the north employee parking lot (North of SR518) to 6,000 stalls *including improvements to the intersection of S. 154th/24th Ave. S.*	*Added intersections improvements to address this lot and the ramps associated with the North Unit Terminal at 24th Ave. S. at SR 518*
Construction of second phase of overnight apron	*Was assumed completed in Phase I*
Development of the first phase of the North Unit Terminal (south Pier), *development of the ramps off SR-518 near 20th Ave. S. and intersection improvements to S. 160th St. to address surface transportation issues associated with the closure of S. 170th Street to through traffic.*	*Moved from Phase III (2006-2010) to Phase II (2001-2005, identified the ramps separately, and added surface transportation improvements at S. 160th Street/International Blvd.*
Construct first phase of the North Unit Terminal parking structure for public and rental cars	*Moved from Phase I (1996-2000) to Phase II (2001-2005)*
Development of the North Unit Terminal Roadways	*Moved from Phase III (2006-2010) to Phase II (2001-2005)*
Interchange near 20th/SR-518 for access to cargo complex	*Previously included in the project above, now for clarity, separately identified*
Relocate ARFF facility to north of the North Unit Terminal	*Moved from Phase III (2006-2010) to Phase II (2001-2005)*
Additional improvements to the South Access Roadway connector	*Moved from Phase III (2006-2010) to Phase II (2001-2005)*
Relocation of the United Maintenance complex to SASA	*Not previously separately listed*
Continued expansion of the north cargo facilities	No Change
2006-2010 (Phase III)	
Expansion of North Unit Terminal (North Pier)	*First phase is now in Phase II*
Additional taxiway exists on 16L/34R	*Moved from Phase IV(2011-2020) to Phase III (2006-2010)*
Complete connectors to South Access Roadway (to eventual SR 509 Extension and South Access)	*Now separately identified*
Additional expansion of main parking garage	*New Project*
Additional Expansion of north employee lot to 6,700 stalls	No Change
Further expansion or redevelopment of north cargo complex	No Change
Expand North Unit Terminal parking structure for public parking	No Change
2011-2020 (Phase IV)	
Development as needed to accommodate growth in demand	No change
SR 509 Extension/South Access	*Not previously listed / part of Do-Nothing and With Project*

nearly 26,000 hours of delay, with a cost of $42 million. As activity levels have increased nearly 16% between 1993 and 1996, continuing the increase in passenger inconveniences and delay.

Poor weather related arrival delay would not be resolved and as activity levels grow, delay levels would be expected to increase. The Final EIS and Table 2-4 summarize the delay conditions that will occur as demand increases. By 2000, when activity is now anticipated to reach 409,000 annual operations, average all weather delay levels will have increased to about 11 minutes. By 2004, activity would reach 437,000 operations annual which would result in average all weather delay levels of over 23 minutes. Thus, the during the period in which the runway is not available, the growth in air travel demand is expected to result in an increase in total average all weather delay by about 155%.

However, as a practical matter, the third parallel runway cannot be completed much sooner than 2004. Obstacles exist to fast-track development of the third runway including: limitations on financial resources and the short time available to acquire and relocate residences and businesses. Thus, the new phasing plan represents a compromise, which among other things, will sacrifice considerable bad-weather airfield reliability and service for several years.

The year 2005 could be the first full year of operation of the third parallel runway. The differences between the shorter construction period presented in the Final EIS, and the construction phasing of this additional analysis bracket the likely conditions that could occur in building the runway.

- Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim. The extension of 34R was identified as needed between 2015 and 2020. Based on the updated forecasts, the same levels of activity are now likely to occur by 2010.

- Provide Runway Safety Areas (RSAs) that meet current FAA standards. As was identified in the Final EIS, the Port has entered into grant assurances that require it to bring these RSA's into compliance. To date, only 16L and 16R require action to bring these runway ends up to meeting the current RSA standard. Thus, upon environmental approval, these improvements would be anticipated. As a result, they would remain in the first phase (1996-2000) as was identified in the Final EIS.

- Provide efficient and flexible landside facilities to accommodate future aviation demand. The proposed terminal and landside improvements were identified to address growth in passenger, cargo, and aircraft operations up to 19 million annual enplanements. As the updated forecasts now anticipate that 19 million enplanements could be reached soon after the year 2010 (instead of 2020), the timing of facilities was altered. As a result, the projects that were slated to be implemented by 2005, have now been scheduled to occur by 2000. Similarly, projects slated to occur by 2015 were accelerated in the schedule to occur by 2005 and projects slated to occur between 2016-2020 were accelerated to 2010.

B. Changes in the Project Definition/Location

The following refinements were made in the Master Plan Update improvements:

- Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay. No changes were made in the third runway project. However, to clarify the various elements of this project that were assessed in the Final EIS, the relocation of S. 154th/S. 156th has now been separately identified, as well as the relocation of the navigation aids, and the possible construction of a temporary interchange off SR-509 and SR-518 to enable haul vehicles to directly exit these roads onto airport property.

- Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim. No changes were made in this project.

- Provide Runway Safety Areas (RSAs) that meet current FAA standards. No changes were made in the RSA projects. However, to clarify the various elements of the 16L and 16R RSA projects that were assessed in the Final EIS, the relocation of S. 154th/S. 156th has now been separately identified.

- Provide efficient and flexible landside facilities to accommodate future aviation demand. The majority of changes in the terminal and landside related to earlier timeframes for these projects. To clarify projects that were assessed in the Final EIS, several other terminal and landside projects were separated from a larger project and are now listed individually in the table (e.g., overnight parking apron, development of a ground support equipment facility, etc.). Several changes in the project definition are reflected in the table. First, additional expansion of the Main Parking Garage would occur in the 2006-2010 timeframe over what was examined in the Final EIS, which reflects additional flexibility in how parking demand could be satisfied. Second, in expanding the North Employee Parking Lot (North of SR 518) between 2001-2005, improvement to the intersection of S. 154th/ 24th Avenue S would be needed. These improvements would include construction of dual northbound left-turn lanes, an additional westbound departure lane, construction of a southbound right-turn lane and construction of a right turn lane, as well as changes in the signalization. Finally, the development of the North Unit Terminal (in Phase II 2001-2005) at S. 170th Street would cut off access through Airport property from eastern SeaTac to western SeaTac, as public traffic uses S. 170th Street/Air Cargo Road/S. 154th Street. As a result, the completion of the North Unit Terminal would include improvements to S. 160th Street to address additional traffic through this intersection that would have used S. 170th Street. Improvements include: construction of dual northbound turn lanes, construction of a high capacity eastbound right-turn lane, and signalization changes. Such improvements at S. 154th/24th Avenue South and International Blvd./S. 160th Street are reflected in the City of SeaTac Transportation Improvement Plan.

The changes in the timing of proposed improvements, in accordance with changes in forecast demand, as well as the refinements in the projects, were reflected in the additional environmental analysis documented in Chapter 5.

4. LONG-TERM DEVELOPMENT CAPABILITY

One of the predominant comments made by opponents of the proposed runway and Master Plan Update improvements is that the improvements have a short life; that a new airport would be needed in the future to serve the air travel demand of the Region. The Master Plan Update improvements were developed to accommodate a forecast demand for air travel of 19 million enplanements or 38 million annual passengers (enplanements and deplanements). Therefore, the capabilities of the future airport facilities were examined relative to their longer-term capability; key elements of airport facilities were examined to determine how many passenger and/or aircraft operations could be served.

(A) Airfield Capability With A Third Parallel Runway

Based on the same evaluation methodology used in assessing the operating constraint associated with the existing airfield, the operating capability of a third runway airfield was assessed. The 1995 FAA Capacity Enhancement Plan Update did not identify a weighted hourly operations for a third runway airfield. Therefore, no extrapolations can be prepared using that methodology. Instead, the following three conditions were considered: 1) practical capacity as defined by the National Plan of Integrated Airports System (NPIAS) at 4-6 minutes of delay; 2) severely congested delay, as identified by the NPIAS at 9 minutes; and 3) a Theoretical Maximum Capacity, assuming a constant fleet mix, based on delay at the busier airports.[11]

Exhibit 2-7 contrasts the delay curve of the existing airfield with comparable delays if a third runway were available. Also shown on the exhibit are the three delay conditions. As is shown, with a third runway, Sea-Tac would reach its theoretical maximum capacity at 600,000 to 630,000 annual operations. Using a linear extension of the updated forecasts, this would likely occur after the year 2030. With improvements in technology (air traffic technology and video conferencing) that are anticipated to occur around the year 2020, this could likely extend the operating capability of Sea-Tac well beyond 2030.

(B) Terminal Capability With the Master Plan Update Improvements

As is described in Master Plan Technical Report 7A, the Master Plan Update terminal facilities were anticipated to accommodate a forecast of 19 million enplanements or 38 million annual passengers. With the proposed terminal facilities identified by the Master Plan Update, the airport's narrowbody equivalent gates (NBEG) would increase from 90 to about 120 NBEG. The gate use per passengers would reach 317,000 passengers per NBEG which is greater than today's gate usage. As activity levels grow beyond 19 million enplanements, levels of service would decline. Beyond 19 million enplanements, either additional gates could be necessary or remote parking locations would be needed to accommodate passengers during peak periods. To achieve the gate use assumed by the Do-Nothing/constrained forecast (396,000 passengers/NBEG), enplanements would reach 23.7 million (48.4 MAP). Assuming a linear extension of the new Port forecasts, this could occur by 2024. However, to maintain an efficient terminal/landside operation, it would not be preferable to allow the level-of-service to deteriorate.

As a consequence, it would be anticipated that additional terminal and landside facilities could be necessary between 2010 and 2020, well before additional airfield capability would be needed, if demand were to continue to grow at the current rate. In examining terminal options, several issues became apparent. First, the preferred concept (the North Unit Terminal), could be expanded beyond the footprint identified by the Master Plan Update. This expansion would come at the cost of displacing adjoining cargo and support facilities currently located along Cargo Drive. Expansion in this fashion could result in the addition of one or more pier like concourses in a northerly direction from the new terminal. If this were not desirable, the option of pursuing continued expansion from the Main Terminal in a southerly direction, similar to the Master Plan Update's South Unit Terminal expansion might be possible. A future Master Plan for Sea-Tac would be expected to examine and identify any terminal improvements to accommodate more than 19 million enplanements.

(C) Landside Capability With the Master Plan Update Improvements

As is described in the Master Plan Update and Final Environmental Impact Statement, the roadway system in the immediate airport vicinity currently operates at a very low level of

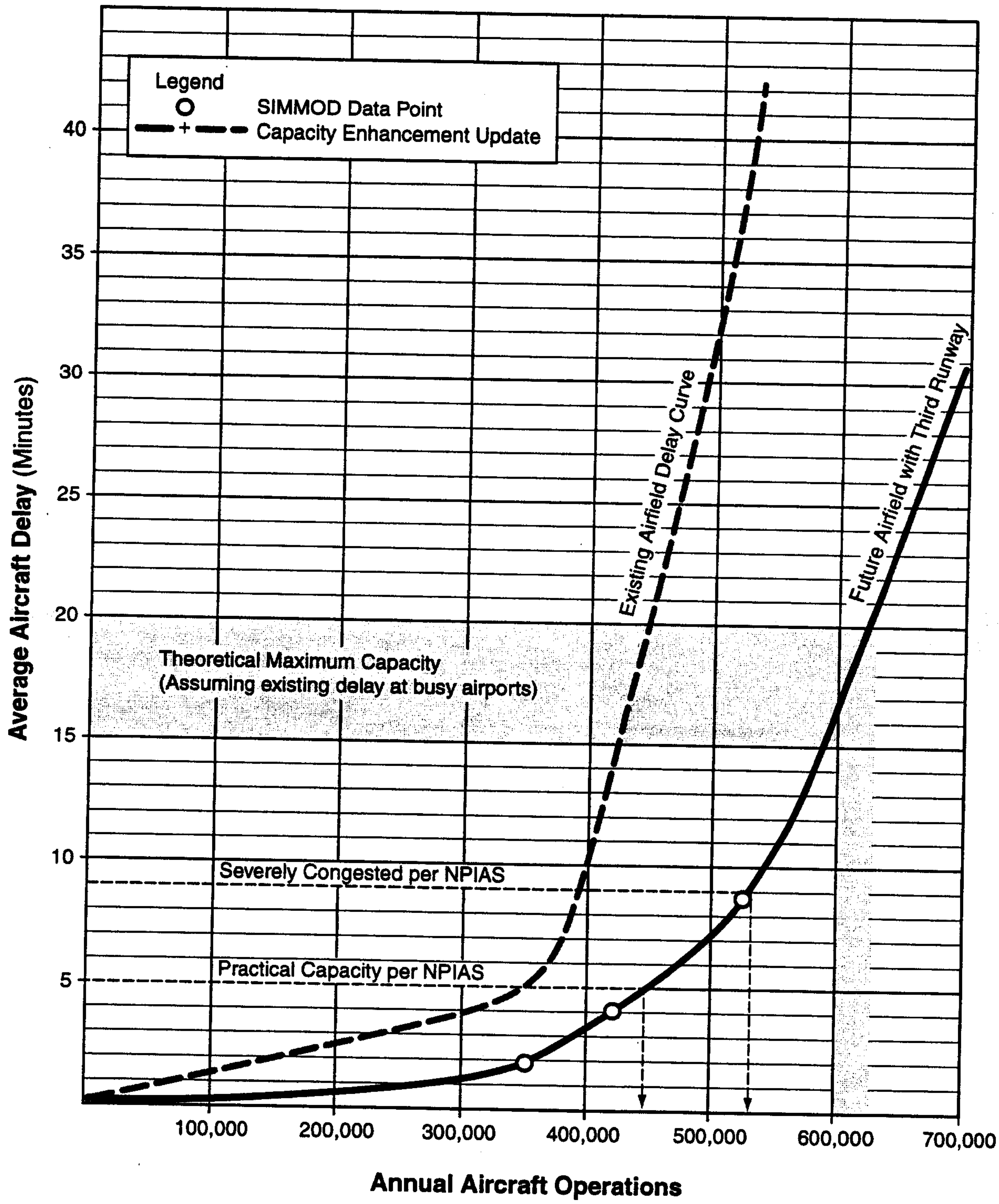
[11] *Working Paper 1, Unconstrained Aviation Forecast Update, Forecast Update, Capacity Analysis and Landside Evaluation for Seattle-Tacoma International Airport,* P&D Aviation, January 1997.

service and is expected to continue to operate at a low level of service. As airport activity is anticipated to grow in proportion to the growth in population and per capita income, a similar or greater growth is anticipated in use of regional roadways by non-airport related traffic. By 2020, the Final EIS (and this Supplemental EIS as well as regional planning documents) anticipate that most of the intersections along International Blvd. (SR 99) in the immediate airport vicinity would operate at Levels of Service D or F, regardless of whether improvements are undertaken at Sea-Tac. As the region continues to grow, and greater demands are placed on the conventional roadway travel system, greater and greater roadway related delays would be anticipated. Therefore, in the long-run, surface transportation is likely to serve as the greatest constraint to the long-term development of Sea-Tac Airport.

Recognizing the significance of congestion on the regional roadway system, the region has had under consideration various initiatives, such as the Regional Transit Authority (RTA) plan. Additional surface travel relief would be anticipated as a result of the Region's approval of the RTA plan to develop a light rail system. Current plans for the light rail would connect Sea-Tac Airport with downtown Seattle and portions of north Seattle. The RTA plan was included in the 1995 Metropolitan Transportation Plan for the Puget Sound Region and is anticipated to be complete by 2010. As a result, it was reflected in the Final EIS as well as this additional environmental analysis. Such a system could serve passengers and employees using the Airport. It is anticipated that the RTA's availability between 2010 and 2020 would reduce the pressures on the regional and airport roadway network.

EXHIBIT 2-7

Delay Curve for Future Airfield



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SECTION 5-4

CONSTRUCTION IMPACTS

Since publication of the Final EIS, new information has arisen that has lead to possible changes in the construction of the Master Plan Update improvements. Chapter 2 of this Supplemental EIS describes the effects of the new Port forecasts on construction phasing. Other construction related changes include:

- Third parallel runway haul duration - the Final EIS analyzed a 3 year haul, with the runway being available for use in the year 2000. This Supplemental EIS analyzes a 5-year haul, with the runway available for use in late 2004. Under this new construction schedule, the peak of hauling would occur in year 2000, with the haul complete in 2002. The lengthening of the haul duration would likely reduce the number of average daily truck trips;[1/]
- Additional haul routes have been identified - the Final EIS examined the primary haul routes that are anticipated to be used. Based on a further examination of barge transfer opportunities and a review of alternative material delivery methods, several additional routes were identified.
- Examination of two temporary interchanges - In addition to the identification of additional haul routes, two temporary, construction-only interchanges were identified: from SR 518 near 20th Avenue South and from SR 509 near South 176th Street.

No changes in the total quantity of fill material have been identified since publication of the Final EIS.

At this time, detailed design and construction plans have not been prepared. Therefore, it is not possible to identify the specific types of construction equipment and frequency of usage that could occur with construction of the proposed Master Plan Update improvements. However, based on a refined examination of possible equipment, additional analysis of possible construction impacts has been prepared. This section identifies a range of construction impacts, assuming two alternative scenarios:

1. Option 1: minimum excavation from on-site sources, and
2. Option 2: maximum excavation from on-site sources.

To implement the proposed new parallel runway and other Master Plan Update improvements, one or more permitted material site(s) off of Port owned land may be used to supply the required fill (or serve as transfer sites from barge to truck). Permitted material sites have or will be subjected to environmental review as part of the appropriate regulatory process that granted the permits and which established conditions of operations. Several municipalities have recently adopted truck route ordinances that may pose additional conditions on operations from individual

[1/] The February 1996 Final EIS examined 109 one-way hourly truck trips based on a 3-year haul. This Supplemental EIS, unless otherwise noted, examines 66 one-way hourly truck trips based on a 5-year haul. These truck levels represent an average hourly truck level over the duration of the haul. Therefore, conditions during any one day could incur higher or lower truck trip levels.

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material sites. The process of removing fill material from the source location and transporting it to the fill site must comply with valid and legally enforceable local permits, operating conditions, legal load limits, and restoration associated with the source site(s) and haul routes. This is standard procedure for construction projects in the Puget Sound Region.

Provisions of FAA Advisory Circular 150/5370-10 "Standards for Specifying Construction of Airports", would be incorporated into construction specifications.

(A) METHODOLOGY

A number of assumptions were made concerning the construction of the Master Plan Update alternatives:

- Schedule:
  1. Activities involving the hauling of embankment fill material for the construction of the proposed new parallel runway, the expansion of Runway Safety Areas, and the haul of fill material for the South Aviation Support area are anticipated to occur over a five year period between 1997 and the year 2002. The runway would be available for use in late 2004.
  2. Year 2000 would represent the peak year of haul activity.
  3. Transport of fill material from off-site sources could occur as much as 270 days per year and 16 hours per day. Transport of fill material from on-site sources could occur as much as 210 days per year and 16 hours per day. It is anticipated that during peak periods, haul could occur more than 16 hours a day.
  4. While the analysis presented in this study reflects an average annual haul over the 5 year period, peak conditions with greater truck levels could occur. For instance, during good summer weather periods, truck haul would be anticipated to be as high as 109 one-way truck trips. During winter periods, of cold or wet weather, truck trips could be expected to be substantially reduced.

- On-Site Borrow:
  1. The Final EIS, and this Supplemental EIS, addresses both the likely minimum and the likely maximum use of on-site fill (Option 1 and Option 2 defined previously).
  2. The Port will explore non-trucking alternatives for material extracted from Port land. Alternatives such as conveyer belts could be used to move fill within Port-owned land. To present a worst case assessment, this EIS assumes that on-site fill is transported to the embankment area by truck. Impacts associated with alternative on-site movement of material would be expected to lessen the environmental impacts of conventional truck haul.
  3. The analysis prepared for the Supplemental EIS reflect the average on-site haul over the construction period. It is anticipated that the time to excavate any individual site could take as little as 4 months to as much as about 38 months.

- Off-Site Borrow:
  1. At this time, it is not possible to determine the exact off-site material sources that will be used. Several permitted sites exist within 20 miles of the Airport, sufficient to supply some or all of the material needed for the Master Plan Update improvements. Given the fill requirements of the Master Plan Update, it is also possible that new material sites could be economically developed and permitted. A selection will be made among the material sites based on availability, costs, mitigation requirements for the use of those material sites, and other considerations.

2. Fill may be transported by rail or barge to locations near to the Airport and then trucked or conveyed by belt systems to the Airport construction sites. To present a worst case assessment, this EIS assumes that fill will be most likely transported by truck (or by barge to a transfer site, where trucks would transport the material the remaining distance).
3. Material transported by truck will use freeway, highway, arterial class roadways, designated truck routes, permitted local streets, or Port properties, until reaching the on-airport haul routes. Include in this analysis is use of existing permitted barge transfer sites where material could be transferred from barge to truck .

Table 5-4-1 shows fill requirements associated with the Master Plan Update improvements. The compacted in-place fill requirements were increased by 15 percent to account for swell/shrinkage during placement of transported fill material. Based on an assumed average capacity of 22 cubic yards per truck, about 1,200,000 truck loads of fill would be needed to complete all of the improvements included in the Master Plan Update. Using the five year construction haul period, the average number of trucks required to haul the required material could range from 44 one-way truck trips to 17 trips per hour, per direction for Option 1 (minimum on-site) and Option 2 (maximum on-site) respectively. A factor of 1.5 was assumed to account for average peaking of truck traffic, resulting in off-site truck traffic rates of 66 and 26 trucks per hour, per direction for Option 1 and 2, respectively. On-site truck traffic necessary to haul material would average 33 trucks per hour, per direction or adjusted for peaking to 50 trucks per hour, per direction. Construction vehicles, such as scrapers or loaders, are anticipated for use in moving the common excavation material, with no trips on public roads.

The following contrast the assumptions of this Supplemental EIS with those of the Final EIS:

	Supplemental EIS		1996 Final EIS	
Haul Duration	5 years		3 years	
Total Fill Required (Million Cubic Yards)	23.64		23.64	
On-Site/Off-Site Fill Sources	Option 1	Option 2	Option 1	Option 2
On-Site (Million Cubic Yards)	0	12.35	0	8.0
Off-Site (Million Cubic Yards)	20.74	8.19	20.74	12.54
Common (Million Cubic Yards)[2/]	2.90	3.10	2.90	3.10
Average Hr Traffic/Peaking	Option 1	Option 2	Option 1	Option 2
On-Site truck traffic (1 direction)	0	50	0	33
Off-Site truck traffic (1 direction)	66	26	109	66

Option 1= Minimum use of on-site material Option 2= Maximum use of on-site material

As is shown above, and in **Table 5-4-1**, this Supplemental EIS examines possible use of a greater quantity of fill from on-site sources. This Supplemental EIS Option 2 (maximum use of on site sources) evaluated a greater quantity from On-Site Borrow Source #1 relative to the Final EIS, the same as the Final EIS for On-Site Sources #2 through #4, and no material from On-Site Source #5. The revision to On-Site Source #1 reflects the quantity identified by the Preliminary Engineering Study. On-Site Source #5 will not be used to provide material due to the potential operational costs associated with excavation. The net result is that the Supplemental EIS

[2/] Material moved from one portion of the construction site to another location in the site.

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examines a greater quantity for Option 2 for on-site sources (12.35 MCY versus the Final EIS evaluation of 8.0 MCY).

Of the on-site options, Option 1 would result in the greatest amount of off-airport truck traffic. For Option 1, the Final EIS examined 109 hourly truck trips on all roads, whereas with the new construction schedule and fill source assumption, the average truck trips could be lessened. Therefore, the analysis described in the Supplemental EIS reflects a lower, more realistic level of truck travel on the arterials in the airport area (with 66 on-way truck trips per average hour). With the exception of International Blvd.(SR99), the off-airport site haul routes converge on three roads (I-5, SR 509, SR 518). For these three roads, the analysis relies on the evaluation prepared for the Final EIS with the higher truck trips, which under the longer construction haul period would reflect peak construction conditions on these roads.

(B) SURFACE TRANSPORTATION

The following section summarizes construction related surface transportation impacts. Off airport hauling could affect the level of service on freeways, highways, arterials, and permitted local streets used for hauling. The degradation of service levels would be significant if hauling occurs in congested areas during peak travel times. However, these impacts would be temporary and would be mitigated as a part of actions to be included in the Construction and Earthwork Management Plan and similar mitigation measures. For the purpose of the construction surface transportation analysis, a significant impact was found if the construction activity would create ~~LOS F (on arterials~~ LOS E or LOS F) or worsen an existing LOS F intersection.

(1) On-Site Source Transportation

Source Locations: Due to wetland impacts, type of material, and operational costs, four of the eight on-airport sites identified by the Preliminary Engineering Study would likely be used to extract fill (Source locations #1 through 4). The location of those sources and potential haul routes are shown in **Exhibit 5-4-1**.

On-site Sources #1 through 4 are located south of South 188th Street and north of South 216th Street. All of Site #2 and portions of #1 and #3 lie within the City of Des Moines. Portions of #1 and #3, and all of Sites #4 and #5 lie within the City of SeaTac.

This analysis assumes a constant hourly rate of truck trips, and accounted for the ability to construct during poor weather. A construction haul period of 210 days per year was assumed to account for the water sensitive nature of the on-site material source soils.

Haul Conveyance Mechanism: As was noted earlier, several means exist for the transport of fill. While trucks are anticipated to be used, contractors may bid use of conveyor systems for the on-site sources. The Final EIS, and this Supplemental EIS, presents a worst case evaluation by assuming truck modes. Use of conveyors would reduce or eliminate truck trips.

Haul Routes and Service Levels: Transport of the material from the southern on-site material sources would most likely use on-site haul routes constructed within or adjacent to the on-site sources to reach South 200th Street, whereupon the trucks would either access directly into the area known as SASA or to the on-airport roadway system. Construction activity could cross South 188th Street via the runway bridge or an at-grade flagged crossing (which would not be used during peak traffic hours). Because off-site routes could be used, the EIS assessed their use.

Construction trucks from On-Site Sources #1 through 4 could use South 200th Street to access Des Moines Memorial Drive and Starling Drive at the intersection with South 188th Street. Both South 200th Street and Des Moines Memorial Drive in this area are designated truck routes. As residences exist along both South 200th Street and Des Moines Memorial Drive, travel conditions were examined along these routes. This analysis showed that entering sight distance, roadway width, and shoulder conditions are adequate for safe truck traffic along these roadways. Through the year 2000, all intersections along this alternative construction route are expected to operate at LOS C or better. The use of both South 200th Street and Des Moines Memorial Way may require rehabilitation of the pavement at the end of the construction period.

On-Site Source #2 is anticipated to be connected to Site #1 via a constructed east-west haul route, and then use the on-site haul route through Site #1 to South 200th Street. This route would roughly parallel South 216th Street, traversing the existing WsDOT SR 509 Extension right-of-way. In the event that this haul route could not be constructed, the Port could seek permits from the City of Des Moines for the use of South 216th Street as an alternative route, between Sites #1 and #2.

As was noted earlier, no material is anticipated to be excavated from On-Site Source #5 or #8.

(2) <u>Off-Site Source Transportation</u>

As noted earlier, the amount of truck trips that would occur would depend on the quantity of soil obtained on-site versus off-site, as well as the source of material, its quality, and weather conditions. Using the new construction timetable, Option 1 (minimum on-site) versus Option 2 (maximum on-site) off-site truck trips necessary to transport required import material could range from 66 to 26 trucks per hour, per direction respectively, adjusted for peaking conditions. As was noted earlier, the evaluation prepared for this Supplemental EIS reflects the use of this lower, average annual haul, while the converge points in the Airport vicinity (I-5, SR 509, and SR 518) reflect the higher 109 one-way trips, reflecting the greater possibility of peak traffic occurring on these roadways.

Source Locations: Eighteen (18) off-site material source locations were identified in the Final EIS. Potential haul routes to access those sites are depicted in **Exhibit 5-4-2**. **Based on** a further review of the off-site sources, the truck haul would most likely focus on Off-Site Sources 4 (SeaTac-Kent-Tukwila), 7 (Auburn), 9 (Maltby), 11 (Black Diamond), 11A (Black Diamond), 12 (Covington/Kent), 13 (North Bend), 15 (Maury Island), and a potential future site at the Maury Island King County Park (15A) due to the quantity of material these sites can provide, and the condition of the roadway access to these sites. **Table 5-4-2** lists the following haul route characteristics for these off-site locations: roadway jurisdiction; roadway classification; number of lanes; current pavement condition; speed limit along route; and existing average daily traffic volumes.

Most of the probable off-site material locations are currently permitted. Sites 11A, 13, and the Maury Island King County Park site could require additional permits.[1] Most likely a combination of sites would be required to comply with hours of operation and future truck route conditions. For these off-site sources, the expected haul routes are arterial or highway roads, in 'fair' or better pavement conditions. No safety concerns are anticipated due to sight distance or roadway configuration. **Table 5-4-3** summarizes the conditions along the off-site haul routes, and Final EIS evaluations of potential use of the off-site material sources.

[1] Currently, the Maury Island King County Park site is not permitted, although one would be anticipated with the grading associated with the King County project. The other Maury Island site has been exhausted of fill material under the present permit requirements. Weyerhaeuser is presently working with the owner concerning expansion of the fill capability.

The Port also anticipates the use of suitable fill material from other construction projects in the region as well as possible sources outside the region/state or country. The Final EIS and this Supplemental EIS analyze the impact of virtually all likely routes that converge on the Airport construction site. Transport of material in the immediate vicinity of those other regional construction projects would be assessed in the environmental approval documents for those projects.

Haul Conveyance Mechanism: Similar to the on-site source conveyance, trucks are expected to be the likely mode of transport from off-site sources. Other potential ways of providing material to the construction site involve barges to the Duwamish area from sites #15 and the King County Parks site (#15A), and/or rail supplied material from site #9 to either the Duwamish or Kent Valley areas. Material barged or rail transported to the Duwamish could be trucked to the Airport via SR 509. In 1996, the Port of Seattle completed the first phase of an Alternative Delivery Method Study that identified several barge sites in the Duwamish where fill could be transferred from barge to truck. The feasible sites include several existing private operations (including Lone Star, Cadman, Ash Grove, etc.), and Port properties at: Terminal 105, Terminal 115, and Terminal 106 West-Container Freight Station (W-CFS). Capacity exists, as the private operators currently operate subject to appropriate permits for the transfer of such fill material, and these facilities could be used in accordance with their permit requirements. Port owned land was also considered. Terminal 2 and Terminal 18 could also be used, but would require haul traffic to cross congested intersections at Southwest Spokane Street. Port owned properties at Terminal 105 and Terminal 115, and the private operations have existing capacity to enable barge traffic associated with the Sea-Tac Airport fill requirements and are located south of Southwest Spokane Street, along West Marginal Way (a four lane arterial that is in good condition with light to moderate traffic volumes). SR 509, south of West Marginal Way, currently operates at LOS E and is anticipated to remain at LOS E through the year 2010. **Exhibit 5-4-3** shows the locations of these sites.

Material transported by rail to the Kent Valley area could be trucked to the site, but due to roadway congestion in that area, trucking may be limited to evening and night periods. Required environmental review would be conducted and compliance with permitting requirements would occur prior to development of a new rail station or rail spur for this rail alternative.

An alternative to the import of off-site material by trucks has been suggested. This alternative could use a conveyor belt system to transport material barged or transported by rail to a site in the general vicinity of the Airport. Based on one proponents suggestion, several conveyance routes were reviewed. These include: conveyance south from the Duwamish industrial area along SR 509, conveyance from the Kent valley west along Orilla Road, and conveyance from Puget Sound, along the Des Moines Creek. The Port's 1996 Alternative Material Delivery Study performed a more detailed consideration of the alternatives. That study found that only the Des Moines Creek and SR 509 routes to be technically viable alternatives to conventional truck haul. The SR 509 route would result in significant right-of-way difficulties.

The Des Moines Creek route is in the initial stages of development by a private proponent. It is anticipated to require an in-water of Puget Sound off-load and docking station near the Des Moines Beach Park, and installation of an above-ground conveyor belt system approximately two miles along the Des Moines Creek Park via a Midway Sewer District easement to the construction site. The advantages of this proposal is that it has been used effectively on other large scale projects and it could effectively eliminate all off-site fill material truck transport. Due to the size and quality of the material sites that could barge material, this alternative could also eliminate the need for use of the on-site material sources. The conveyor belt proponent has obtained an agreement with the Sewer District for the use of the easement, but has not obtained other permits or environmental review which could be insurmountable. Thus, the Final EIS (and this Supplemental EIS) assumes transport of material by truck (and a truck/barge combination). Required environmental review would be conducted and compliance with applicable permitting requirements would occur prior to development of an off-site conveyor system and any associated facilities.

Haul Routes and Service Levels: The Final EIS examined the haul routes that were believed to be the routes most likely to be used. However, since completion of the Final EIS, additional routes have been identified that could be used by construction traffic. Routes that were not examined in the Final EIS, but assessed in this additional analysis are:

- I-5 from the North or South to South 188th Street, to Starling Drive
- I-5 from the South to South 200th Street to International Blvd. to South 188th Street to Starling Drive
- I-5 from the South to Kent-Des Moines Road (SR 516) to International Blvd./SR99 to South 188th Street to Starling Drive
- South 154th/156th Street, Southcenter Blvd., SW Grady Way
- State Route 509 to South 176th Street temporary construction traffic access
- State Route 518 to 20th Avenue South temporary construction traffic access
- State Route 518 to International Blvd. to South 192nd Street
- I-5 from the North or South to South 188th Street, to 28th Street South to South 192nd Street
- I-5 from the North or South to South 200th Street, to 28th Street South to South 192nd Street
- I-5 from the South to Kent-Des Moines Road (SR 516) to International Blvd./SR99 to South 192nd Street

All haul routes considered by this Supplemental EIS are shown in **Exhibit 5-4-2.**

Contractor use of off-site material sites east of I-5 would require the use of I-5 or I-405 to reach SR 518 and SR 509 to access the Airport construction site. Use of material sources located on Maury Island, Port Gamble, or the Dupont area are expected to be barged into the Duwamish and trucked to the Airport construction site. Level of service analysis throughout the day for year 2000 volumes at key locations with conditions expected to cause congestion impacts due to increased volumes of heavy vehicles were performed. Year 2000 traffic was chosen as a worst case condition, even though most construction haul activities are to occur before then, as well as up through 2002. Year 2000 is anticipated to represent the peak period of haul.

As is shown in **Exhibit 5-4-2**, all haul routes (with the exception of SR 99/International Blvd) converge on either I-5, SR 509 or SR 518 in the immediate Airport vicinity. Therefore, for the purpose of this evaluation, I-5, SR 509 and SR 518 were evaluated using a 109 one-way peak hour truck trips and the remaining roadways were examined using the lower 66 one-way truck trips. The higher 109 trips reflect peak construction conditions on these converge points, while the lower 66 represents the peak construction conditions on these other roadways, either due to congestion or distance/location relative to the construction site.

Results of the level of service analysis are summarized in **Table 5-4-4.** Analysis conducted by the Final EIS for both minimum and maximum off-site truck traffic found that varying impacts to the regional transportation network were predicted where background levels of congestion are near or exceed roadway capacity and where extended grades exist.[4] The minimum off-site truck traffic examined in the Final EIS corresponds to the maximum truck traffic now expected as a result of the changes to the Airport Master Plan discussed previously in this supplemental analysis. The year 2000 was used as the forecast year in the Final EIS analysis of the regional system, and under the new construction schedule would represent the peak year of construction activity for the third parallel runway.

In the Final EIS, there were six (6) locations where the maximum (109 one-way truck trips) off-site haul truck volumes would reduce the expected operating conditions to LOS F from a LOS E or higher (or deeper into LOS F) relative to the "Do Nothing" condition. These included:

1. I-5 southbound between SR 518 and South 188th Street during the Midday and PM peak hours of the day.
2. SR 518 westbound between I-5 and SR 99 during the PM peak.
3. SR 18 westbound, between I-5 and SR 167 during all hours except the evening and night hours.
4. SR 167 southbound, between I-405/Carr Street, during the PM peak.
5. I-405 northbound between SR 167 and I-5, during the AM peak and the PM peak.
6. I-405 southbound between SR 167 and I-5 during the Midday and PM peak.

At the reduced volumes associated with a longer construction period, deterioration to LOS F from "Do Nothing" conditions occurs at five (5) regional system locations:

1. Interstate 5 Southbound between SR 518 and South 188th Street during the PM peak.
2. SR 18 westbound, between I-5 and SR 167 during all hours except the evening and night hours.
3. State Route 167 Southbound, between Interstate 405 and SW 34th Street, during the PM peak.
4. Interstate 405 Northbound, between State Route 167 and Interstate 5, during the AM and PM peak.
5. Interstate 405 Southbound, between State Route 167 and Interstate 5, during the Midday and PM peak.

Haul truck access directly to the Third Runway construction site from either State Route 509 at South 176th Street or from State Route 518 in the area of 20th Avenue South may be occur through the development of construction only temporary interchanges. Construction access from State Route 509 and State Route 518 would be temporary, being used only during construction of the Third Runway by construction related traffic. Key issues involved in WSDOT permitting of these access points would be operational affects on State Route 509 and State Route 518, as well as safety and traffic control. LOS conditions with these facilities are:

<u>State Route 518</u>

• West Bound Off Ramp to 20th Avenue South	LOS C
• East Bound On Ramp from 20th Avenue South	LOS B

[4] *Final Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*, February 1996, Section 23, B-2, p. IV 23-4

State Route 509

- South Bound Off Ramp to South 176th Street LOS C
- North bound On Ramp from South 176th Street LOS B

Peak Hour (PM) level of service analysis was performed for major intersections along these routes for the five year haul process. Level of service results are summarized in **Table 5-4-5**. Of the 40 intersections analyzed, 14 degraded to LOS E, or further into LOS F, when compared to the Do-Nothing condition as a result of the construction truck traffic.

Most intersections listed in **Table 5-4-5** are only affected by a few of the alternative truck routes. Level of service was calculated for all intersections for all alternatives in order to also determine the affects of trips generated by the Preferred Alternative and construction employee traffic. As was the case for the Final EIS, construction employee traffic was estimated as 50 vehicles per hour during the peak hour.

Potential airport vicinity haul routes were reviewed to supplement off-site route analysis performed under the Final EIS. A summary of that review is included as **Table 5-4-5**.

All of the additional haul routes identified through the Alternative Materials Delivery Study are minor arterial or above in classification, in fair or better pavement condition. Evaluated routes within the City of SeaTac are designated truck routes, although South 188th Street, South 200th Street, and Des Moines Memorial Drive south of South 188th Street has abutting residential land use.[1] All the additional routes considered serve commercial or industrial areas and have existing truck movements. The additional routes are classified appropriately for use by truck traffic, subject to any truck ordinance restrictions or street use permits.

(3) Temporary Construction Only Interchanges

The Port of Seattle is considering the development of construction-traffic-only interchanges that would be developed to enable transport of fill material directly from State roads onto Airport property. Two interchanges are being considered: 1) from SR 518 near 20th Avenue South and 2) from SR 509 near South 176th Street. Use of these interchanges would be envisioned to be used solely by airport construction traffic. The purpose of their development and use would be to minimize impacts to the off-airport arterial roadway system and adjoining neighborhoods.

The SR 518 interchange could be completed in the location of the future ramps proposed by the Master Plan Update near 20th Avenue South. While the ramps are not needed for public traffic until the development of the North Unit Terminal, the ramps could be developed earlier to serve as an interchange for the construction traffic. No homes or businesses are located in the immediate vicinity of this location and, therefore, no adverse impacts on the built or social environment would be expected. All natural resource (water, wetland, biotic communities, floodplains) impacts associated with the use of a construction interchange would be the same as would occur with the public access ramps addressed by the Final EIS and this Supplemental EIS. Air quality impacts would be less than if all traffic were to access the site from South 160th Street/SR 509, which is projected to be well below the AAQS.

The SR 509 interchange would occur in the vicinity of the South 176th Street overpass. This interchange would be developed to only accommodate airport related construction traffic, and would be abandoned after completion of the runway embankment. This interchange could be developed within the current WSDOT right-of-way, and thus would not disrupt any significant natural resources. Homes on the east side of SR 509 are being acquired as part of

[1] *City of SeaTac, Comprehensive Transportation Plan*, February, 1994, Figure 3, Truck Route Plan

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the Master Plan Update. A few residences exist west of SR 509, along South 176th Street. Impacts to these residential areas would be similar to those that would occur if the existing South 160th Street were used, and are discussed throughout this section, which would not be significant.

During construction of the temporary interchange(s) construction impacts would occur including, additional roadway traffic, movement of earth to develop the interchanges, etc. Construction impacts would be minimized through the implementation of the construction best management practices shown in **Table 5-4-8**.

(4) <u>Cumulative On-Site and Off-Site</u>

The proposed new Runway embankment and runway safety areas lie along the west side of the existing airfield. Potential direct access from existing roadways include South 154/156th Street, South 160th Street, Starling Road, Airport Perimeter Road, and associated airport security roads. Haul traffic would reach these roads from SR 518, the Northern Airport Expressway, Air Cargo Road, Des Moines Memorial Drive, SR 509, South 188th Street, and 24th Avenue South. Construction traffic transporting off-site fill material requirements for SASA are anticipated to use SR 509, South 188th Street, and 28th Avenue South. The traffic level of service both with and without construction traffic was calculated at key intersections and freeway locations, and for combinations of on-site and off-site truck volumes.

Airport construction traffic could result in a degradation in levels of service on area roads during construction. This degradation could be significant, particularly where background levels of congestion are at or exceed capacity. However, there are periods and routes which can be used to haul the required material to the site without significant degradation of levels of service.

WSDOT, upon review of the information developed for Final EIS, requested several conditions as mitigation for use of the State Highway System: Based on WSDOT comments and the revised surface transportation analysis, the following were identified in addition to those listed in **Table 5-4-8:**

- Legal load limit and other hauling requirements must be enforced on State Highways. In addition to weight requirements, this requires top of loads to be 6 inches or more below top of truck bins (freeboard) or use of covered loads.
- Coordination must occur with the WSDOT Construction Traffic Office regarding all haul routes on State Routes. Coordination must be maintained through the Construction Traffic Office in order to minimize conflicts between Port construction activities and any WSDOT projects along the haul routes.
- The Port should consider restricting hauling activities during peak hours through congested areas of the State Highway System.
- Provisions should be considered that would handle complaints of broken windows and other damage to vehicles caused by flying debris off the trucks identified as associated with these projects.
- Haul truck traffic should avoid or minimize use of arterial routes with afternoon peak hour congestion of LOS E or LOS F. This would include State Route 99 between State Route 518 and State Route 516, South 188th Street, and South 200th Street.
- Haul truck traffic should avoid or minimize use of arterial routes during evening and night conditions with abutting residential land use. This would include South 188th Street,

South 200th Street, South 154th Street/Southcenter Boulevard/Grady Way, and Des Moines Memorial Drive.

- Many of the potential haul routes are scheduled for reconstruction or improvements between 1997 and the year 2005. Haul truck traffic should avoid or minimize use of those routes while under construction. The contractor should be required to coordinate activities with contractors working on roadway projects.

(C) SITE AESTHETICS

As part of continued preliminary design associated with the proposed third parallel runway, additional consideration has been given to the layout of the area where the runway would be developed. Additional review was also performed of the on-site borrow sources. The following summarize these efforts.

1. Westside Third Runway Embankment

A number of comments have been received requesting clarification of how the embankment would look when complete and how it would appear to residents living west of the Airport. **Exhibit 5-4-5** illustrates possible conditions in the northern portion of the site as well as the southern portion. These illustrations show a site where a retaining wall may be used while the other site shows the earth embankment with a 2:1 slope.

2. Borrow Source Areas

The following summarize the on-site borrow source locations, which are shown in **Exhibit 5-4-1**. The Master Plan Update does not identify an eventual use of this land, as no specific users or uses have been identified. However, to provide a greater understanding how the site would be excavated, a visualization of the property after excavation was undertaken. The following paragraphs summarize the sources and possible after-use options:

- **Borrow Site Area 1** - this site consists of approximately 111 acres and is located South of the Airport at the corner of South 216th Street and 24th Avenue South. The north and west sides of the site is bound by Des Moines Creek Park and the Washington State Department of Transportation (WSDOT) SR 509 Extension right of way and is located in the City of Des Moines and City of SeaTac. The site is mostly vegetated by a mixture of Douglas Fir, Western Red Cedar, Alder, Cottonwood, Ferns, Salal, English Ivy, and Brambles. Existing topography is characterized by gently sloping from the east to the west toward Des Moines Creek with significantly steep slopes on the northwest side.

- **Borrow Site Area 2** - is located south of the Airport approximately at the comer of South 216th Street and 15th Avenue South and consists of 17 acres. Bordering the site to the west and the south is residential development, with future Business Park zoning to the south. The north and east sides are bound by the Des Moines Creek and the existing WSDOT right of way. The site lies entirely within the limits of the City of Des Moines. Primarily existing vegetation includes mostly grasses with some mix of Douglas Fir, Western Red Cedar and minimal ornamental shrubs, the northwest comer of the site is heavily wooded with Douglas Fir, Western Red Cedar, Alder, Cottonwood, with an understory of ferns, salal, and blackberry. The existing topography is primarily gently sloping toward the Des Moines Creek drainage area. This site has been identified as the potential park and recreational opportunity area with view points identified in the northwest comer at approximately elevation 250.

- **Borrow Site Area 3** - consists of approximately 60 acres at the northwest corner of South 200th Street and 15th Avenue. Bordering the site to the north and east is WSDOT right of way and Des Moines Creek Park. To the west is residential development and to the south is Des Moines Creek. The site is split between the City of Des Moines and the City of SeaTac at approximately South 208th Street. The site is mostly vegetated heavily with Douglas Fir, Western Red Cedar, Alder, and Cottonwood with an understory of blackberries, salal, ferns, English Ivy, and grasses. The existing topography is characterized as gently sloping to the southeast with steep slopes adjacent to the Des Moines Creek ravine on the southern end of the site. The southern end of the site is identified as having potential for recreational/open space opportunities which will link to the potential park site in Area 2. The site offers view opportunities down to the Des Moines Creek from the southeast corner of the site.

- **Borrow Site Area 4** - Site 4 is an area of approximately 40 acres in size and is located to the west of Tyee Golf Course. Bordering the site to the north is South 196th Street which includes existing residential development. The site is bound by South 200th Street to the south and the proposed WSDOT right of way to the east. Area 4 lies solely within the City of SeaTac and its future zoning designated by the city is Industrial. Access to the site is primarily from South 196th Street and 18th Avenue South. The site is heavily wooded with a mix of Douglas Fir, Western Red Cedar, Alder, Cottonwood, Salal, ferns, and blackberry. The existing topography of the site is described as a hillside with a knoll located approximately in the center of the site, with primary drainage to the golf course.

- **Borrow Source Area 5 and 8** - Several borrow source areas were identified north of the existing airfield. Because of operational issues, the Port does not propose to excavate material from Borrow Source 5. No material would be excavated from Borrow Source 8 due to the quantity of wetland on that site.

In examining how the sites could be left upon excavation, a number of possible objectives were identified, including:

- **Access and Circulation**
  1. Link the various functional use portions of the site with pedestrian and bicycle trails.
  2. Provide adequate vehicular access to redevelopment. Access could be from South 216th Street, 24th Avenue South, 15th Avenue South, 18th Avenue South, South 200th Street, the proposed SR 509 Extension.
  3. Take advantage of SR 509 alignment for trail locations.
  4. Explore use of the Des Moines Creek natural area for trail use.
  5. In conjunction with commercial redevelopment, explore a multi-purpose trail system throughout the borrow area to optimize pedestrian and bicycle opportunities.

- **Redevelopment Sites**
  1. Adequately buffer the borrow site(s) from adjacent residential areas. As is shown in **Exhibit 5-4-6**, about 96 acres of open space could serve as a buffer to surrounding land uses (Area 1 could provide 34 acres, Area 2 - 17 acres, Area 3 - 21 acres, Area 4 - 24 acres);
  2. Site grading should optimize the amount of borrow material from redevelopment sites.
  3. Contour edges of borrow sites to optimize stands of existing trees to maximize buffering opportunities while minimizing costs to Port of Seattle. The slopes could be terraced with new evergreen and deciduous plants to provide a visual buffer to adjacent land uses. Existing vegetation would be preserved within a 30-foot right-of-way adjacent to redevelopment areas.

4. Maximize opportunities within overall borrow site for redevelopment. Approximately 132 acres of land could be developed for commercial uses.

No specific development plans exist for the borrow source locations after material is excavated. However, the features identified in the preceding section represent possibilities that the Port would pursue in obtaining any permits to excavate the material.

(D) NOISE

Noise impacts will occur in the vicinity of the construction sites associated with the "With Project" alternatives. Earth work and site preparation activities will result in elevated levels of noise generated by the types of equipment used on most construction sites. Noise from this equipment would vary from model to model, and would change according to the operation (type of construction) involved. **Table 5-4-6** lists an estimate of the typical sound level energy from each basic type of construction equipment. The total sound level energy is essentially a product of the machine's sound level, the number of such machines in service, and the average time they operate.

TABLE 5-4-6

CONSTRUCTION EQUIPMENT NOISE

Type	Typical Sound Level dB(A) at 50'
Dump Truck	88
Portable Air	81
Concrete Mixer	85
Jackhammer	88
Scraper	88
Dozer	87
Paver	89
Generator	76
Pile Driver	101
Rock Drill	98
Pump	76
Pneumatic Tools	85
Backhoe	85

Source: *Handbook of Noise Assessment*,, May, D.N. Page 215. Van Nostrand Reinhold Company, New York, 1978

Although pile drivers and rock drills produce the greatest sound levels, it is dump trucks, air compressors, and concrete mixers that, due to their greater number or longer operating times, produce the most total sound energy. However, with a few exceptions, there would be limited off-airport construction-related noise impacts because of the distances of most residential areas from the sound sources at the various construction sites. A pile driver and rock drill are not anticipated to be used in the borrow source areas or in the runway embankment area. Therefore, the primary vehicles to be used in the construction of the embankment would be dump trucks (Option 1 with minimum use of on-site material could result in 66 average off-site truck trips per hour). Therefore, dump truck traffic noise would be the most significant during the construction period.

Based on the maximum hourly number of truck trips prepared for the February, 1996 Final EIS, the FHWA's STAMINA 2.0 model was used to quantify the changes in noise exposure to residential areas located along the haul routes. The analysis from the Final EIS was not updated, as the higher traffic levels associated with the Final EIS (with 109 average hourly one-way trips) was shown to not produce a significant change in roadway related noise levels. The following peak hour average sound level changes were identified, based on the February, 1996 Final EIS average 109 hourly trips:

- With maximum use of on-site material, property located along South 200th Street, between the on-site borrow sources and Des Moines Memorial Drive could experience construction noise levels of as high as 5.5 dBA over existing roadway-related noise levels if South 200th Street is used as a haul route. However, in this area, aircraft noise levels are substantially greater than the peak hour average construction related roadway noise levels;
- Residences facing Des Moines Memorial Drive, between South 200th Street and SR 509 would experience an increase in sound level of about 3.6 dBA due to airport-related construction haul;
- With maximum use of off-site sources, residences facing South 160th Street east of the SR 509 interchange could experience an increased peak hour average roadway-related noise levels of about 7.6 dBA due to airport-related construction haul. Because of this increase noise level, the area between Des Moines Memorial and the new runway embankment is proposed for acquisition.

With the 5-year haul presented earlier, the Option 1 truck trips would be 66 per hour instead of the 109 analyzed above. As less truck traffic would generate less noise, the longer construction duration would reduce hourly and daily noise levels. However, instead of occurring over a 3 year period, the noise exposure would occur over a 5 year period.

While construction related noise could increase by 5 dBA or more above existing or Do-Nothing (a substantial increase) with the 109 one-way truck trips assessed in the February 1996 Final EIS, according to Washington State Department of Transportation guidelines, these impacts are not permanent changes in noise levels, and are, thus, exempt from the 5 dBA criterion. The construction noise impact exemption, however, does not apply during nighttime hours (10 p.m. to 7 a.m.). As a result, the Port will develop the Construction and Earthwork Management Plan to minimize nighttime noise impacts on noise sensitive facilities adjacent to the haul routes. However, even with noise management actions in use during the nighttime hours, residents west of the proposed runway may experience dump truck related construction noise. Consideration was also given to the noise that could be experienced in the residential areas near the borrow source locations. The following summarizes these noise levels:

- Runway Embankment - the earth moving equipment in this area is anticipated to generate a noise level of 91 dBA at 50 feet from the noisiest source. Sound would be reduced to noise levels equivalent to ambient daytime noise in nearby residential areas (about 60 dBA). During periods of low aircraft traffic, residential areas west of Des Moines Memorial Way could experience elevated sound levels from construction activity associated with the third parallel runway embankment.
- Borrow Source Areas - based on the anticipated usage of earth moving equipment, maximum noise levels 50 feet from the equipment could reach 94 dBA. However, given the proposed site grades, buffering, and distances of the sites from residential areas, construction noise levels would be less. Each of the borrow source locations is directly under the flight path of the existing runways and currently receive average noise levels in excess of 70 DNL. Residential areas to the west of Borrow Source Areas 2, 3 and 4 could experience elevated noise as a result of construction activity when aircraft overflights are not present.

(E) AIR QUALITY

Construction will have a short-term impact on local air quality. Air pollution levels during the construction period would be a consequence of one or more of the following activities: Vehicular activity in support of construction; wind erosion of soils; the movement of construction vehicles along haul routes; excavation; and cement and aggregate handling. Air pollution impacts would be most pronounced at the individual construction sites and along the construction haul routes.

The air quality impacts associated with the hauling of construction fill material was evaluated through a separate pollutant dispersion modeling analysis. The analysis presented in the Final EIS is repeated here, and is based on 109 peak hour truck trips, instead of the longer construction period trips of 66 trips per hour. CAL3QHC, a USEPA approved model used to predict pollutant concentrations from motor vehicles, was used to examine construction related pollutant Carbon Monoxide concentrations. Vehicle emission rates for input into the CAL3QHC model were derived from two other USEPA air quality models, MOBILE5A for carbon monoxide emissions and PART5 for particulate matter.

Particulate matter (PM10) is usually the pollutant of greatest concern related to construction activity. To quantify the effects of dispersing the pollutants within the surrounding environs, receptors were modeled at three meters (12 feet) from the edge of the roadways along each of the proposed haul routes.

It should be noted that the methodology used in this analysis relies on the use of modeling default values and input assumptions, as determined in consultation with the Department of Ecology and USEPA. Because of lack of data concerning the Puget Sound Region, this analysis used the more arid (dry) environment associated with Spokane. These assumptions tend to overstate PM10 concentrations associated with construction activity at Sea-Tac Airport.

TABLE 5-4-7

CONSTRUCTION AIR POLLUTION CONCENTRATIONS

	CO Concentrations (ppm)			
	1-Hour		8-Hour	
Haul Route	Do-Nothing	With Project	Do-Nothing	With Project
SR 509 from SR 518 to S. 160th Street	1.4	1.5	1.0	1.1
South 160th Street from SR 509 to Des Moines Memorial Drive	2.1	2.5	1.5	1.7
Des Moines Memorial Dr. from S. 160th Street to 8th Ave. South	1.8	2.1	1.3	1.5
Des Moines Memorial Dr. from 8th Ave. South to 148th Street	1.5	2.0	1.1	1.4
Des Moines Memorial Dr. from S. 200th Street to S. 188th Street	3.2	3.5	2.2	2.4
South 200th St. from Des Moines Memorial to 26th Ave. South	3.5	3.7	2.5	2.6
Unpaved on-Airport Road south airfield	-	0.1	-	0.1
Ambient Air Quality Standard	35	35		9

Haul Route	PM10 Concentrations (ug/m3) 24-Hour Do-Nothing	24-Hour With Project	Annual Do-Nothing	Annual With Project
SR 509 from SR 518 to S. 160th Street	156	253	31	51
South 160th Street from SR 509 to Des Moines Memorial Drive	105	352	21	70
Des Moines Memorial Dr. from S. 160th Street to 8th Ave. South	84	311	17	62
Des Moines Memorial Dr. from 8th Ave. South to 148th Street	67	318	13	64
Des Moines Memorial Dr. from S. 200th Street to S. 188th Street	154	276	31	55
South 200th St. from Des Moines Memorial to 26th Ave. South	164	309	33	62
Unpaved on-Airport Road south airfield	-	462	-	93
Ambient Air Quality Standard	150	150	50	50

Source: Final EIS, Chapter IV, Section 23 Tables IV.23-6 and IV.23-7.

(1) Carbon Monoxide Concentrations

The use of diesel haul trucks would not be expected to produce substantial carbon monoxide (CO) emissions. As shown in **Table 5-4-7**, the maximum 1-hour and 8-hour CO concentrations along each of the haul routes would be expected to be well below the CO ambient air quality standards. The "With Project" concentrations would all be well below the Ambient Air Quality Standards.

(2) PM10 Concentrations

The high volume of construction truck activity would be expected to generate considerable fugitive dust emissions, or particulate matter especially during dry conditions. Without mitigation or the use of control measures, the results would be particulate emissions above the ambient air quality standards along each of the proposed construction haul routes. **Table 5-4-7** presents the maximum 24-hour and annual PM10 (particulate matter of 10 microns ore smaller) concentrations along each construction route based on arid assumptions.

Based on arid assumptions and the use of no controls, the PM10 concentrations could exceed the 24-hour and annual standards along all routes with the 109 hourly truck trips. If truck trips were reduce by 30 percent (to 66 truck trips). At the reduced trip level (longer construction period) , the annual AAQS would not be expected to be exceeded, but the 24-hour standard could be exceeded during arid conditions along all haul routes.

(3) Mitigation Measures

Control measures for paved roads focus on either preventing material from being deposited on the roads (preventive controls), or removal from the travel lanes of any material that has been deposited (mitigative controls). Preventive measures include policies requiring "wetting" of material being hauled, cleaning vehicles before they leave a construction site, using 'bump strips' or grates to 'shake' dust from vehicles, or by paving the construction site access roads nearest to the paved roads. **Table 5-4-8** lists construction BMP's that would be used to reduce PM_{10} emissions.

For example, vacuum sweeping along each route would reduce particulate matter by almost 40 percent. Flushing the roadways with water followed by sweeping could reduce particulates by over 90 percent if performed frequently. However, the Port's Temporary Erosion Control Plan does not allow for flushing of streets because of potential water quality impacts. Control

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measures for unpaved roads will include frequently applying water or chemical stabilizers, paving, and traffic control measures limiting vehicle speeds and traffic volumes during dry periods. These measures could achieve up to 80 percent reduction in fugitive dust during dry periods.

(F) SOCIAL

This section summarizes potential social and neighborhood impacts from truck hauling of fill for the construction of the new parallel runway and runway safety areas. As is noted in **Table 5-4-3**, residential neighborhoods are located along a portion of the haul routes from the following off-sites borrow sources:

- Site 2 (Des Moines Memorial Drive/SR 509) residents abut Des Moines Memorial Drive,
- Site 6 (Federal Way) residents along Milton Road;
- Site 7 (Auburn) residents along 41st and Ellingson;
- Site 9 residents along Maltby Road.
- Alternative haul routes could result in truck traffic using International Blvd./SR 99, South 188th Street, South 192nd Street, South 200th Street, South 154th Street, SR 516 (Kent-Des Moines Road) etc. Residential areas about or are in close proximity of these busy roadways.
- The temporary construction traffic only interchanges off SR 509 at South 172nd Street and SR 518 near 24th Avenue South would have residential areas in close proximity of these interchanges.

In addition, residential properties are located along the southern on-site borrow source routes: Des Moines Memorial Drive (the most likely haul route for the southern on-site material) is a minor arterial, with residential development located on the east and west sides of the street. On-site haul routes have been revised to include routes consisting mostly of Port-owned land (see **Exhibit 5-4-1**, which shows potential on-site haul routes). The routes would help to minimize social and neighborhood impacts from truck traffic. South 160th Street, between SR 509 and the Airport, could also potentially be used as a haul route. About 15 residential properties face this street.

Temporary construction impacts would include increased noise, dust, vibration, congestion, and truck traffic near residences, businesses, and institutions located along construction routes near on-site construction areas. Normal vehicular traffic patterns would be disruptive if regional traffic chose to cut-through neighborhoods to avoid congestion along haul routes. Neighborhood cohesion could be adversely affected by increased traffic.

Construction traffic using SR 509, SR 518, and Interstate 5 likely would not result in significant impacts to schools because they are limited access highways, with grade separated crossings. The following schools are located in the vicinity of these limited access haul routes: Dunlap Elementary; Highline High; Woodside Elementary (currently an administrative center); Thorndyke Elementary; Holy Innocents; and Sea-Tac Occupational Skills Center.

The following schools are located near or along haul routes in the immediate Airport area (other than SR 509, SR 518, and I-5) and could be adversely affected: Angle Lake Elementary, Maywood Elementary, Normandy Christian, Sunny Terrace Elementary (currently a mental health facility), Sunnydale Elementary, and Tyee Jr. High School. A number of churches, parks, and nursing homes are located along or in close proximity to these routes.

At this time, haul routes have not been finalized; specific routes will depend upon final borrow source usage, phasing, selected contractor(s) means and methods, and method used to transport fill. Some routes for on-site borrow sources are being investigated that maximize use of Port property. The potential for social impacts at public facilities noted previously as well as residential areas would be reduced with the use of these routes. The use of routes on Port property for On-Site Borrow Sources #1 through 4 could result in potential indirect impacts (primarily noise, fugitive dust, vibration, and truck traffic on nearby roads) on Des Moines Creek Park which could adversely affect public enjoyment of this limited access park area during the construction period. While the park is a designated park facility, limited access is allowed in the area of the on-site borrow sources.

Because of the social disruption that would occur in the general vicinity of the new runway construction activity, a construction mitigation acquisition program has been recommended. This acquisition includes about 70 residential and commercial properties located east of Des Moines Memorial Drive between SR 509 and SR 518. Current Port plans include acquisition of these residential areas and commercial businesses. However, the commercial businesses will be allowed to remain, as they are compatible with the location of the runway, if the owner determines that the construction activities would not have an adverse impact on the business. Only 15 residences would remain in close vicinity to the merge points between on-site and off-site haul traffic. These residences, and those closer to the off-site sources, would experience increased air and noise pollution during the construction period and could, during peak traffic periods experience difficulty in entering and exiting their property.

(G)INDUCED SOCIO-ECONOMIC IMPACTS

The new construction schedule would not likely affect the socio-economic impacts identified in the Final EIS. These include:

	Construction Related Employment
Do-Nothing (Alternative 1)	
Direct Jobs	3,687
Indirect Jobs	4,465
Total	8,152
"With Project" (Alternative 2, 3 and 4)	
Direct Jobs	20,559
Indirect Jobs	24,894
Total	45,453

(G)WATER QUALITY

Potential construction impacts include temporary increases in suspended sediment concentrations caused by an increase of eroded materials entering/reaching Miller and Des Moines Creeks. Construction activities including clearing, grading, and filling at the runway site. The new forecast, construction phasing, and construction duration would not alter the effects of construction on water quality, as described in the Final EIS.

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Seattle-Tacoma International Airport
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SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCE #9 - Maltby, Snohomish County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Maltby Road/Yew Road/ Paradise Lake Road/State Route 524	WSDOT	Collector Arterial	2 lanes	Good	35 mph	9,300	
State Route 522	WSDOT	Principal Arterial Fwy	2 lanes 4 lanes	Very Good	55 mph	45,500	North of the SR9 Interchange South of the SR9 Interchange
Interstate 405	WSDOT	Principal Arterial Fwy	6 lanes	Good	55 mph	129,000	

SOURCE #10, #11, #11A - Black Diamond, King County (Source 10, See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Black Diamond-Enumclaw Road/ State Route 169	WSDOT	Minor Arterial	2 lanes	Good	50 mph 35 mph	9,000	South of Black Diamond Within Black Diamond
Maple Valley-Black Diamond Road/ State Route 169	WSDOT	Minor Arterial	2 lanes 4 lanes	Fair	50 mph 35 mph	11,000	North of Black Diamond Within Black Diamond
Auburn - Black Diamond Road	King County	Principal Arterial	2 lanes	Good	50 mph 40 mph	7,600	East of Kent-Black Diamond Road West of Kent-Black Diamond Road
State Route 18	WSDOT	Principal Arterial Fwy	4 lanes	Good	55 mph	68,000	Steep 6% Grade between I-5 and SR167 (Westbound Uphill)
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

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Seattle-Tacoma International Airport
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SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCE #12 - Covington/Kent, King County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Covington - Sawyer Rd	King County	Minor Arterial	2 lanes	Good/Fair	35 mph	11,000	
Kent - Kangley Rd/South 272nd Street/ State Route 516	WSDOT	Principal Arterial	5 lanes	Excellent/ Very Good	35 mph	25,000	
State Route 18	WSDOT	Principal Arterial Fwy	4 lanes 2 lanes	Good	55 mph	49,000	South of Auburn-Black Diamond I/C North of Auburn-Black Diamond I/C Steep 6% Grade between I-5 and SR167 (Westbound Uphill)
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

SOURCE #13 - North Bend, King County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
468th Avenue SE	King County	Collector Arterial	2 lanes	Good/Fair	35 mph	11,000	
Interstate 90	WSDOT	Principal Arterial Fwy	6 lanes	Good	55 mph	70,500	West of North Bend
Interstate 405	WSDOT	Principal Arterial Fwy	6 lanes	Good	55 mph	129,000	

SOURCE #14 - Dupont, Pierce County
SOURCE #15 - Maury Island, King County
SOURCE #15A - Maury Island, Future King County Park
SOURCE #16 - Port Gamble, Kitsap County (Source 16, See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
East Marginal Way South/SR99	WSDOT	Principal Arterial	7 lanes	Good/Fair	45 mph	43,500	The Borrow Source material would be barged into Duwamish Waterway.
West Marginal Way South (Spokane Street to 2nd Ave SW)	City of Seattle	Principal Arterial	5 lanes	Good/Fair	40 mph	13,300	
West Marginal Way South (S Holden Street to Highland Parkway SW)	City of Seattle	Principal Arterial	6 lanes	Excellent	35 mph	18,500	
State Route 509	WSDOT	Principal Arterial Fwy	4 lanes	Good	55 mph	40,500	

TABLE 5-4-2
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Seattle-Tacoma International Airport
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SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCES EAST OF INTERSTATE 5

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
SW Grady Way (from 167 to Interurban Ave)	City of Renton	Principal Arterial	5 lanes	Good	35 mph	41,000	
Southcenter Blvd./ S 154th Street (from Interurban Ave to SR 99)	City of Tukwila	Principal Arterial	4 lanes	Good	35 mph	10,750	
S 188th Street (from I-5 to Des Moines Mem Dr.)	City of SeaTac	Principal Arterial	5 lanes	Good	35 mph	25,000	
S 200th Street (from I-5 to SR 99)	City of SeaTac	Principal Arterial	4 lanes	Good	35 mph	17,100	Accident concerns @ I-5 & Military Rd/S. 200th intersection; Elementary school crossing @ 32nd Ave./South 200th Street
SR 516 (from I-5 to SR 99)	WSDOT	Principal Arterial	5 lanes	Good	35 mph	29,800	
International Blvd. (SR 99) (from SR 518 to SR 516)	City of SeaTac City of Des Moines	Principal Arterial	5 lanes	Good	35 mph	33,000	

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(H)SOLID WASTE

The new forecast, construction phasing, and construction duration would not alter the effects of construction on solid waste, as described in the Final EIS. A substantial amount of demolition and construction waste will be generated. The majority of the waste material will result from off-Airport site building, road, and associated infrastructure demolition, as well as on-site building, road, and taxiway demolition to accommodate new and expanded landside and airside facilities at the Airport.

(I) CUMULATIVE IMPACTS

The completion of the proposed Master Plan Update improvement, in combination with other regional construction projects, could have an impact in the Airport area. As is described in **Appendix C-1 and C-4** of this Supplemental EIS, a number of roadway improvements are anticipated to occur in the Airport area between 1997 and 2005. Construction activity associated with the Master Plan Update improvements and these regional roadway projects could worsen the levels of service afforded at already congested intersections along International Blvd. Contractor construction best management practices for the Airport construction project would be expected to minimize the adverse impacts by using less congested routes.

(J) MITIGATION

Based on the selected hauling plan, the Port of Seattle will develop a Construction and Earthwork Management Plan. **Table 5-4-8** lists general construction best management practices designed to minimize congestion and pollution related effects of construction activity.

Because of the social disruption that would occur in the general vicinity of the proposed new runway construction, a construction mitigation acquisition program will be implemented. This acquisition includes about 70 residential and commercial properties located east of Des Moines Memorial Drive between SR 509 and SR 518.

It is anticipated that the Port of Seattle will coordinate with surrounding jurisdictions and WSDOT on the proposed schedule for improvements to the regional roadways and the relationship of these improvements to the proposed Master Plan Update improvements. The purpose of this coordination would be to coordinate construction activity and to evaluate the merits of accelerating or delaying such improvements if appropriate to minimize the adverse impacts from multiple construction activities.

TABLE 5-4-1

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CONSTRUCTION FILL REQUIREMENTS

Fill Available

On-Site Borrow Source	Available On-Site Fill (Million Cubic Yards) Minimum	Maximum
Area 1	0.00	6.60**
Area 2	0.00	0.65
Area 3	0.00	2.90
Area 4	0.00	2.20
Area 5	0.00	0.00**
Area 8	0.00	0.00
Subtotal	0.00	12.35
Common Excavation	2.90	3.10
Total On-Site Fill Available	2.90	15.45

Fill Requirements

Master Plan Update Construction Activity	Total Fill Requirements (Million Cubic Yards) In-Place	Adjusted
8,500 Foot New Parallel Runway	17.25	19.84
RSA Improvements	0.98	1.13
Relocation of South 154th Street	0.13	0.14
SASA Facilities	2.20	2.53
Subtotal	20.56	23.64
Runway 34R Extension	2.40	2.76
Total Fill Required	22.96	26.40

** Reflects changes in fill availability since publication of the Final EIS. Availability is based on the *Preliminary Engineering Study*, Volume 2, March 1994

Source: INCA Engineers, January 1997.

TABLE 5-4-2
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Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCE #1 - SeaTac, King County (See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
International Boulevard/SR99	WSDOT	Principal Arterial	5 lanes	Very Good	45 mph	33,000	
South 160th Street	City of SeaTac	Minor Arterial	4 lanes	Good	35 mph	9,000	

SOURCE #2 - SeaTac, King County (See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Des Moines Memorial Drive South	City of SeaTac	Minor Arterial	2 lanes	Good	35 mph	13,000	

SOURCE #3 - SeaTac/Kent/Tukwila, King County (See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Orillia Road	King County	Principal Arterial	2 lanes	Good	35 mph	27,000	
South 188th Street	City of SeaTac	Principal Arterial	4 lanes	Very Good	40 mph	27,000	

SOURCE #4 - Dieringer, Pierce County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
East Valley Highway	Pierce County	Principal Arterial	2 lanes	Good Poor	35 mph	11,000	North of Forest Canyon Road South of Forest Canyon Road
8th Street East	Pierce County	Principal Arterial	2 lanes	Fair	35 mph	12,000	
State Route 167	WSDOT	Principal Arterial Fwy	4 lanes	Very Good	55 mph	56,500	
West Valley Highway	City of Auburn	Principal Arterial	4 lanes	Good	40 mph		
State Route 18	WSDOT	Principal Arterial Fwy	4 lanes	Good	55 mph	68,000	Steep Grades
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

Notes: 1. Limited quality or quantity. Use of Material not anticipated.
2. Local access route congested. Use of Material not anticipated.

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Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCE #5, #8 - Tacoma, Pierce County (See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Marine View Drive/East-West Road	City of Tacoma	Minor Arterial	2 lanes	Fair/Poor	35 mph	8,300	
Taylor Way/54th Avenue East/ Valley Avenue	City of Tacoma	Minor Arterial	5 lanes	Good	35 mph	13,500	
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

SOURCE #6 - Federal Way, King County (See Note 2)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Milton Road/16th Avenue South	King County	Collector Arterial	2 lanes	Fair/Poor Excellent	35 mph	5,000	South of 375th Street North of South 375th Street
Enchanted Parkway/ State Route 161	WSDOT	Minor Arterial Minor Arterial	2 lanes 5 lanes	Good	35 mph	23,000	South of 351st Street North of South 351st Street
South 348th Street/State Route 18	WSDOT	Principal Arterial	5 lanes	Good	35 mph	51,000	
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

SOURCE #7 - Auburn, King County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Kersey Way/"R" Street SE	Auburn	Principal Arterial	2 lanes	Good	35 mph	12,200	
Private Truck Route	Private						
Ellingson Road/41st Street SE	Algona/Auburn/ Pacific	Principal Arterial	4 lanes	Good	35 mph	10,800	
State Route 167	WSDOT	Principal Arterial Fwy	4 lanes	Very Good	55 mph	56,500	
West Valley Highway	City of Auburn	Principal Arterial	4 lanes	Good	40 mph		
State Route 18	WSDOT	Principal Arterial Fwy	4 lanes	Good	55 mph	68,000	Steep 6% Grade between I-5 and SR 167 (Westbound Uphill)
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

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Seattle-Tacoma International Airport
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SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCE #9 - Maltby, Snohomish County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Maltby Road/Yew Road/ Paradise Lake Road/State Route 524	WSDOT	Collector Arterial	2 lanes	Good	35 mph	9,300	
State Route 522	WSDOT	Principal Arterial Fwy	2 lanes 4 lanes	Very Good	55 mph	45,500	North of the SR9 Interchange South of the SR9 Interchange
Interstate 405	WSDOT	Principal Arterial Fwy	6 lanes	Good	55 mph	129,000	

SOURCE #10, #11, #11A - Black Diamond, King County (Source 10, See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Black Diamond-Enumclaw Road/ State Route 169	WSDOT	Minor Arterial	2 lanes	Good	50 mph 35 mph	9,000	South of Black Diamond Within Black Diamond
Maple Valley-Black Diamond Road/ State Route 169	WSDOT	Minor Arterial	2 lanes 4 lanes	Fair	50 mph 35 mph	11,000	North of Black Diamond Within Black Diamond
Auburn - Black Diamond Road	King County	Principal Arterial	2 lanes	Good	50 mph 40 mph	7,600	East of Kent-Black Diamond Road West of Kent-Black Diamond Road
State Route 18	WSDOT	Principal Arterial Fwy	4 lanes	Good	55 mph	68,000	Steep 6% Grade between I-5 and SR167 (Westbound Uphill)
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

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Seattle-Tacoma International Airport
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SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCE #12 - Covington/Kent, King County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
Covington - Sawyer Rd	King County	Minor Arterial	2 lanes	Good/Fair	35 mph	11,000	
Kent - Kangley Rd/South 272nd Street/ State Route 516	WSDOT	Principal Arterial	5 lanes	Excellent/ Very Good	35 mph	25,000	
State Route 18	WSDOT	Principal Arterial Fwy	4 lanes 2 lanes	Good	55 mph	49,000	South of Auburn-Black Diamond I/C North of Auburn-Black Diamond I/C Steep 6% Grade between I-5 and SR167 (Westbound Uphill)
Interstate 5	WSDOT	Principal Arterial Fwy	8 lanes	Fair	55 mph	154,500	

SOURCE #13 - North Bend, King County

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
468th Avenue SE	King County	Collector Arterial	2 lanes	Good/Fair	35 mph	11,000	
Interstate 90	WSDOT	Principal Arterial Fwy	6 lanes	Good	55 mph	70,500	West of North Bend
Interstate 405	WSDOT	Principal Arterial Fwy	6 lanes	Good	55 mph	129,000	

SOURCE #14 - Dupont, Pierce County
SOURCE #15 - Maury Island, King County
SOURCE #15A - Maury Island, Future King County Park
SOURCE #16 - Port Gamble, Kitsap County (Source 16, See Note 1)

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
East Marginal Way South/SR99	WSDOT	Principal Arterial	7 lanes	Good/Fair	45 mph	43,500	The Borrow Source material would be barged into Duwamish Waterway.
West Marginal Way South (Spokane Street to 2nd Ave SW)	City of Seattle	Principal Arterial	5 lanes	Good/Fair	40 mph	13,300	
West Marginal Way South (S Holden Street to Highland Parkway SW)	City of Seattle	Principal Arterial	6 lanes	Excellent	35 mph	18,500	
State Route 509	WSDOT	Principal Arterial Fwy	4 lanes	Good	55 mph	40,500	

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Seattle-Tacoma International Airport
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SUMMARY OF EXPECTED OFF-SITE BORROW SOURCE HAUL ROUTES

SOURCES EAST OF INTERSTATE 5

Expected Source Access Route	Jurisdiction/ Agency	Route Classification	Number of Lanes	Pavement Condition	Speed Limit	Existing ADT	Additional Comments
SW Grady Way (from 167 to Interurban Ave)	City of Renton	Principal Arterial	5 lanes	Good	35 mph	41,000	
Southcenter Blvd./ S 154th Street (from Interurban Ave to SR 99)	City of Tukwila	Principal Arterial	4 lanes	Good	35 mph	10,750	
S 188th Street (from I-5 to Des Moines Mem Dr.)	City of SeaTac	Principal Arterial	5 lanes	Good	35 mph	25,000	
S 200th Street (from I-5 to SR 99)	City of SeaTac	Principal Arterial	4 lanes	Good	35 mph	17,100	Accident concerns @ I-5 & Military Rd/S. 200th intersection; Elementary school crossing @ 32nd Ave./South 200th Street
SR 516 (from I-5 to SR 99)	WSDOT	Principal Arterial	5 lanes	Good	35 mph	29,800	
International Blvd. (SR 99) (from SR 518 to SR 516)	City of SeaTac City of Des Moines	Principal Arterial	5 lanes	Good	35 mph	33,000	

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TABLE 5-4-3

Seattle-Tacoma International Airport
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SUMMARY OF CONSTRUCTION TRAFFIC IMPACTS
REVIEW FOR USE OF OFF-SITE BORROW SOURCES ACCESS ROUTES

Borrow Source	Feasible Site: Quality/ Quantity	Residential Concerns	Safety Concerns	Roadway Classifications	Roadway Condition	Comments
1	Limited Class C		Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated.
2	Limited Class C May be on SR 509 Alignment	Des Moines Drive	Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated.
3	B/C	Along Orillia Road and South 188th	Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated
4A/4B	Yes		Satisfactory	Satisfactory	Satisfactory	
5	Yes		Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated.
6	Yes	Along Milton Road	Satisfactory	Satisfactory	Satisfactory	Local access route congested throughout the day. Use not anticipated.
7	Yes, Could Supply All	Along 41st/ Ellingson	Satisfactory	Satisfactory	Satisfactory	
8	Yes		Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated
9	Yes	Along Maltby Road	Satisfactory	Satisfactory	Satisfactory	Potential Rail Source
10	Yes, Could Supply All		Satisfactory	Satisfactory	Satisfactory	limited quality. Use not anticipated.
11/11A	Yes		Satisfactory	Satisfactory	Satisfactory	
12	Yes		Satisfactory	Satisfactory	Satisfactory	
13	Yes, Could Supply All		Satisfactory	Satisfactory	Satisfactory	
14, 15, 15A	Yes, Could Supply All		Satisfactory	Satisfactory	Satisfactory	
16	Class C		Satisfactory	Satisfactory	Satisfactory	limited quality or quantity. Use not anticipated.

Off-site borrow source construction truck traffic could range from 66 truck trips to 109 truck trips per hour. Exhibit IV.23-2 shows the possible off-site sources.

Source: INCA Engineers, January 1997.

TABLE 5-4-4

Seattle-Tacoma International Airport
Environmental Impact Statement

REGIONAL SYSTEM LEVEL OF SERVICE SUMMARY SHEET

Facility Section		1994 Existing Condition					Haul Process 1997-2002 "Do-Nothing" Without Const. Trucks					Haul Process 1997-2002 Final EIS Maximum Off-Site Haul*					Haul Process 1997-2002 Supplemental Max. Off-Site Haul**				
		AM	MID.	PM	EVE	NIGHT	AM	MID.	PM	EVE	NIGHT	AM	MID.	PM	EVE	NIGHT	AM	MID.	PM	EVE	NIGHT
I-5	NB	E	D	D	B	A	E	D	E	B	A	E	D	E	C	B	E	D	E	C	B
(SR 518 to S 188th St.)	SB	D	E	F	D	A	D	E	F	D	A	D	F	F	E	B	D	E	F	D	B
SR 518	EB	C	C	D	B	A	C	C	E	C	A	D	D	E	C	A	C	D	E	C	A
(I-5 to SR 99)	WB	C	C	D	B	A	C	C	D	B	A	D	D	F	C	B	D	D	E	C	A
SR 518	EB	A	B	B	A	A	A	B	C	A	A	B	C	C	B	A	B	C	C	B	A
(SR 99 to SR 509)	WB	B	B	C	A	A	B	B	C	A	A	D	B	C	A	A	B	B	C	A	A
SR 18	EB	D	C	D	B	A	D	D	D	B	A	E	D	E	C	B	E	D	E	B	B
(I-5 to SR 167)	WB	F	E	F	B	B	F	F	F	C	B	F	F	F	E	E	F	F	F	D	D
SR 509	NB	D	B	C	B	A	E	C	C	B	A	E	C	D	C	B	E	C	C	C	A
(North of SR 518)	SB	B	B	C	A	A	B	B	C	A	A	C	C	E	C	B	C	C	D	C	A
SR 509	NB	B	A	B	A	A	C	A	B	A	A	C	B	C	A	B	C	A	C	A	A
(SR 518 to S. 160th St.)	SB	C	C	D	B	C	D	D	D	B	C	D	D	D	C	C	D	D	D	C	C
SR 167	NB	D	D	C	B	A	E	D	D	B	B	E	E	D	C	B	E	D	D	C	B
(I-405 to SW 34th St., Carr St.)	SB	C	D	E	C	A	D	E	E	C	B	E	E	F	D	B	D	E	F	D	B
I-405	NB	F	E	E	C	B	F	E	E	C	B	F	E	F	D	C	F	E	F	C	B
(SR 167 to I-5)	SB	D	E	F	C	A	D	E	F	D	A	E	F	F	E	B	E	F	F	E	B

* 109 Trucks per Hour, Adjusted for Peaking.
** 66 Trucks per Hour, Adjusted for Peaking.
NB = North Bound on segment
SB = South Bound on segment
Source: INCA Engineers, January 1997.

TABLE 5-4-5
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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 1			Route 1-A			Route 2		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	B	B	B	B	B	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	A	A	A	A	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	A	A	A	A	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	F	F	F	F	F
Des Moines & 8th Ave South	B	B	B	B	B	B	B	C	B	B
International/SR 99 & S 154th St.	E	E	E	E	E	E	E	E	E	E
24th Ave S & S 154th St.	C	E	D	D	D	D	D	D	D	D
Des Moines & S 156th St.	C	C	C	C	C	C	C	C	C	C
Southbound SR 509 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 160th St.	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 170th St.	E	F	E	E	E	E	E	E	E	E
Airport Expressway & S 170th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 170th St.	F	F	F	F	F	F	F	F	F	F
International/SR 99 & S 176th St.	C	C	C	C	C	C	C	C	C	C
International/SR 99 & S 180th St.	D	D	D	D	D	D	D	D	D	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 188th St.	C	C	D	C	C	D	C	C	D	C
28th Ave S & S 188th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 188th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 188th St.	E	E	E	E	E	E	E	E	E	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	D	D	D	D	D
Northbound I-5 Ramps & S 188th St.	F	E	E	E	E	E	E	E	E	E
28th Ave S & S 192nd St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 192nd St.	D	C	C	C	C	C	C	C	C	C
Des Moines & S 200th St.	B	B	B	B	B	B	B	B	B	B
28th Ave S & S 200th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 200th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	E	E	E	E	E	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	C	C	C	C	C
Des Moines & Marine View Drive	B	B	B	B	B	B	B	B	B	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	E	E	E	E	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	E	E	E	E	E
SB I-5 Ramps & SR 516	F	F	F	F	F	F	F	F	F	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 1 State Route 518, Airport Expressway, Air Cargo Road, South 156th Street

Route 1A State Route 518, to 20th Avenue South, Temporary Construction Access

Route 2 State Route 518, Des Moines Memorial Drive South, South 156th Street

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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 3			Route 4			Route 4-A		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	C	B	B	C	B	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	A	A	A	A	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	A	A	A	A	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	F	F	F	F	F
Des Moines & 8th Ave South	B	C	B	B	B	B	B	B	B	B
International/SR 99 & S 154th St.	E	E	E	E	E	E	E	E	E	E
24th Ave S & S 154th St.	C	D	D	D	D	D	D	D	D	D
Des Moines & S 156th St.	C	C	C	C	C	C	C	C	C	C
Southbound SR 509 & S 160th St.	D	D	D	D	E	D	D	D	D	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 160th St.	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 170th St.	E	E	E	E	E	E	E	E	E	E
Airport Expressway & S 170th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 170th St.	F	F	F	F	F	F	F	F	F	F
International/SR 99 & S 176th St.	C	C	C	C	C	C	C	C	C	C
International/SR 99 & S 180th St.	D	D	D	D	D	D	D	D	D	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 188th St.	C	C	D	C	C	D	C	C	D	C
28th Ave S & S 188th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 188th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 188th St.	E	E	E	E	E	E	E	E	E	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	D	D	D	D	D
Northbound I-5 Ramps & S 188th St.	F	E	E	E	E	E	E	E	E	E
28th Ave S & S 192nd St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 192nd St.	D	C	C	C	C	C	C	C	C	C
Des Moines & S 200th St.	B	B	B	B	B	B	B	B	B	B
28th Ave S & S 200th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 200th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	E	E	E	E	E	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	C	C	C	C	C
Des Moines & Marine View Drive	B	B	B	B	B	B	B	B	B	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	E	E	E	E	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	E	E	E	E	E
SB I-5 Ramps & SR 516	F	F	F	F	F	F	F	F	F	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 3 State Route 518, Des Moines Memorial Drive South, South 160th Street

Route 4 State Route 518, State Route 509, South 160th Street

Route 4A State Route 518, State Route 509, South 176th Street, Temporary Construction Access

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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 5			Route 6			Route 7		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	B	B	B	B	B	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	A	A	A	A	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	A	A	A	A	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	F	F	F	F	F
Des Moines & 8th Ave South	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 154th St.	E	E	E	E	E	E	E	E	E	E
24th Ave S & S 154th St.	C	D	D	D	E	D	D	D	D	D
Des Moines & S 156th St.	C	C	C	C	C	C	C	C	C	C
Southbound SR 509 & S 160th St.	D	D	D	D	D	D	D	E	D	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 160th St.	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 160th St.	D	E	E	E	D	D	D	D	D	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 170th St.	E	E	E	E	F	E	E	E	E	E
Airport Expressway & S 170th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 170th St.	F	F	F	F	F	F	F	F	F	F
International/SR 99 & S 176th St.	C	C	C	C	C	C	C	C	C	C
International/SR 99 & S 180th St.	D	D	D	D	D	D	D	D	D	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 188th St.	C	E	D	D	C	D	C	C	D	C
28th Ave S & S 188th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 188th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 188th St.	E	E	E	E	E	E	E	E	E	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	D	D	D	D	D
Northbound I-5 Ramps & S 188th St.	F	E	E	E	E	E	E	E	E	E
28th Ave S & S 192nd St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 192nd St.	D	C	C	C	C	C	C	C	C	C
Des Moines & S 200th St.	B	B	B	B	B	B	B	B	B	B
28th Ave S & S 200th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 200th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	E	E	E	E	E	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	C	C	C	C	C
Des Moines & Marine View Drive	B	B	B	B	B	B	B	B	B	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	E	E	E	E	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	E	E	E	E	E
SB I-5 Ramps & SR 516	F	F	F	F	F	F	F	F	F	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 5 State Route 518, International Boulevard / State Route 99, South 188th Street, Starling Drive

Route 6 State Route 509, State Route 518, Airport Expressway, Air Cargo Road, South 156th Street

Route 7 State Route 509, South 160th Street

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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 7-A			Route 8			Route 9		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	B	B	B	B	B	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	A	A	A	A	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	A	A	A	A	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	F	F	F	F	F
Des Moines & 8th Ave South	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 154th St.	E	E	E	E	E	E	E	E	E	E
24th Ave S & S 154th St.	C	D	D	D	D	D	D	D	D	D
Des Moines & S 156th St.	C	C	C	C	C	C	C	C	C	C
Southbound SR 509 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 160th St.	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 170th St.	E	E	E	E	E	E	E	E	E	E
Airport Expressway & S 170th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 170th St.	F	F	F	F	F	F	F	F	F	F
International/SR 99 & S 176th St.	C	C	C	C	C	C	C	C	C	C
International/SR 99 & S 180th St.	D	D	D	D	D	D	D	D	D	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 188th St.	C	C	D	C	D	D	D	E	D	D
28th Ave S & S 188th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 188th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 188th St.	E	E	E	E	E	E	E	E	E	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	D	D	D	D	D
Northbound I-5 Ramps & S 188th St.	F	E	E	E	E	E	E	E	E	E
28th Ave S & S 192nd St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 192nd St.	D	C	C	C	C	C	C	C	C	C
Des Moines & S 200th St.	B	B	B	B	B	B	B	B	B	B
28th Ave S & S 200th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 200th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	E	E	E	E	E	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	C	C	C	C	C
Des Moines & Marine View Drive	B	B	B	B	B	B	B	B	B	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	E	E	E	E	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	E	E	E	E	E
SB I-5 Ramps & SR 516	F	F	F	F	F	F	F	F	F	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 7A State Route 509, to South 176th Street, Temporary Construction Access

Route 8 State Route 509, South 188th Street, Starling Drive

Route 9 Interstate 5 (from North), South 188th Street, Starling Drive

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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 10			Route 11			Route 12		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	B	B	B	B	B	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	A	A	A	A	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	A	A	A	A	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	F	F	F	F	F
Des Moines & 8th Ave South	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 154th St.	E	E	E	E	E	E	E	E	E	E
24th Ave S & S 154th St.	C	D	D	D	D	D	D	D	D	D
Des Moines & S 156th St.	C	C	C	C	C	C	C	C	C	C
Southbound SR 509 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 160th St.	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 160th St.	D	D	D	D	D	D	D	D	D	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	B	B	B	B	B
Air Cargo Rd & S 170th St.	E	E	E	E	E	E	E	E	E	E
Airport Expressway & S 170th St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 170th St.	F	F	F	F	F	F	F	F	F	F
International/SR 99 & S 176th St.	C	C	C	C	C	C	C	C	C	C
International/SR 99 & S 180th St.	D	D	D	D	D	D	D	D	D	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	A	A	A	A	A
Des Moines & S 188th St.	C	E	D	D	E	D	D	E	D	D
28th Ave S & S 188th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 188th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 188th St.	E	E	E	E	E	E	E	E	E	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	D	D	D	D	D
Northbound I-5 Ramps & S 188th St.	F	F	E	E	E	E	E	E	E	E
28th Ave S & S 192nd St.	B	B	B	B	B	B	B	B	B	B
International/SR 99 & S 192nd St.	D	C	C	C	C	C	C	C	C	C
Des Moines & S 200th St.	B	B	B	B	B	B	B	B	B	B
28th Ave S & S 200th St.	C	B	B	B	B	B	B	B	B	B
International/SR 99 & S 200th St.	F	F	F	F	F	F	F	F	F	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	F	F	F	E	E	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	C	C	C	C	C
Des Moines & Marine View Drive	B	B	B	B	B	B	B	B	B	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	E	E	E	E	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	E	E	F	E	E
SB I-5 Ramps & SR 516	F	F	F	F	F	F	F	F	F	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 10 — Interstate 5 (from South), South 188th Street, Starling Drive

Route 11 — Interstate 5 (from South), South 200th Street, International Boulevard / State Route 99, South 188th Street, Starling Drive

Route 12 — Interstate 5 (from South), Kent-Des Moines Road / State Route 516, International Boulevard / State Route 99, South 188th Street, Starling Drive

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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 13			Route 14			Route 15		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	B	B	B	n/a	B	B	n/a	B
Northbound SR 509 Ramps & SR 518	A	A	A	A	A	n/a	A	A	n/a	A
Des Moines & EB SR 518 On-Ramp	A	A	A	A	A	n/a	A	A	n/a	A
Des Moines & WB SR 518 Off-Ramp	F	F	F	F	F	n/a	F	F	n/a	F
Des Moines & 8th Ave South	B	B	B	B	B	n/a	B	B	n/a	B
International/SR 99 & S 154th St.	E	E	E	E	E	n/a	E	E	n/a	E
24th Ave S & S 154th St.	C	D	D	D	D	n/a	D	D	n/a	D
Des Moines & S 156th St.	C	C	C	C	C	n/a	C	C	n/a	C
Southbound SR 509 & S 160th St.	D	D	D	D	D	n/a	D	D	n/a	D
Northbound SR 509 & S 160th St.	A	A	A	A	A	n/a	A	A	n/a	A
Des Moines & S 160th St.	B	B	B	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 160th St.	B	B	B	B	B	n/a	B	B	n/a	B
International/SR 99 & S 160th St.	D	D	D	D	E	n/a	E	D	n/a	D
Air Cargo Rd & Airport Expressway	B	B	B	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 170th St.	E	E	E	E	E	n/a	E	E	n/a	E
Airport Expressway & S 170th St.	B	B	B	B	B	n/a	B	B	n/a	B
International/SR 99 & S 170th St.	F	F	F	F	F	n/a	F	F	n/a	F
International/SR 99 & S 176th St.	C	C	C	C	C	n/a	C	C	n/a	C
International/SR 99 & S 180th St.	D	D	D	D	D	n/a	D	D	n/a	D
Southbound SR 509 & S 188th St.	A	A	A	A	A	n/a	A	A	n/a	A
Des Moines & S 188th St.	C	C	D	C	C	n/a	C	E	n/a	D
28th Ave S & S 188th St.	C	B	B	B	B	n/a	B	C	n/a	B
International/SR 99 & S 188th St.	F	F	F	F	F	n/a	F	F	n/a	F
Military Rd & S 188th St.	E	E	E	E	E	n/a	E	E	n/a	E
Southbound I-5 Ramps & S 188th St.	D	D	D	D	D	n/a	D	D	n/a	D
Northbound I-5 Ramps & S 188th St.	F	E	E	E	E	n/a	E	E	n/a	E
28th Ave S & S 192nd St.	B	B	B	B	B	n/a	B	B	n/a	B
International/SR 99 & S 192nd St.	D	C	C	C	D	n/a	C	C	n/a	C
Des Moines & S 200th St.	B	B	B	B	B	n/a	B	B	n/a	B
28th Ave S & S 200th St.	C	B	B	B	B	n/a	B	B	n/a	B
International/SR 99 & S 200th St.	F	F	F	F	F	n/a	F	F	n/a	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	E	E	E	n/a	E	E	n/a	E
Military Rd & Northbound I-5 Ramps	C	C	C	C	C	n/a	C	C	n/a	C
Des Moines & Marine View Drive	B	B	B	B	B	n/a	B	B	n/a	B
Pacific Highway/SR 99 & S 216th St.	E	E	E	E	E	n/a	E	E	n/a	E
Pacific Hwy./SR 99 & SR 516	E	E	E	E	E	n/a	E	E	n/a	E
SB I-5 Ramps & SR 516	F	F	F	F	F	n/a	F	F	n/a	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 13 South 154th/156th Street

Route 14 State Route 518, International Boulevard / State Route 99, South 192nd Street

Route 15 State Route 509, South 188th Street, 28th Avenue South, South 192nd Street

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1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks								
		Route 16			Route 17			Route 18		
		1	2A	2B	1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	n/a	B	B	n/a	B	B	n/a	B
Northbound SR 509 Ramps & SR 518	A	A	n/a	A	A	n/a	A	A	n/a	A
Des Moines & EB SR 518 On-Ramp	A	A	n/a	A	A	n/a	A	A	n/a	A
Des Moines & WB SR 518 Off-Ramp	F	F	n/a	F	F	n/a	F	F	n/a	F
Des Moines & 8th Ave South	B	B	n/a	B	B	n/a	B	B	n/a	B
International/SR 99 & S 154th St.	E	E	n/a	E	E	n/a	E	E	n/a	E
24th Ave S & S 154th St.	C	D	n/a	D	D	n/a	D	D	n/a	D
Des Moines & S 156th St.	C	C	n/a	C	C	n/a	C	C	n/a	C
Southbound SR 509 & S 160th St.	D	D	n/a	D	D	n/a	D	D	n/a	D
Northbound SR 509 & S 160th St.	A	A	n/a	A	A	n/a	A	A	n/a	A
Des Moines & S 160th St.	B	B	n/a	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 160th St.	B	B	n/a	B	B	n/a	B	B	n/a	B
International/SR 99 & S 160th St.	D	D	n/a	D	D	n/a	D	D	n/a	D
Air Cargo Rd & Airport Expressway	B	B	n/a	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 170th St.	E	E	n/a	E	E	n/a	E	E	n/a	E
Airport Expressway & S 170th St.	B	B	n/a	B	B	n/a	B	B	n/a	B
International/SR 99 & S 170th St.	F	F	n/a	F	F	n/a	F	F	n/a	F
International/SR 99 & S 176th St.	C	C	n/a	C	C	n/a	C	C	n/a	C
International/SR 99 & S 180th St.	D	D	n/a	D	D	n/a	D	D	n/a	D
Southbound SR 509 & S 188th St.	A	A	n/a	A	A	n/a	A	A	n/a	A
Des Moines & S 188th St.	C	C	n/a	C	C	n/a	C	C	n/a	C
28th Ave S & S 188th St.	C	C	n/a	B	C	n/a	B	B	n/a	B
International/SR 99 & S 188th St.	F	F	n/a	F	F	n/a	F	F	n/a	F
Military Rd & S 188th St.	E	E	n/a	E	E	n/a	E	E	n/a	E
Southbound I-5 Ramps & S 188th St.	D	D	n/a	D	D	n/a	D	D	n/a	D
Northbound I-5 Ramps & S 188th St.	F	E	n/a	E	F	n/a	E	E	n/a	E
28th Ave S & S 192nd St.	B	B	n/a	B	B	n/a	B	B	n/a	B
International/SR 99 & S 192nd St.	D	C	n/a	C	C	n/a	C	C	n/a	D
Des Moines & S 200th St.	B	B	n/a	B	B	n/a	B	B	n/a	B
28th Ave S & S 200th St.	C	B	n/a	B	B	n/a	B	B	n/a	B
International/SR 99 & S 200th St.	F	F	n/a	F	F	n/a	F	F	n/a	F
Military Rd & S 200th St. / SB I-5 Ramps	F	E	n/a	E	E	n/a	E	F	n/a	E
Military Rd & Northbound I-5 Ramps	C	C	n/a	C	C	n/a	C	C	n/a	C
Des Moines & Marine View Drive	B	B	n/a	B	B	n/a	B	B	n/a	B
Pacific Highway/SR 99 & S 216th St.	E	E	n/a	E	E	n/a	E	E	n/a	E
Pacific Hwy./SR 99 & SR 516	E	E	n/a	E	E	n/a	E	E	n/a	E
SB I-5 Ramps & SR 516	F	F	n/a	F	F	n/a	F	F	n/a	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 16 Interstate 5 (from North), South 188th Street, 28th Avenue South, South 192nd Street

Route 17 Interstate 5 (from South), South 188th Street, 28th Avenue South, South 192nd Street

Route 18 Interstate 5 (from North), South 200th Street, 28th Avenue South, South 192nd Street

TABLE 5-4-5
Page 8 of 8

1997-2002 HAUL PROCESS INTERSECTION LEVEL OF SERVICE SUMMARY (CONTINUED)

Evaluated Intersection	Do-Nothing Alternative	Preferred Alternative with Trucks					
		Route 19			Route 20		
		1	2A	2B	1	2A	2B
Southbound SR 509 Ramps & SR 518	B	B	n/a	B	B	n/a	B
Northbound SR 509 Ramps & SR 518	A	A	n/a	A	A	n/a	A
Des Moines & EB SR 518 On-Ramp	A	A	n/a	A	A	n/a	A
Des Moines & WB SR 518 Off-Ramp	F	F	n/a	F	F	n/a	F
Des Moines & 8th Ave South	B	B	n/a	B	B	n/a	B
International/SR 99 & S 154th St.	E	E	n/a	E	E	n/a	E
24th Ave S & S 154th St.	C	D	n/a	D	D	n/a	D
Des Moines & S 156th St.	C	C	n/a	C	C	n/a	C
Southbound SR 509 & S 160th St.	D	D	n/a	D	D	n/a	D
Northbound SR 509 & S 160th St.	A	A	n/a	A	A	n/a	A
Des Moines & S 160th St.	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 160th St.	B	B	n/a	B	B	n/a	B
International/SR 99 & S 160th St.	D	D	n/a	D	D	n/a	D
Air Cargo Rd & Airport Expressway	B	B	n/a	B	B	n/a	B
Air Cargo Rd & S 170th St.	E	E	n/a	E	E	n/a	E
Airport Expressway & S 170th St.	B	B	n/a	B	B	n/a	B
International/SR 99 & S 170th St.	F	F	n/a	F	F	n/a	F
International/SR 99 & S 176th St.	C	C	n/a	C	C	n/a	C
International/SR 99 & S 180th St.	D	D	n/a	D	D	n/a	D
Southbound SR 509 & S 188th St.	A	A	n/a	A	A	n/a	A
Des Moines & S 188th St.	C	C	n/a	C	C	n/a	C
28th Ave S & S 188th St.	C	B	n/a	B	B	n/a	B
International/SR 99 & S 188th St.	F	F	n/a	F	F	n/a	F
Military Rd & S 188th St.	E	E	n/a	E	E	n/a	E
Southbound I-5 Ramps & S 188th St.	D	D	n/a	D	D	n/a	D
Northbound I-5 Ramps & S 188th St.	F	E	n/a	E	E	n/a	E
28th Ave S & S 192nd St.	B	B	n/a	B	B	n/a	B
International/SR 99 & S 192nd St.	D	C	n/a	C	D	n/a	D
Des Moines & S 200th St.	B	B	n/a	B	B	n/a	B
28th Ave S & S 200th St.	C	B	n/a	B	B	n/a	B
International/SR 99 & S 200th St.	F	F	n/a	F	F	n/a	F
Military Rd & S 200th St. / SB I-5 Ramps	F	F	n/a	F	E	n/a	E
Military Rd & Northbound I-5 Ramps	C	C	n/a	C	C	n/a	C
Des Moines & Marine View Drive	B	B	n/a	B	B	n/a	B
Pacific Highway/SR 99 & S 216th St.	E	E	n/a	E	E	n/a	E
Pacific Hwy./SR 99 & SR 516	E	E	n/a	E	F	n/a	E
SB I-5 Ramps & SR 516	F	F	n/a	F	F	n/a	F

Option 1 - Max off-site (66 trips); Option 2A - Maximum on-site using Route A (26 trips), Option 2B - Maximum On-Site using on-site Route B (26 trips)

Route 19 Interstate 5 (from South), South 200th Street, 28th Avenue South, South 192nd Street

Route 20 Interstate 5 (from South), Kent-Des Moines Road / State Route 516, International Boulevard / State Route 99, South 192nd Street

TABLE 5-4-8

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPS)

The following construction management practices are typically included in the Port of Seattle's contract specification. It is anticipated that this listing would be included in the requests for bids, and included in contractors construction plans:

A. The Port will monitor all off-site loading operations, haul routes, and on-site operations to ensure compliance with all applicable mitigation provisions.

B. The Contractor will be required to identify and assign a **Haul Route Supervisor**. The Haul Route Supervisor shall be a supervisory person, well-trained, and experienced in handling excavated materials both with "on-highway" and "off-highway" equipment. The Haul Route Supervisor shall be completely familiar with the approved haul routes. The Haul Route Supervisor shall document all activities and answer all complaints regarding spillage, traffic violations, property damage claims, safety, equipment breakdowns, and the terms and conditions of required bonds and permits. The Haul Route Supervisor need not be a full-time employee dedicated to this project. The responsibilities may be shared with other project personnel provided the above-stated qualifications are satisfied.

C. The Contractor will be required to maintain documentation concerning its activities. The Contractor will maintain project records concerning fill material borrow site and haul routes. Before any material is loaded at the fill material source borrow site, the Contractor shall submit the following information: (a) Haul Route to the site and return. (b) Copies of permits, agreements, or letter of understanding from regulatory agencies, towns, cities, or other governmental entities. (c) Description, owner, vehicle number, and license number of each hauling vehicle. (d) Each vehicle operator's name and driver's license number.

D. Vehicles delivering materials to or hauling material, shall **access the site from** [to be inserted] via the contractor's access route. These routes and a specific contractor hauling plan will be reviewed by the Port and approved prior to implementation. When reviewing requested haul routes, the Port will consider the potential impacts on traffic congestion, roadway conditions, impacts on neighboring properties, and other relevant factors. Based on this consideration, and in consultation with other jurisdictions (such as WSDOT and adjacent cities), the Port may accept or reject proposed haul routes or impose conditions on the use of haul routes, including hours of operating and number of vehicles permitted to use the route. The hauling vehicle shall proceed to the project site via the approved haul route. Any deviation from the approved haul route shall be approved by the Haul Route Supervisor and the Port.

E. The Contractor shall provide an asphalt or concrete paved drive for haul truck access to and exit from the construction site. This paved/concrete drive, in conjunction with a rock run-out area, should be 500-1,000 feet continuous from connection to public roads or the project site.

F. Contractors will be required to maintain and repair all equipment in a manner that reasonably minimizes adverse environmental impacts, such as air pollution, noise, and entrainment of dust. Contractors will be required to maintain minimum freeboard on all hauling trucks with continuous monitoring for compliance. The Haul Route Supervisor will ensure that all haul vehicles have effective mufflers at all times and that Jake Brakes are not used except in specifically designated areas.

TABLE 5-4-8 (Continued)

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPS)

G. The vehicle operator shall conform to the agreed upon all operational procedures established by the site operator and the Contractor. The procedure shall include but not be limited to, traffic control, turn-outs, turn-arounds, queue time, truck washing facilities, gate security, etc. The contractor will provide all **flagging, signing, lighting**, etc., as required by the applicable jurisdiction (including City of SeaTac, King County, State of Washington or the Port of Seattle) to provide all **reasonable safety measures** to protect all persons using the roads The contractor shall obey all vehicular weight and speed limits established by the applicable jurisdiction. Flagging, signs and all traffic control devices shall conform to WAC 296-155-300, -05, -310 and -315 and specific regulation or requirements of the City of SeaTac. Flaggers must meet the requirements of the State of Washington, Department of Labor and Industries (WAC 296-155-305). All workers engaged in flagging or traffic control shall wear reflective vests and hard hats. Contractors will use truck scales or loading equipment scales at borrow sites to ensure compliance with legal load limits.

   The local jurisdiction may notify the Port if a safety issue arises, and subsequent to the Port and Contractor taking reasonable steps to promptly address the safety issues, may assign a uniformed officer to enforce safety regulations, including overweight vehicle enforcement.

   The Contractor shall appoint one employee as the responsible representative in charge of traffic control and safety. The appointed representative shall have authority to act on behalf of the Contractor and shall be available, on call, twenty-four hours a day throughout the period of construction for the Contract. A twenty-four hour phone number shall be provided to the Port of Seattle for use in case of an off-hour emergency. The Contractor shall provide immediate response to correct any and all deficiencies upon notification and keep a log of the response and actions taken to address deficiencies.

H. The contractor shall continuously **sweep and wash-down** access routes to the construction areas and existing adjacent paving areas. These areas shall be kept free of debris at all times. Sediment shall be removed from roads by shoveling or sweeping and be transported and place within the fill area. Coordinate the sediment disposal area with the Port of Seattle. Street washing shall be allowed only after sediment has been removed. The contractor shall flush and clean storm drainage systems along the haul route within 1,000 feet of the site when so directed by the Port. Water may be used for dust control purposes provided that runoff does not discharge directly into a receiving stream.

I. Any **damage** (including lane striping and lane turtles) along the contractor access/haul routes due to the contractors use for this project shall be repaired immediately. At the completion of the project, all pavements and surfaces along the access routes that were existing at the start of the project shall be restored to their original condition or fees paid in lieu of repairs as agreed by the Port and local jurisdiction. The contractor shall repair any damage to the haul road due to their operations. The contractor shall coordinate and meet the cleaning and repair requirements set by other public agencies for use of their roads for Sea-Tac Airport related work. Existing pavements, facilities, utilities, or equipment which are damaged shall be replaced or reconstructed to original strength and appearance at the Contractor's expense. The Contractor shall take immediate action to replace any damaged facilities and equipment and reconstruct any damaged area which is to remain in service.

TABLE 5-4-8 (Continued)

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPS)

J. The contractor shall keep a vacuum sweeper truck and a water truck on site at all times during the working and non-working hours and shall maintain the site **free from dust and objectionable debris**. During the periods of time that there is no construction activity (i.e., between work shifts), the water truck must be ready with on-site contractor's personnel available to respond immediately to a dust problem, as identified by Airport Operations staff or the Port Engineer. At no time shall there be more than a 20 minute response time to calls concerning dust/debris problems during work hours and a 90-minute response time at all other tomes on a 24-hour per day basis. The Contractor's method for dust control will be continuously monitored and if the method is not controlling the dust to the satisfaction of the Port, the Contractor will be required to improve the method or utilize a new method at no additional cost to the Port.

The contractor shall provide whatever means are necessary to prevent foreign object debris (FOD) in aircraft movement areas on a 24-hour basis. Trucks and equipment shall have all loose dirt, rocks, and other materials removed when accessing the Airport Operations Area or when leaving the work area and using public roads. They will be continuously monitored by the Port and if the Contractor's method is not adequate, the Contractor will be required to improve their method or utilize a new method at no additional cost to the Port.

The Contractor shall provide **truck washes, rumble strips, stabilized construction entrances,** shakers or whatever means are necessary to prevent any foreign material from being deposited on public roads.

When Airport roadways and public highways are used in connection with construction under this contract, the Contractor shall remove all debris cluttering the surfaces of such roadways. Trucks and equipment shall have all accumulated dirt, mud, rocks, and debris removed before accessing the site and when leaving the work area. Loads shall be struck flush and secured to prohibit loss of material. If spillage occurs, such roadways shall be swept clean immediately after such spillage to allow for safe operation of vehicles as determined by the Port of Seattle. If the Contractor is negligent in cleanup and Port forces are required to perform the work, the expense of said cleanup shall be paid by the Contractor.

K. At all times keep objectionable **noise** generation to a minimum by: (1) Equip air compressors with silencing packages. (2) Equip jackhammers with silencers on the air outlet. (3) Equipment that can be electrically driven instead of gas or diesel is preferred. If noise levels on equipment cannot reasonably be brought down to criteria, listed as follows, either the equipment will not be allowed on the job or use time will have to be scheduled subject to approval of the Port of Seattle. Objectionable noise received on neighboring (non-Port-owned) properties is defined as any noise exceeding the noise limits of State Regulations (WAC 173-60-040) or City ordinance, or as any noise causing a public nuisance in residential area, as determined by the Port and community representatives, or by the nuisance provisions of local ordinances. The noise limitations established are as set forth in the following table after any applicable adjustments provided for herein are applied:

	RECEIVING PROPERTY		
Noise Source	**Residential**	**Commercial**	**Industrial**
Airport	50 dBA	65 dBA	70 dBA

Between the hours of 10:00 p.m. and 7:00 a.m. on weekdays and 10:00 p.m. and 9:00 a.m. on weekends the noise limitations above may be exceeded for any receiving property by no more than:

TABLE 5-4-8 (Continued)

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPS)

(a) Five dBA for a total of 15 minutes in any one hour period; or (b) Ten dBA for a total if 5 minutes in any one hour period; or (c) 15 dBA for a total of 1.5 minutes in any one hour period.

In addition to the noise controls specified, demolition and construction activities conducted within 1,000 feet of residential areas may have additional noise controls required.

L. To minimize pollution emissions, the Contractor shall:

1. Develop and submit for approval a Contractor Erosion Control Plan (CECP). The CECP shall include all the erosion and sedimentation control features required by: (1) The project specifications. (2) The Temporary Erosion and Sedimentation Control Plan (TESCP); (3) Storm Water Management Manual for the Puget Sound Basin (Volumes I and II). (4) Regulatory agencies and such additional controls made necessary by the Contractor's operation. The Contractor shall maintain a copy of the CECP and all references at the job site.
2. Designate an experienced Sedimentation and Erosion Control Representative (SEC). The SEC shall have authority to act on behalf of the Contractor and shall be available, on call, 24 hours a day throughout the period of construction. A 24 hour phone number shall be provided to the Port of Seattle. The Contractor shall provide immediate response to correct all deficiencies.
3. Coordinate and schedule the installation of the controls, features, and best management practices (BMPs) identified in the Contractor Erosion Control Plan. Coordinate the erosion and sedimentation control work with the other contract work in order to provide continuous erosion and sedimentation control and protection.
4. Maintain the installed BMPs and controls for the duration of the project or as indicated in the contract documents.
5. Provide periodic inspection and response to ensure that the installed BMPs function during any and all storm events. Contractor shall be responsible for erosion and sedimentation control 24 hours a day, seven days a week, including holidays.
6. Remove all temporary controls at the end of the project or when no longer needed as determined by the Port of Seattle.
7. Conduct project operations in accordance with the State National Pollution Discharge Elimination System (NPDES) permit for storm water discharges associated with construction activity.
8. No grading or earthwork shall be started before the CECP is submitted and the Best Management Practice (BMPs) erosion and sedimentation control items are in place and functioning. BMPs once installed shall be maintained for the life of the project or until their erosion and sediment control function has been completed. BMPs shall be reviewed after each major storm event. BMPs shall be maintained during all suspensions of work and all non-work periods.
9. Clearing limits, sensitive/critical areas and their buffers, trees, drainage courses, and wetland areas shall be clearly delineated in the field. Extreme care shall be taken to prevent sediment deposition or contamination of the golf course property, wetland areas, existing drainage courses, or public streets. In the event that these areas suffer degradation in the opinion of the Port of Seattle, the Port Engineer may stop construction activities until the situation is rectified. BMPs intended as sediment trapping measures shall be installed and functional before land disturbing activities take place. Properties and waterways downstream shall be protected from erosion due to increases in the volume, velocity and peak flow rate of storm water from the

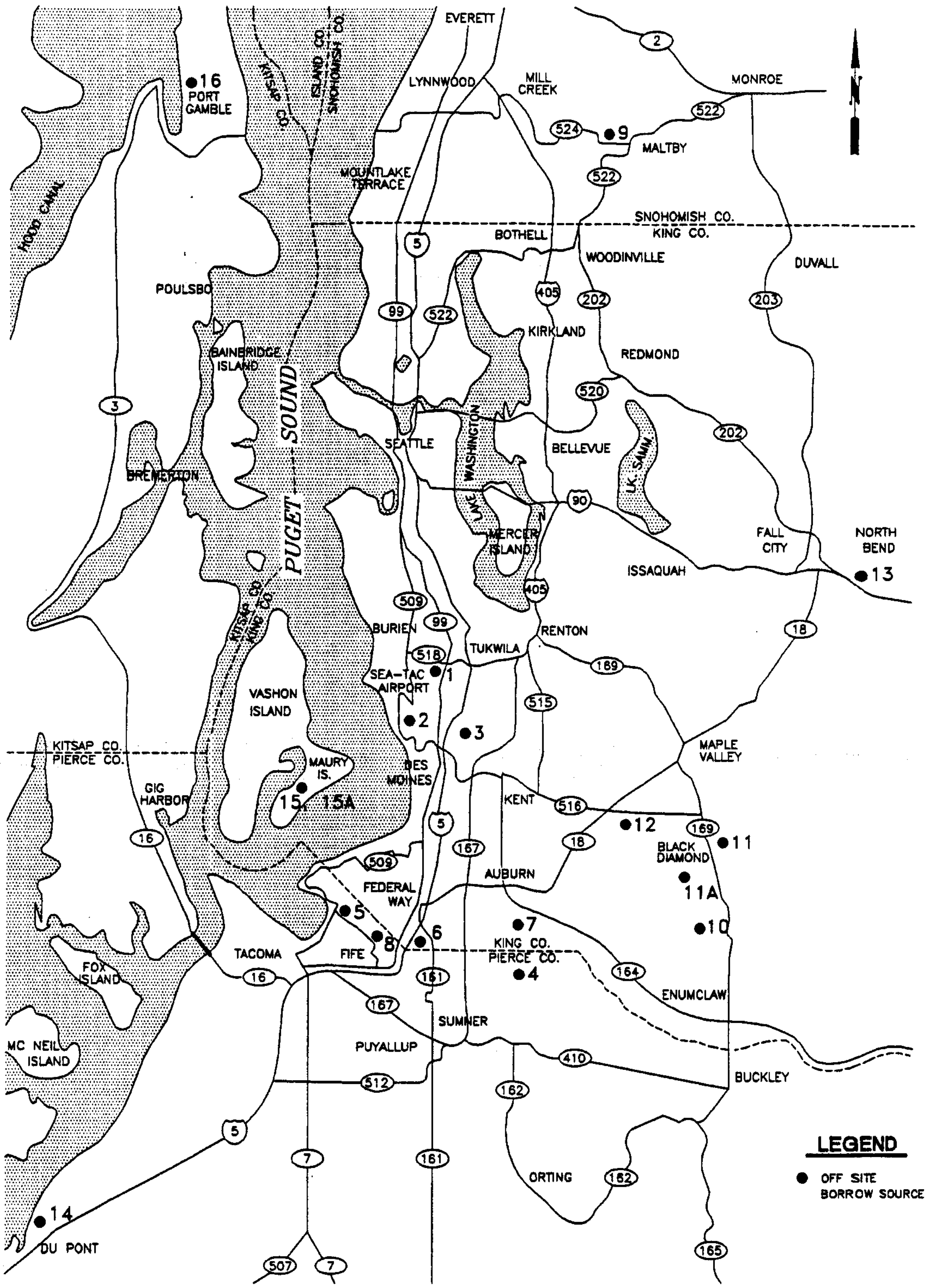
TABLE 5-4-8 (Continued)

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CONSTRUCTION BEST MANAGEMENT PRACTICES (BMPS)

project site. All temporary on-site conveyance channels shall be designed, constructed and stabilized to prevent erosion from the expected velocity of flow from a 2 year, 24 hour frequency storm for the developed condition. When warranted, application for a Temporary Modification of Water Quality Certification, 401 Permit will be made. All requirements of the permit will be adhered to for the duration of the project.

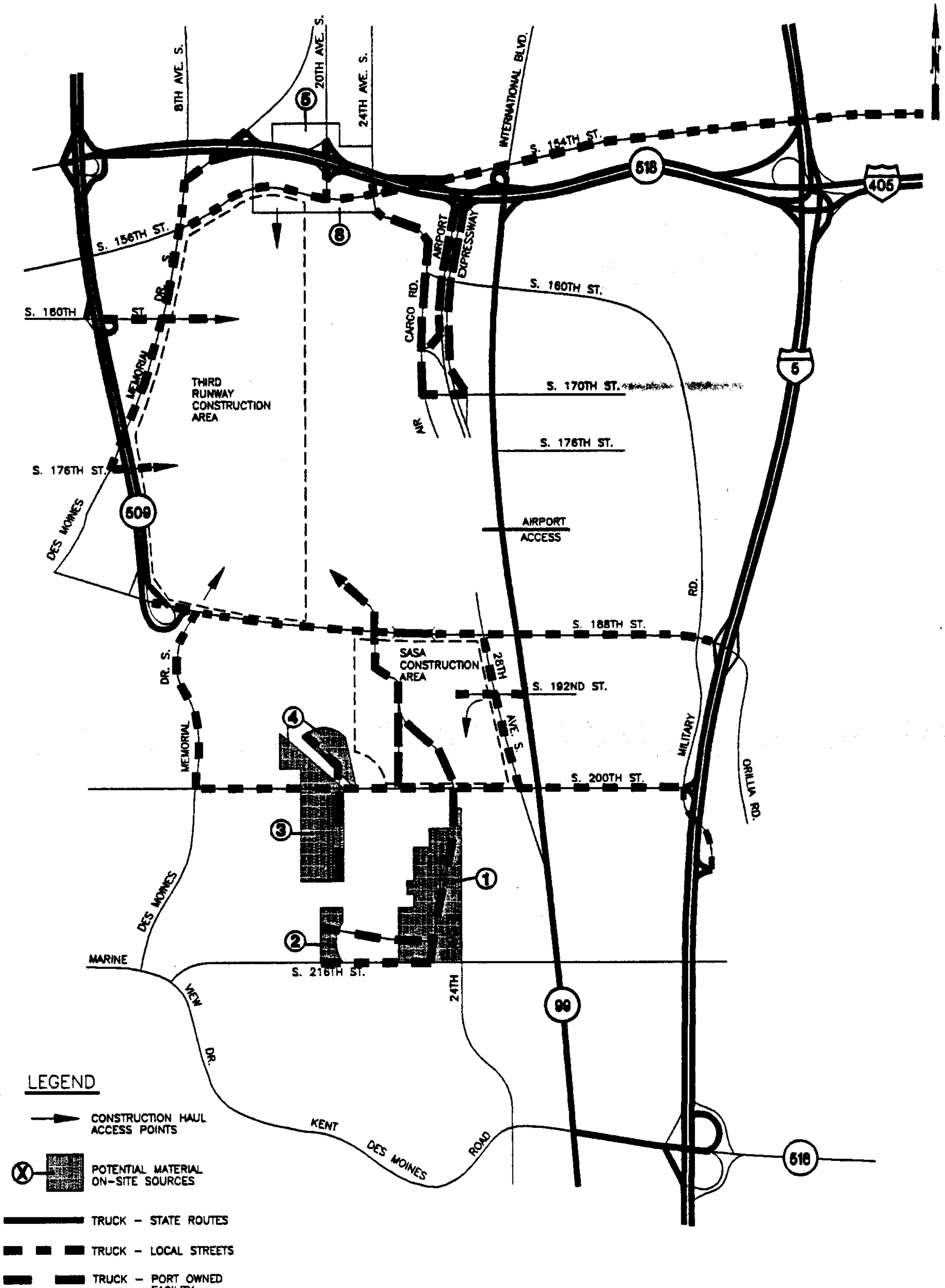
10. All temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Disturbed soil areas resulting from removal shall be permanently stabilized.
11. Dewatering devices shall discharge into a sediment trap or sediment pond. All pollutants other than sediment that occur on-site during construction shall be handled and disposed of in a manner that does not contaminate storm water.
12. A designated maintenance area will be established for all construction sites with appropriate pollution controls. Fueling of Contractor's equipment will be performed away from storm drain inlets in areas designated by the Contractor and reviewed by the Port of Seattle. Extreme care shall be taken to prevent fuel spills. Contractor's representative shall be present at all times when equipment is being fueled. In the event of a spill the Port of Seattle Fire Department shall be called by way of the Port of Seattle. Place oil absorbent pads and drip pans beneath the vehicle being fueled and under parked vehicles (overnight and otherwise). Provide and maintain absorbent materials, shovels, and five gallon buckets at the fueling area for spill cleanup.



INCA ENGINEERS INC.

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE
ENVIRONMENTAL IMPACT STATEMENT

REGIONAL VICINITY MAP
& OFF-SITE MATERIAL
SOURCES
EXHIBIT 5-4-1



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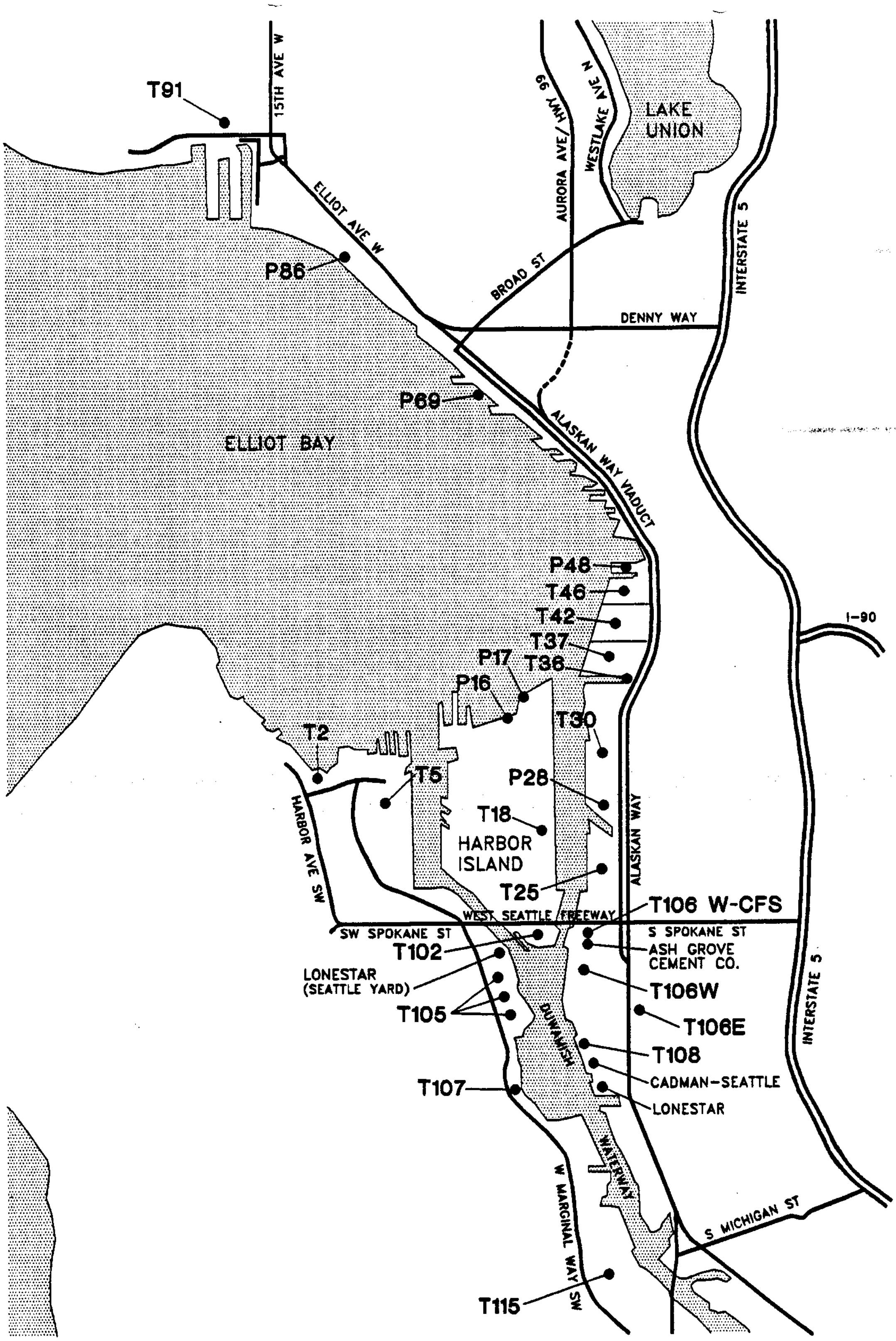
INCA ENGINEERS INC.

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE
ENVIRONMENTAL IMPACT STATEMENT

AIRPORT VICINITY HAUL ROUTES

EXHIBIT 5-4-2



SOURCE: HNTB ALTERNATIVE DELIVERY STUDY, NOVEMBER 1996.

INCA
INCA ENGINEERS INC.

SEATTLE-TACOMA INTERNATIONAL AIRPORT
MASTER PLAN UPDATE
ENVIRONMENTAL IMPACT STATEMENT

POTENTIAL BARGE TRANSFER LOCATIONS
EXHIBIT 5-4-3

EMBANKMENT SECTION
NORTH END OF THIRD RUNWAY

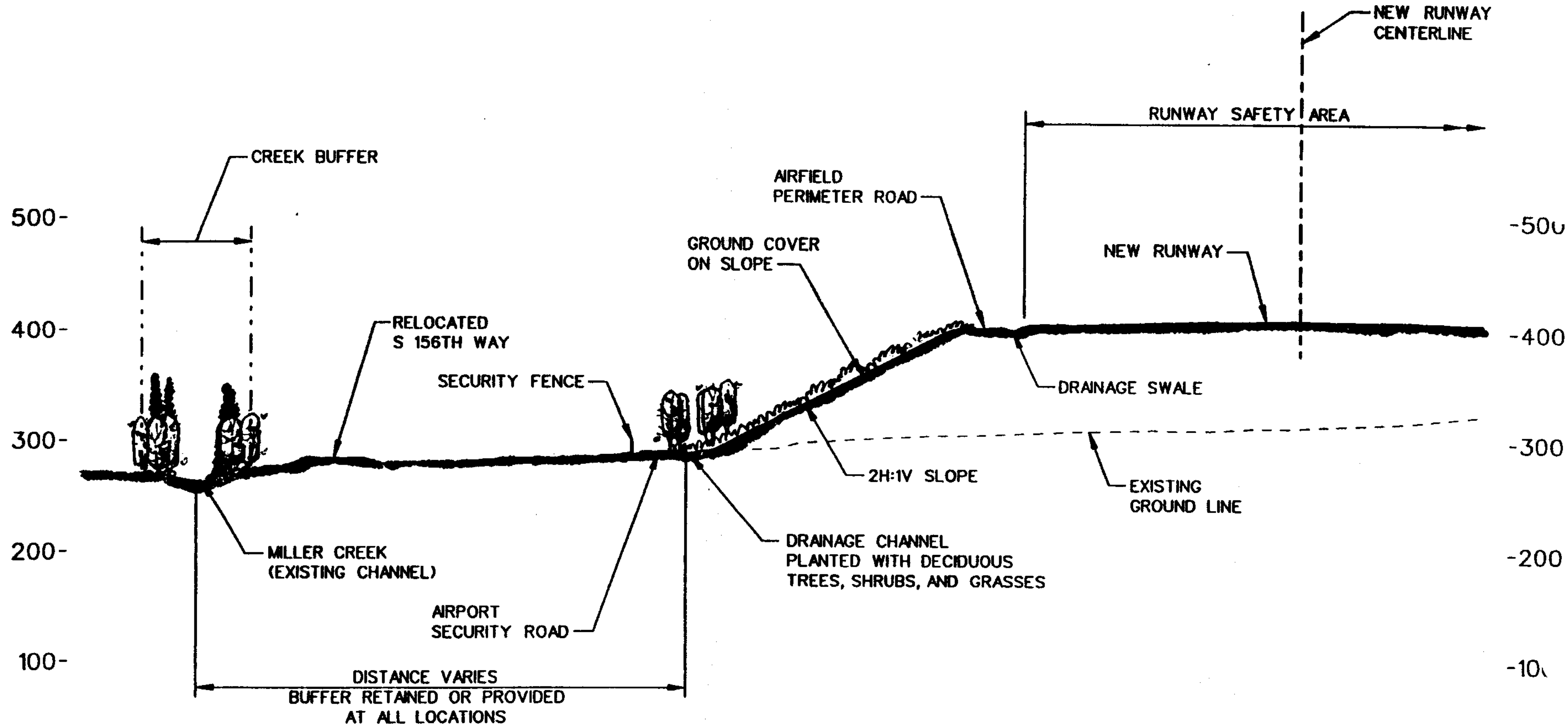
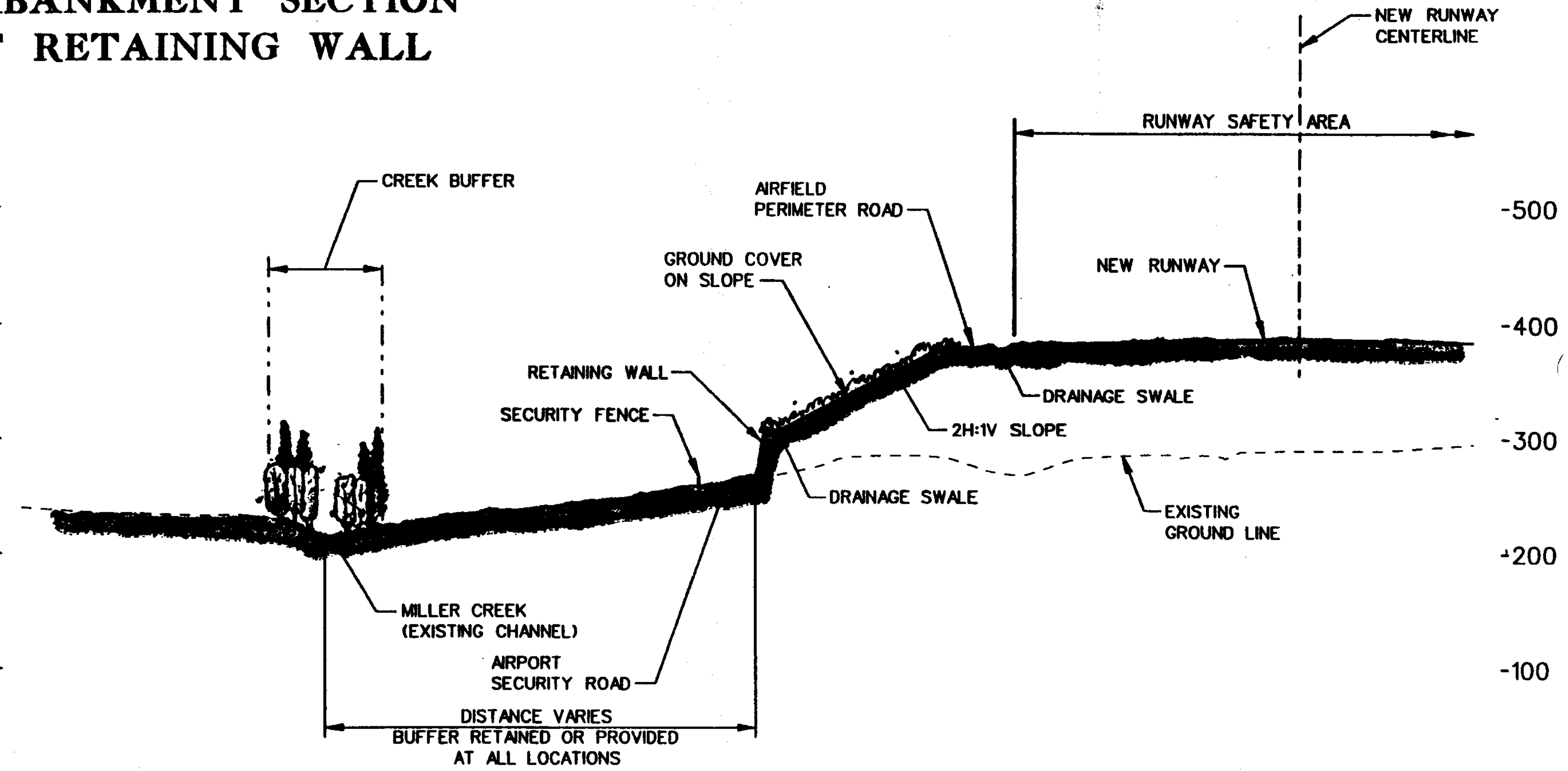
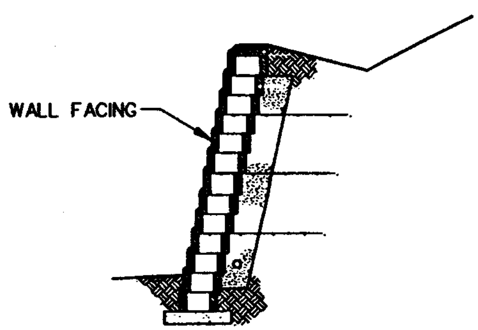


Exhibit 5-4-5A
New Runway Embankment
(North End)

JANUARY 17, 1997

EMBANKMENT SECTION AT RETAINING WALL



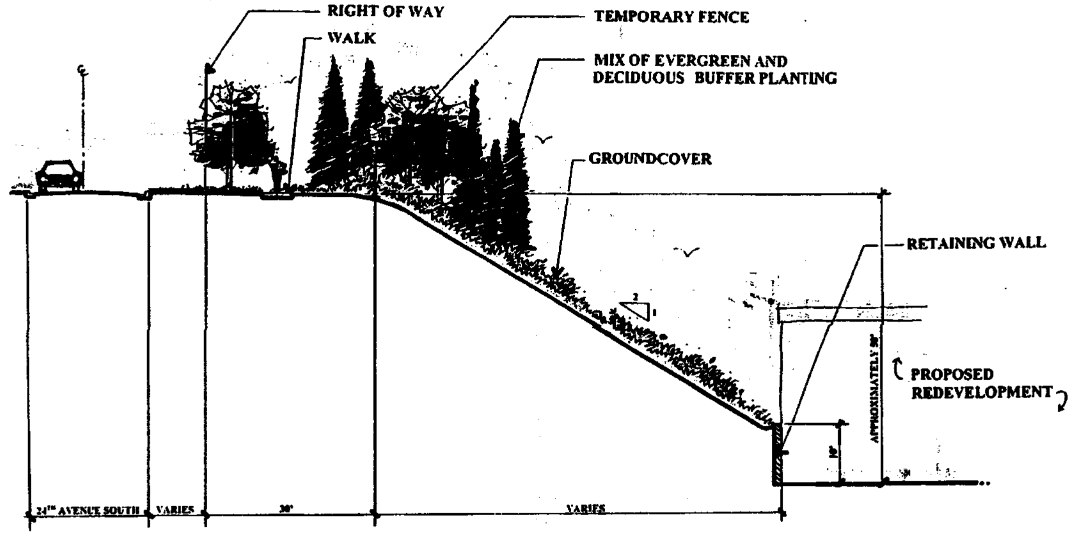


POSSIBLE RETAINING WALL CONCEPT

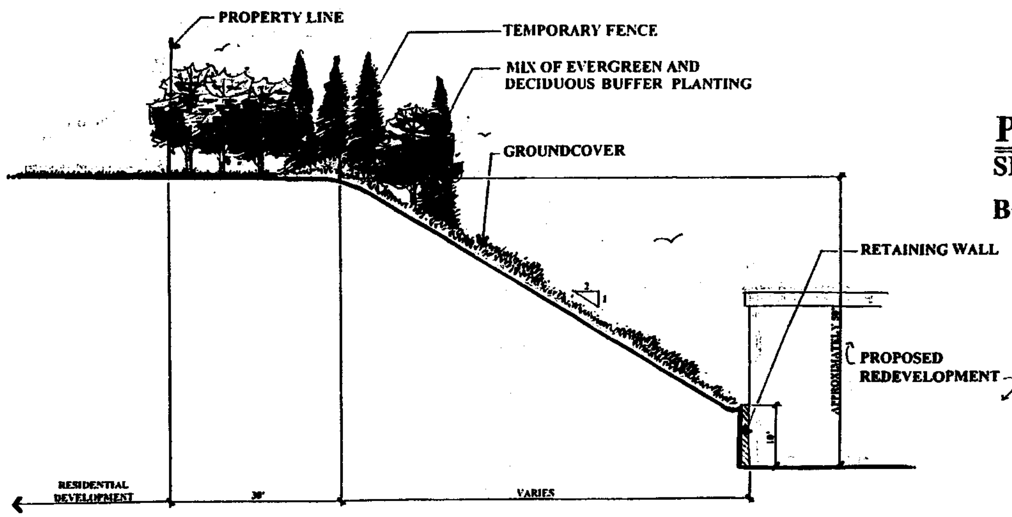
Exhibit 5-4-5B
New Runway Embankment
(Retaining Wall)

JANUARY 17, 1997

REDEVELOPMENT CONCEPT SECTIONS



SECTION A - A



SECTION B - B

PORT OF SEATTLE
SEATAC INTERNATIONAL AIRPORT
BORROW SITE REDEVELOPMEN

Exhibit 5-4-6
South On-Site Borrow Source Redevelopment Concept

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SECTION 5-5

BIOTIC COMMUNITIES, WETLANDS AND FLOODPLAINS

Chapter IV of the Final EIS (located in Volume I) presents the impacts of the Master Plan Update improvements relative to biotic communities (including creeks), wetlands, floodplains. Since the issuance of the Final EIS, information concerning two key areas has been produced:

- Submission of the wetland fill Section 404 permit application to the U.S. Army Corps of Engineers and further definition of wetland mitigation and Miller Creek relocation mitigation; and
- Survey of raptors in the area of the third runway.

This section of the additional environmental analysis presents the new information.

The Final EIS (Chapter IV, Section 16) states:

> Approximately 40 percent of the detailed study area is occupied by Sea-Tac Airport and is characterized by frequently mowed grassland bisected by service roads and taxiways. This area provides little wildlife habitat value. Wildlife habitat surrounding the airfield consists of fragmented habitat, which is composed of forest, shrub, and grassland with scattered wetlands. These areas are subject to a variety of airport-related disturbances as well as increasing residential, commercial, and industrial development. Each of the "With Project" alternatives would remove approximately the same amounts of vegetation (about 712 acres total). Of that total, the majority is managed grassland (about 303 acres), which provides little wildlife habitat value. In addition, about 269 acres of forest, 78 acres of shrub, 52 acres of unmanaged grassland, and 10 acres of wetlands would be removed under each "With Project" alternative.
>
> About 3,700 feet of Miller Creek and its tributaries would require realignment and relocation to complete the runway. About 200 feet of Des Moines Creek would require relocation due to the 600 ft extension of Runway 34R. About 2,200 feet of open channel on Des Moines Creek would require relocation due to the South Aviation Support Area. The 200-foot section of Des Moines Creek that would be affected by the extension of Runway 34R is within the area that would be realigned as mitigation for SASA. Proposed mitigation would reduce potential impacts on the hydrology, water quality, and aquatic habitat and biota of Miller and Des Moines Creeks and Puget Sound.

The findings of the Final EIS remain current. The following summarize the status of other processes and information developed as part of the mitigation planning, further investigations were undertaken concerning wetland impacts, and stream relocation, and possible use of the site by raptors.

1. Wetland Impacts and Relocation of Miller Creek

In December 1996, the Port submitted an application to the Army Corps of Engineers for a permit to fill wetlands at Sea-Tac Airport associated with the Master Plan Update improvements in compliance with the Clean Water Act, Section 404. The 404 permit application submitted to the Corps of Engineers includes a completed Joint Aquatic Resources Project Application (JARPA) form, in a report entitled "JARPA Application for Proposed Improvements at Seattle Tacoma

International Airport" dated December 1996. Copies of this document, that includes the jurisdictional delineation of wetlands at Sea-Tac, the proposed Wetland Mitigation Plan, the proposed mitigation for relocation of Miller Creek, and accompanying tables and drawings are available for review at the Port of Seattle Engineering Office at Sea-Tac Airport and the Northwest Mountain Region FAA Office in Renton, Washington at the addresses noted on the cover of this Supplemental EIS. These documents are hereby incorporated by reference.

The Final EIS noted that about 10.4 acres of wetland would be filled in order to complete the proposed improvements. Since issuance of the Final EIS, the Port has refined its evaluation of the projects affecting wetlands, including identification of nearly two (2) additional acres of wetland impacts, documented its review of in-basin mitigation options, and further defined plans for development of a wetland mitigation site in Auburn.

Based on a refined evaluation of the wetlands, the following impacts were identified:[1]

Project Element	New Data	Final EIS
Runway impacts		
Embankment	5.46	5.48
Borrow Source impacts	1.92	2.38
Runway Safety Areas 16L/R	2.34	Included above
Runway 34R Extension	0.00	0.00
Terminal/Landside		
N. Employee Parking lot	0.81	0.81
Development in SASA	1.70	1.70
Total	12.23	10.40

As is noted in Chapter 2 (page 2-19) two alternatives are possible for the relocation of S/154th/S. 156th around the Runway Safety Areas for 16L/16R. Option 1 would result in the relocation of the road just around the existing RSA, and connect to the existing alignment of the road (it would not address the alignment of the third parallel runway). This option would affect 2.34 acres of wetland. Option 2 would account for the new parallel runway, and would relocate the roadway as shown in the Preferred Alternative (Exhibit 3-3) around the RSA's for all three runways. Wetlands impacted by Option 2 would include the 2.34 acres from Option 1 plus an additional 0.73 acres that is included in the runway impacts above (5.46 acres noted for the embankment includes the 0.73 acres for the road relocation), for a total of 3.04 acres.

To mitigate for the unavoidable impacts to wetlands, the Port proposes to create new wetlands on a 47-acre site of an approximately 69-acre parcel located within the city limits of Auburn, Washington. Wetland mitigation at the Airport, within the watersheds where the impacts may occur, is not feasible for three reasons: (1) most of the area surrounding the Airport is developed, and not enough available land exists in the watershed to create compensatory mitigation wetlands without relocation of additional business and residences; (2) the FAA has indicated that "wildlife attractions" within 10,000 ft of the edge of any active runway is not recommended; and (3) wildlife control activities in wetlands near the airport would conflict with wetland habitat mitigation goals. Because of wildlife attraction issues, the Port cannot commit to maintaining sites on or near the Airport as wetland habitat mitigation

[1] The quantity of wetland to be filled is based on the best information available at this time. The Port and FAA do not have access to all property to be acquired for construction of the third runway. It is possible that some additional wetland areas could be identified when access is available to all property in the acquisition area.

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in perpetuity. If a wetland site were to become a safety concern because of its attraction to wildlife, particularly birds, and jeopardize aircraft safety, the Port would be compelled to remove the hazard, including flora and/or fauna. However, the hydrologic functions the wetlands perform would be replaced at the Airport with the proposed storm water management facilities, relocation of the drainage channels, and relocation of affected portions of Miller Creek.

Because much of the wetland mitigation was established based on FAA guidance, the FAA Advisory Circular, approved on May 1, 1997 has been included in its entirety at the end of this section.

(A) Impacts to Wetlands

Implementation of the proposed Sea-Tac Airport Master Plan Update improvements would impact all or portions of 36 wetlands. The total area of wetland impact is 12.23 acres. Most impacts would occur during the first phase (1997-2000) of implementation, which includes construction of the new parallel runway, north employee lot, site preparation of the land known as SASA, and runway safety area upgrades. The wetland mitigation would compensate for all anticipated wetland impacts attributed to full implementation of the proposed Master Plan Update improvements. **Table 5-5-1** lists the impacts by wetland location and type.

The ecological characteristics of wetlands within the proposed impact areas have been evaluated and incorporated into the mitigation design to ensure that mitigation compensates for unavoidable wetland impacts from the entire Master Plan Update. Due to similarities in vegetation, many of the affected wetlands serve similar physical and biological functions and have been grouped for ecological assessment. Wetlands within the impact area occur in the Des Moines Creek and Miller Creek drainage basins, where natural habitats (including wetlands) are fragmented by urban development. In addition to substantial fragmentation of habitat, the small size of most impacted wetlands suggests that they function independently rather than as a natural ecological system.

According to the Washington State Natural Heritage Program information system and field studies, no rare plants, high-quality native wetlands, or high-quality native plant communities occur in the study area. Nineteen vegetation communities were identified in the proposed Master Plan Update study area, including nine (9) wetland and ten (10) upland vegetation communities. The wetland vegetation communities include forested wetland, shrub wetland, and emergent wetland.

Wetland Functions and Values: The biological and physical functions of wetlands within the study area were assessed to identify important qualities that should be replicated by the mitigation design.

Impacts associated with the Master Plan Update improvements are to small (<0.5 acre) wetlands that are isolated from other significant aquatic or semi-aquatic habitat, and occur in a landscape fragmented by streets, commercial, residential, or airport development. Therefore, for most functions, the wetlands were not considered to provide high function. Emergent wetlands (some with associated shrub habitat) were rated low for the following functions: export of production; baseflow support; and control of floodflow. Forested wetlands (some with associated shrub habitat) received a low functional value for export of production and stormwater runoff storage functions.

The wildlife habitat functions are generally significant to the local vicinity (rather than to a larger landscape or watershed) because urban development isolates the area for many species of wildlife, and the size of many of the wetlands are smaller than the habitat requirements of many mammal and bird species. The biological functions of wetlands are further limited by the lack of permanent open water, the short duration of seasonal ponding or soil saturation, and the high occurrence of non-native plant species in some emergent wetlands. The wildlife habitat value increases where trees and/or shrubs are adjacent to the grass-dominated emergent areas.

TABLE 5-5-1

Seattle-Tacoma International Airport
Supplemental Environmental Impact Statement

CLASSIFICATION, SIZE, AND IMPACTS TO WETLANDS

Wetland Number	Classification[1]	Wetland Size (Acres)	Total Impact[5] (Acres)	Vegetation Cover Types Impacted (Acres) Forested	Shrub-Scrub	Emergent
1	Forested	0.07	0.07	0.07	–	–
2	Forested/Emergent (60/40)	0.74	0.74	0.44	–	0.29
3	Forested	0.56	0.19	0.19	–	–
4	Forested	5.02	0.46	0.46	–	–
5	Forested/Shrub-Scrub (10/90)	4.58	1.69	0.17	1.52	–
6	Shrub-Scrub	0.87	0.00	–	–	–
7	Forested/Open Water/Emergent	6.70	0.00	–	–	–
8	Shrub-Scrub/Emergent	4.95	0.00	–	–	–
9	Emergent/Forested (60/40)	2.85	0.13	0.05	–	0.08
10	Shrub-Scrub	0.31	0.00	–	–	–
11	Forested/Emergent (80/20)	0.50	0.47	0.37	–	0.09
12	Emergent/Forested (80/20)	0.21	0.21	0.04	–	0.16
13	Emergent	0.05	0.05	–	–	0.05
14	Forested	0.19	0.19	0.19	–	–
15	Emergent	0.28	0.28	–	–	0.28
16	Emergent	0.06	0.06	–	–	0.06
17	Emergent	0.03	0.03	–	–	0.03
18	Forested	0.12	0.12	0.12	–	–
19	Forested	0.57	0.57	0.57	–	–
20	Shrub-Scrub/Emergent (90/10)	0.06	0.06	–	0.06	0.01
21	Forested	0.22	0.22	0.22	–	–
22	Emergent/Shrub-Scrub (90/10)	0.06	0.06	–	0.01	0.05
23	Emergent	0.78	0.78	–	–	0.78
24	Emergent	0.14	0.14	–	–	0.14
25	Forested	0.06	0.06	0.06	–	–
26	Emergent	0.02	0.02	–	–	0.02
27	Emergent[2]	0.00	0.00	–	–	–
28	Open Water/Shrub-Scrub (0/100)	18.10	0.06	–	0.06	–
29	Forested	0.74	0.74	0.74		–
30	Forested/Shrub-Scrub (80/20)	0.50	0.50	0.40	0.10	–
31	Emergent	0.05	0.00	–	–	–
32	Emergent	0.05	0.05	–	–	0.05
33	Forested/Shrub-Scrub/Emergent/Open Water	17.60	0.00	–	–	–
34	Open Water	1.40	0.00	–	–	–
35	Emergent	0.21	0.18	–	–	0.18
36	Forested/Emergent	0.30	0.00	–	–	–
37	Forested/Shrub Scrub (70/30)	2.41	1.68	1.17	–	0.50
38	Emergent/Shrub Scrub[3]	0.00	0.00	–	–	–
39	Forested	0.07	0.00	–	–	–
40	Forested	0.09	0.09	0.09	–	–
41	Emergent	0.09	0.08	–	–	0.08

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Wetland Number	Classification[1]	Wetland Size (Acres)	Total Impact[5] (Acres)	Vegetation Cover Types Impacted (Acres) Forested	Shrub-Scrub	Emergent
42	Emergent	0.50	0.00	–	–	–
43	Emergent/Shrub-Scrub/Forested/Open Water	30.3	0.00	–	–	–
44	Forested/Shrub-Scrub	0.70	0.00	–	–	–
45	Emergent	5.00	0.00	–	–	–
46	Open Water	0.06	0.00	–	–	–
47	Open Water	0.20	0.00	–	–	–
48	Emergent	0.02	0.00	–	–	–
49	Emergent	0.02	0.03	–	–	0.03
50	Shrub-Scrub	0.03	0.12	–	0.02	–
51	Forested	2.41	0.48	0.48	–	
52	Forested/Shrub-Scrub (90/10)	1.00	1.00	0.90	0.10	–
53	Forested	0.60	0.60	0.60	–	–
54	Shrub-Scrub/Open Water	25.70	0.00	–	–	–
55	Shrub-Scrub	0.04	0.04	–	0.04	–
TOTAL[4]		**143.86**	**12.23**	**7.34**	**2.00**	**2.88**

1 All wetland are palustrine based on USFWS classification system. Where more than one cover type is present, the percent impact to each cover type is shown in parenthesis.

2 Fill of this wetland completed with an approved Section 404 Nationwide 26 permit.

3 This wetland was determined not to be a regulated wetland by the City of Sea-Tac and the Corps of Engineers.

4 Values are rounded to two significant figures. Actual values/totals may differ slightly due to the effects of rounding.

5 Exact areas of wetland impact are subject to minor changes due to final engineering design and completion of wetland delineations on private property.

Hydrologic functions (such as floodflow storage, groundwater discharge, and storm water detention) are potentially important at the watershed level, because, when present, they may affect hydrologic and habitat conditions in off-site locations, especially fish habitat in Miller and Des Moines Creeks. Forested wetlands, on groundwater seeps adjacent to Miller and Des Moines Creeks, help to support the baseflow of the creeks by providing seasonal or perennial sources of water. Some of the forested wetlands associated with the creeks temporarily store floodwaters, which alleviates the severity of downstream flooding, and streambank erosion. Other wetlands help reduce peak flows by collecting and storing storm runoff, reducing the rate and volume of water that reaches the stream systems during storms. The on-site wetlands have a limited ability to provide these functions, largely due to their small size, the lack of direct connections to the creeks, or topographic conditions that limit seasonal detention of stormwater.

The groundwater recharge function of wetlands appears to be limited throughout much of the site. Many wetlands occur on compact till soils (Alderwood Series) above the Miller Creek and Des Moines Creek ravines. The wetlands have formed in shallow depressions where a perched water table has developed on low permeability till. Due to the low permeability of the till layer, it is unlikely these wetlands contribute significantly to recharge of groundwater.

These functional assessments were used in developing the appropriate mitigation for the proposed improvements at Sea-Tac Airport.

As was noted earlier, wetland impacts will occur due to the three specific development actions: 1) development of the third parallel runway and use of on-site borrow sources, 2) Relocation of S. 154th Street due to the Runway Safety Areas; 3) development of the North Employee Parking Lot (north of SR 518); and 4) Development of the area known as the

South Aviation Support Area (SASA). The following summarize the alternatives to these projects:

(1) **Third Parallel Runway/Use of On-Site Borrow**

The following alternatives were considered for the third parallel runway and borrow source areas:

- Use of Other Modes of Transportation - Three forms of other modes of transportation were considered (Auto/Bus, Rail, and Telecommunication) and are described on Page 3-1 and 3-2 of this Supplemental EIS. As discussed, less than 5% of passengers could use alternative of modes of transportation. A reduction in traffic by 5% would not eliminate the need for the proposed project. Therefore, while this alternative is feasible,[2] it would not address poor weather operating requirements of the Airport. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2003), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 operations (now forecast to occur around the year 2019), delay levels would reach 283,000 hours at a cost of $454 million.[3]
- Use of Other Airports or Construction of a New Airport - A substantial amount of study and deliberation over an 8 year period has been conducted concerning the development of a new/replacement airport or a supplemental airport. The regional consideration of this alternative showed that this is not a feasible alternative because: 1) there is not sponsor for such an undertaking, 2) regional consensus is that there is no "feasible" site, and 3) neither the lack of sponsor nor the conclusion of the PSRC's regional planning process appears to depend on the level of air travel demand in the region.
- Activity/Demand Management - The primary objective of activity management alternatives is to increase airport efficiency by the airport operator's establishment of pricing or regulatory actions, thereby delaying or eliminating the need for future airport development. The Flight Plan Study concluded that "... demand management measures will at best delay for a few years the need for capacity improvements. For purposes of this analysis, therefore, it was assumed the maximum demand management set of measures will delay capacity improvements for five years." This conclusion has been supported by the PSRC Expert Panel on Noise and Demand/System Management in their December 8, 1995 final order on system/demand management. Therefore, as this action would not satisfy the need, current poor weather demands would remain and would continue to grow in the future. While this is feasible, it is not a prudent alternative because of the delay costs incurred at Sea-Tac. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2003), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 operations (now forecast to occur around the year 2019), delay levels would reach 283,000 hours at a cost of $454 million.
- Other Development at Sea-Tac Airport - Several alternative runway layouts (locations, lengths, and orientations) were considered. As was shown, only a parallel air carrier length runway, with a 2,500 foot separation from 16L/34R would satisfy the poor weather operating needs. An air carrier runway of any length, with the anticipated demand for air travel that is now forecast, would likely result in 1.5 DNL or greater noise levels at these historic sites. Runways with a separation of less than 2,500 feet were considered, these

[2] Feasible for this analysis is defined as a action that can be enacted through sound engineering principles.
[3] *Seattle-Tacoma International Airport, Capacity Enhancement Plan Update*, FAA, July 1995. Page 19.

locations could not be used during poor weather conditions and thus the existing poor weather delay would not be addressed. While this is a feasible alternative, it is not prudent due to the delay levels that would be experienced. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2003), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 operations (now forecast to occur around the year 2019), delay levels would reach 283,000 hours at a cost of $454 million.

About 1.92 acres of wetland impacts are associated with the excavation of fill material from on-site sources. Alternatives to the wetland fill would be use of off-site sources. The Final EIS,[4] as well as Section 5-4 of this Supplemental EIS, describe the impacts that would result from the construction haul, including social impacts, noise impacts, air quality impacts, etc. Impacts to the wetlands at these on-site borrow source locations could be avoided, but would result in environmental related tradeoffs, primarily construction related surface transportation. The following contrast the wetlands at each of the on-site borrow source locations:

On-Site Borrow Source	Fill Available (MCY)	Wetlands (Acres)	Possible Daily 1-Way Trips
#1	6.60	0.68	225
#2	0.65	0.0	22
#3	2.90	1.24	99
#4	2.20	0.0	75
#5	1.75	0.81	60
#8	0.30	20.7	11

The Port of Seattle has agreed to not excavate material from On-Site Sources #5 and #8. Impacts to wetlands associated with Borrow Area #5 could occur regardless of excavation for the runway, as the site is planned for use as a future employee parking lot, as is discussed later in this section. Therefore, the project scope has been designed to avoid 20.7 acres of wetland associated with Borrow Area #8. Further trade-offs could occur by not excavating fill from other on-site sources, but would result in use of off-site material and the associated off-airport truck trips. For each 1million cubic yard of material imported from off-airport sites, about 45,460 truck trips would result, which could amount to an average 33 truck one-way trips per day (or about 3 one-way trips during a peak hour). Because of the negative impacts associated with off-airport truck trips, and the ability to provide equal or better wetland resource through mitigation, avoidance of wetland fill of the on-site sources is not prudent.

- <u>Use of Technology</u> - As is shown, no technology exists (or appears eminent) that would address the poor weather operating constraints experienced at Sea-Tac. While a Localizer Directional Aid (LDA) would address visual flight rule conditions, it would not address the instrument flight rule conditions (poor weather) and it would likely result in increased noise exposure at other residential and locally significant historic sites. Because half of the poor weather constraint would not be addressed, delay would result. While this alternative is feasible, it is not a prudent alternative. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2003), delay levels would reach about 82,000 hours at

[4] *Final Environmental Impact Statement for Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*, FAA and Port of Seattle, February, 1996.

a cost of $132 million annually. When activity reaches 525,000 operations(now forecast to occur around the year 2019), delay levels would reach 283,000 hours at a cost of $454 million.

- Delayed or Blended Alternatives - This alternative has become the Preferred Alternative, as the new construction schedule for the runway would entail it being available 5 years later than was addressed in the Final EIS.
- Do-Nothing - as is discussed, the Do-Nothing alternative would prevent the adverse impact to the 4(f) properties, but would not satisfy the purpose and need and as a result poor weather related arrival delay would increase. The FAA's 1995 Capacity Enhancement Study found that currently, poor weather related delay causes the airlines increased operating costs of about $24 million annually. When aircraft operations reach 425,000 (now forecast to occur by 2003), delay levels would reach about 82,000 hours at a cost of $132 million annually. When activity reaches 525,000 (now forecast to occur around the year 2019), delay levels would reach 283,000 hours at a cost of $454 million. Therefore, it is not a prudent alternative.

(2) **Runway Safety Areas (RSAs)**

The following alternatives were considered for the Runway Safety Areas:

- Declared Distances/Displace the runway threshold: Recognizing that airports may incur difficulty in achieving the full RSA standard, the FAA has enacted declared distance criteria. With the declared distance criteria, the FAA requires that an airport declare which portions of the runway are available for take-off and landing, so that the full 1,000-foot safety areas are provided for operations on the runway. Those portions of the runway declared not usable for takeoff and landings are then considered part of the RSA. The following declared distance/displaced thresholds were considered:

  - **Runway 16R**:

    -- *(Alternative RSA-1A)* A 250-foot displacement to the threshold of Runway End 16R. This alternative would include a partial grading and filling for 750 feet of the area north of the existing runway threshold. With the 250-foot displacement, the full 1,000-foot long RSA would be provided. This alternative would avoid the northward relocation of South 154th Street, but would require the construction of a retaining wall along the roadway and relocation of approach lights and other navigational aides. However, when in north flow (arrivals on 34L or departures on 34L) the ASDA (accelerate-stop distance available) and LDA (landing distance available) would be reduced by 250 feet. In south flow, a reduced LDA of 250 feet would occur. The Port estimated that this option would cost between $3-6 million to complete. For these reasons, this alternative was found unreasonable.

    -- *(Alternative RSA-2A)* A 450-foot displacement to the threshold of Runway End 16R. This alternative is the same as the above, except with an expansion of the existing RSA out to 550 feet, using a 450 displacement of the north runway end to achieve the requisite 1,000 feet. While other lengths could occur, this distance would avoid the development of the retaining wall. As a result, a 450-foot reduced LDA to the south on Runway 16R would occur. The Port estimated that this option would cost between $1.0 and $3.0 million to complete.

    The reduced landing distances would restrict the usage of taxiway M to some aircraft, thus increasing the runway occupancy. For these reasons, this alternative was found unreasonable.

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-- *(Alternative RSA-3A)* A 770-foot displacement to Runway End 16R. This alternative would use the existing 230 feet of full-width RSA with a 770-foot displacement. This alternative would result in a 770-foot reduction in the LDA to the south and a 770-foot reduction in the ASDA to the north. A relocation to South 154th would not be required. The Port estimated that this option would cost between $0.5-1.5 million to complete.

Because of the reduced available runway length, aircraft landing would not be able to use the existing taxiway exits in an efficient manner. Thus runway occupancy would be increased or additional taxiway exits would need to be developed. For these reasons, this alternative was found unreasonable.

- **Runway 16L**:

-- *(Alternative RSA-1B)* A 300-foot displacement to 16L (which is currently displaced 490 feet - thus the existing displacement would be reduced), and a slight build out of the 16L RSA to 700'. As a result of the displacements, the south flow LDA would be reduced to 11,600 and the ASDA would be 11,900 feet. In north flow, the LDA would be reduced to 11,600 and the ASDA would be reduced to 11,600 feet. Due to the length requirement of 12,500 feet identified in the Master Plan Update, displacement of this runway was not considered a realistic alternative.

Relative to declared distances, the FAA noted to the Port in a February 1993 letter "The FAA strongly recommends that declared distances not be used at Seattle-Tacoma International Airport. Aircraft operations during low visibility conditions are a major concern. Declared distance lighting would be required in addition to low visibility lighting and result in a confusing lighting system during low visibility operations. We recommend you consider relocating the threshold to adjoin the starting boundary of the RSA".[5] For these reasons, these alternatives were not found reasonable. However, because the Port must address the RSA compliance issue, if clearance, grading and filling were not undertaken, the declared distances would be the Do-Nothing action.

- <u>Clearance, grading, filling and development of the requisite areas for 1,000 feet beyond the existing pavement end</u>: These alternatives would result in the conventional configurations for the RSAs.

■ <u>Runway 16R *(Alternative RSA-4A)*</u>: To provide the necessary area, the north RSA would require the relocation of South 154th Street around the RSA. About 2.34 acres of wetland would be affected by the relocation of South 154th Street around a corrected RSA for this runway. While the road could be tunneled under the RSA, the cost of such tunneling is prohibitive, about $40 million. Consideration was given to avoiding the tunnel, and attempting to minimize the impacts of the RSA by developing a retaining wall. The cost of a retaining wall to avoid the tunnel would cost about $12.5 million more than the Preferred Alternative to avoid the impacts to wetlands, but would result in 1.13 acres of wetland impact.

[5] Letter from Paul Johnson, Civil Engineer, Seattle Airports District Office to the Port of Seattle, February 19, 1993

The following contrasts the costs of the South 154th Street relocation options:

Scenario	Wetland Impact (ac)	Cost
Tunnel - Avoid Wetlands	0.00	$46.2 million
Retaining Wall - Minimize Impacts	1.13	$19.3 million
Preferred Alternative	2.34	$6.8 million

Source: HNTB, December 1996

As compliance with RSA standards must occur, the only other alternative would be use of the declared distances, which is not prudent with the Region's low-visibility conditions as discussed earlier, or the fill of wetlands with mitigation provided by equal or higher quality wetlands as is proposed.

- Runway 16L *(Alternative RSA-4B)*: Currently Runway 16L is displaced 460 feet due to trees that once penetrated the approach surfaces to the runway. Therefore, two options exist: 1) maintain the current threshold and clear and grade the requisite 1,000 feet or 2) remove the displacement and clear and grade the requisite area. The first option would require clearing and grading for 310 feet, while the second option would require 800 feet. In either case, South 154th Street and the airport service road would require relocation. While neither of the options for this runway end would affect wetlands, the relocation of South 154th Street would require coordination with the RSA for 16R.

- Delayed Alternative - As is noted earlier, SEPA requires the consideration of the benefits and disadvantages of delaying implementation of the proposed alternative. Delaying implementation of actions to addressing the RSA issues is not possible, due to the FAA grant assurances. Therefore, the only non-development options would be the establishment of declared distance procedures and displaced runway thresholds.

- Do-Nothing/No-Build [6] This alternative would maintain the current RSA dimensions, which do not meet FAA requirements. As this option may result in the FAA bringing an RSA enforcement action against the Port of Seattle, it is not a reasonable alternative. The result of a Do-Nothing alternative would be the requirement that displaced thresholds be developed, as described previously. While this option is considered to be a last resort action for airports with low visibility conditions, it is technically feasible; declared distances are not recommended due to the low visibility lighting confusion that pilots could experience. Each displacement would require relocation of approach lights and other navigation aides.

(3) North Employee Parking Lot

As a landside related project, the following alternatives were considered:

- Use of Other Modes of Transportation Alternatives - Alternative modes of transportation were evaluated in terms of their capability to meet the needs of freight shippers and travelers who presently use Sea-Tac Airport. Based upon the characteristics of freight shipments and travelers from Sea-Tac, alternative modes of

[6] Technically, the literal Do-Nothing is not an option for addressing the RSA issues. The Port of Seattle has two options for addressing RSAs, both of which require some action: grade and develop off the ends of the runways or establish declared distance procedures. The Do-Nothing alternative presented in this EIS reflects the non-development action (declared distances).

transportation, such as rail (traditional or high speed) or automobile/bus, cannot be realistically considered as providing a suitable solution to needs identified in this study at Sea-Tac Airport.

- Use of Other Airports or Development of a New Airport Alternatives - An extensive study of the development of a replacement or supplemental airport was conducted by the Puget Sound Regional Council. This study found: "The Executive Board concludes that there are no feasible sites for a major supplemental airport within the four-county region and that continued examination of any local sites will prolong community anxiety while eroding the credibility of regional governance."7/ Based on the analysis presented earlier and the findings of the Puget Sound Regional Council, it is unlikely that use of other airports or development of a new airport are reasonable alternatives to serving future air travel demands.

- Activity/Demand Alternatives - Another group of alternatives which are frequently suggested when considering airport development include traffic demand management and activity restrictions. As was described in a preceding section, activity alternatives would not reduce demand such as to prevent the need for improvements at Sea-Tac Airport.

- Landside Development at Sea-Tac Airport Alternatives -Chapter 3 of this Supplemental EIS, beginning on Page 3-14 discusses the alternatives to this project.

- Delayed/Blended Alternative - Delaying implementation of the SASA would result in the Do-Nothing for some period. This alternative is not a reasonable alternative as it would not satisfy the need.

- Do-Nothing/No-Build Alternative - The Do-Nothing alternative would result in the Airport remaining as it is today. Therefore, future operational congestion and delay would not be relieved, and would increase. Although this alternative may not be prudent, it is feasible, and therefore, is one of the alternatives considered throughout the Environmental Impact Statement.

(4) Development of SASA

The following summarize the alternatives to satisfying future terminal/landside improvements that envision the development of cargo and maintenance functions in the area known as the South Aviation Support Area:

- Use of Other Modes of Transportation Alternatives - Alternative modes of transportation were evaluated in terms of their capability to meet the needs of freight shippers and travelers who presently use Sea-Tac Airport. Based upon the characteristics of freight shipments and travelers from Sea-Tac, alternative modes of transportation, such as rail (traditional or high speed) or automobile/bus, cannot be realistically considered as providing a suitable solution to needs identified in this study at Sea-Tac Airport.

- Use of Other Airports or Development of a New Airport Alternatives - An extensive study of the development of a replacement or supplemental airport was conducted by the Puget Sound Regional Council. This study found: "The Executive Board concludes that there are no feasible sites for a major supplemental airport within the four-county region and that continued examination of any local sites will prolong

7/ PSRC Executive Board Resolution EB-94-01.

community anxiety while eroding the credibility of regional governance."[8] Based on the analysis presented earlier and the findings of the Puget Sound Regional Council, it is unlikely that use of other airports or development of a new airport are reasonable alternatives to serving future air travel demands.

- Activity/Demand Alternatives - Another group of alternatives which are frequently suggested when considering airport development include traffic demand management and activity restrictions. As was described in a preceding section, activity alternatives would not reduce demand such as to prevent the need for improvements at Sea-Tac Airport.

- Landside Development at Sea-Tac Airport Alternatives - The following summarizes options to addressing cargo and maintenance facilities.

  Centralized Cargo Option - About 176 acres of land would be required to centralize the cargo facilities in a single complex. To centralize the facilities, it is assumed that the existing cargo facilities would be abandoned and redeveloped at another location on-airport. Two locations for centralized facilities were identified: the area known as the South Aviation Support Area (SASA) and a north site. Because of the site characteristics and size requirements and cost, the complete redevelopment of a new centralized cargo complex is not practical.

  Decentralized Cargo Option - The decentralized cargo option would result in supplementing existing cargo facilities at new sites on-airport. Decentralized cargo facilities could be developed within the existing cargo development (to the north of the Main Terminal), further north on existing airport property or in the SASA. Within the existing cargo area, all of the year 2005 needs can be served and about 67% of the year 2010 cargo building area needs can be accommodated and about 57% of the hardstand needs. The post year 2005 forecast needs can then be accommodated in the SASA.

  Aircraft Maintenance - As is described in the Final EIS and Record of Decision of the South Aviation Support Area (SASA), three principal objectives will be met through the development of the SASA: to accommodate displaced line maintenance facilities, to accommodate future line maintenance facilities, and to accommodate a major base maintenance facility. That EIS addressed three sites for the development of aircraft maintenance needs: northeast, far north and southeast. The northeast was rejected as there is insufficient land to develop the requisite 84 acres. The far north site (located north of SR 518, west of 24th Avenue South) was rejected because of the cost of developing a taxiway bridge over SR 518, and fill requirement costs.

  Because of the need to use portions of the SASA site for supplemental cargo facilities, the extent of aircraft maintenance facility development in the SASA would be dictated by the displacement caused by alternative terminal development.

- Delayed/Blended Alternative - Delaying implementation of the SASA would result in the Do-Nothing for some period. This alternative is not a reasonable alternative as it would not satisfy the need.

- Do-Nothing/No-Build Alternative - The Do-Nothing alternative would result in the Airport remaining as it is today. Therefore, future operational congestion and delay would not be relieved, and would increase. Although this alternative may not be

[8] PSRC Executive Board Resolution EB-94-01.

prudent, it is feasible, and therefore, is one of the alternatives considered throughout the Environmental Impact Statement.

(B) Evaluation of Mitigation In the Same Basin

The recommended preference for selecting wetland mitigation sites in Washington is as follows: (1) on-site and in-kind; (2) off-site, within the watershed, and in-kind; (3) off-site, out of the watershed, and in-kind; and (4) off-site, out of the watershed, and out-of-kind. The proposed mitigation represents option 3 (off-site, out of the watershed, and in-kind). Mitigation within the Sea-Tac Airport operations area (on-site) was eliminated from consideration, because the siting criteria for the first and second preferences could not be met. In addition, on-site mitigation could be subject to degradation from wildlife control for safety reasons, or on-going airport operations.

In evaluating option 2 (off-site, within the same watershed), the Miller Creek basin and Des Moines Creek basins were examined for suitable mitigation development. All undeveloped, non-forested, non-wetland sites with average slopes less than 5% were identified in both basins. Based on these criteria, 19 potential mitigation sites were identified, six (6) of which are between airport runways and taxiways at Sea-Tac Airport and cannot be used for wetland mitigation. The suitability of the thirteen remaining sites (although all are within the 10,000-ft radius of concern for wildlife hazards to aircraft) for wetland mitigation was evaluated further. **Exhibit 5-5-1a and 5-5-1b** shows the sites considered.

For this level of analysis, it was assumed that each site identified could be modified to perform hydrologically, so evidence of high water tables was not considered. Large sites (in this instance greater than 30 acres) are preferred because combining the functions of several small, isolated wetlands in a single large wetland mitigation site enhances the probability of achieving mitigation goals, ensuring long-term protection, and ultimately providing wetland functions to compensate for project impacts. A site at least 30 acres in size would allow an average mitigation ratio of 2:1 with adequate buffers. Compensating for wetland impacts on more than one site offers fragmented habitat blocks of less overall value. However, in order to adequately address the issue of mitigation within the watersheds, smaller sites (at least 10 acres) were also evaluated.

Field verification of each site identified primary limiting factors for wetland mitigation within the watersheds:

1. Most of the potential sites are too small to support the compensatory mitigation on one site, which would result in two or more sites without habitat connectivity to each other or to other habitat areas;
2. The watersheds are largely urbanized and most of the potential sites are fragmented by homes, roadways, or other development; and
3. Proximity to the existing and proposed runways creates a potential hazard between birds and aircraft.

Table 5-5-2 lists the evaluation considerations for each of the 19 areas.

The primary reason for pursuing mitigation outside the airport area is due to potential bird strike incidents. Increased aircraft operations frequently results in conflicts between aircraft and birds. Bird strikes and jet-engine bird ingestion have caused in the worst situations, aircraft to crash and resulted in loss of human life, or in lesser cases millions in dollars of aircraft damage. Such examples include a Boeing E-3 that crashed at Elmendorf Alaska in September 1995 after it ingested about 30 Canada geese on departure, resulting in the crash of the aircraft, killing all 24 on board.

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Jet engines are more vulnerable to birds than prop aircraft. Although the larger engines are designed to withstand ingesting an occasional small bird, a large bird or large number of smaller birds sucked into a jet aircraft engine can do significant damage and/or disable the engine. When flying at 200 miles per hour, a two-pound gull can produce the force equal of over 10,000 pounds. In a jet flying at 600 mph, the same gull would produce a force of 36 tons. Bird strikes in North America are most frequent during the months of August through October. Between 1986 and 1990, nearly 7000 bird strikes were reported in North America. According to the FAA's Aeronautical Information Manual, 90 percent of bird strikes occur when aircraft are under 3,000 ft altitude, which typically occurs with 3-5 miles of an airport. Over 50 percent of the strikes were reported when aircraft are below 100 feet altitude (above the airfield), or within 1,000 feet of touchdown.

A variety of birds find airport lands attractive for feeding, roosting, and loafing. Large soaring or flocking birds, such as raptors, gulls and blackbirds represent the greatest hazards. Airports serve as attractants to birds for reasons ranging from the airport being a large undeveloped land source in an urban area, to the actual bird attractant properties of the airport itself. Runways draw birds during colder seasons, as pavement is typically warmer than grass, and birds settle around the heat. Second, a wet runway reflects its adjacent airfield lighting. At night, this causes the pavement to resemble a lake, attracting shoreline birds. Because of the natural attraction provided by airport facilities, FAA discourages airports from providing further attractions of water, feeding and resting habitat.

At Sea-Tac Airport, approximately 20 bird strike incidents occur each year.[9] Currently, the Port of Seattle is attempting to decrease the bird strike hazards by removing large trees that have grown near the runways and by relocating populations of Canada geese from Tyee Valley Golf Course. Creation of additional wildlife habitat that would increase use of the area by birds would not meet the goals of the Master Plan Update improvements in which landing and take-off safety is a major consideration.

(C) Proposed Wetland Mitigation in Auburn

The 47-acre mitigation site is part of a 69-acre parcel located within the City of Auburn immediately west of the Green River. The undeveloped parcel has been farmed in the recent past and currently supports a mix of upland pasture grasses and forbs that are common to abandoned agricultural land in the Puget Sound basin. Approximately 4.3 acres of emergent wetland was delineated during previous site investigations and is included in the 47-acre portion of the site proposed for mitigation (only 0.27 acres of these wetlands would be impacted by the mitigation). The wetland mitigation would be located a minimum of 200 ft west of the ordinary high water mark of the adjacent Green River.

The site is bound by a variety of land uses including agriculture to the north and south; undeveloped land, multi-family housing, and a drive-in theater to the west; and the Green River, patches of riparian forest, and undeveloped, forested slopes on the east side of the Green River. King County is proposing to construct a trail along the Green River, east of the proposed mitigation project. The site is currently zoned single-family residential (R2) by the City of Auburn and the 1995 Comprehensive Plan designation is single-family. The site is nearly level but gently slopes to the northwest, with elevations ranging from 45 ft in the northwest corner to 52 ft along the eastern property boundary. The mitigation site is within the boundaries of the Draft Mill Creek Special Areas Management Plan (SAMP).

[9] Port of Seattle records, December 1996.

Exhibit 5–5–1a

Potential Mitigation Sites Evaluated in the Miller Creek & Des Moines Creek Watersheds.

(North Map)

- Major Highway
- Watershed boundary
- City Boundary
- Present Runway
- Proposed Runway
- Impact area
- Suitable area with slopes < 5%, undeveloped, Non-Forested, and Non-Wetland.
- Unsuitable area with slopes > 5%, Developed, Forested, or Wetland.
- 8 Suitable Site > 10 acres.

Data provided by: PSRC, CH2MHILL, Shapiro, King Co.

Miles

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January 16, 1997

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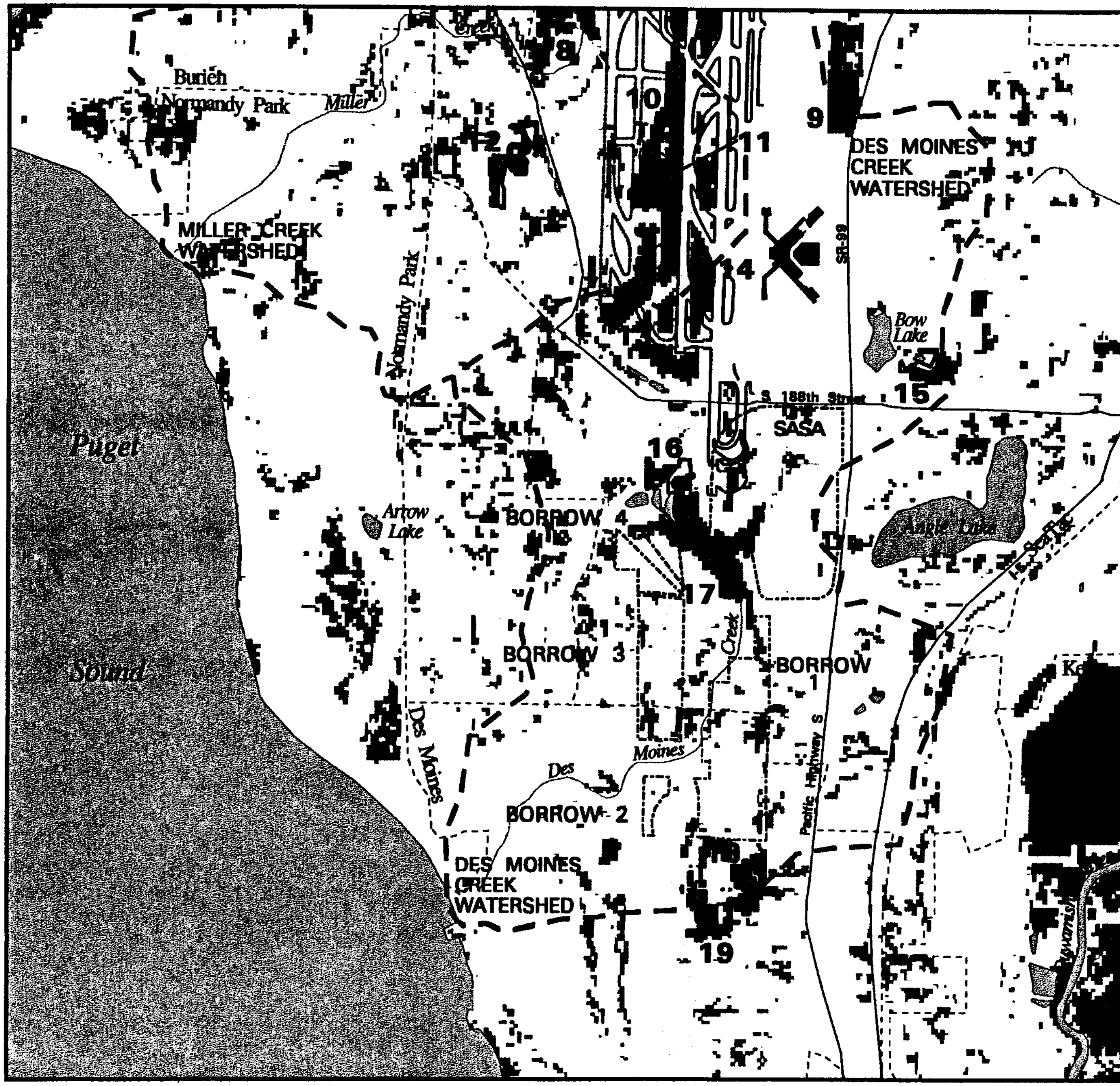

Exhibit 5-5-1b

Potential Mitigation Sites Evaluated in the Miller Creek & Des Moines Creek Watersheds.

(South Map)

- Major Highway
- Watershed boundary
- City Boundary
- Present Runway
- Proposed Runway
- Impact area
- Suitable area with slopes < 5%, undeveloped, Non-Forested, and Non-Wetland.
- Unsuitable area with slopes > 5%, Developed, Forested, or Wetland.
- 8 Suitable Site > 10 acres.

Data provided by: PSRC, CH2MHill, Shapiro, King Co.

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The overall wetland mitigation goal is to compensate for unavoidable wetland impacts by in-kind replacement of habitat. This would be accomplished by creating a diverse replacement habitat with a net gain in functional value and acreage. Specifically, mitigation goals are as follows:

1 Create about 21 acres of palustrine forested, scrub/shrub, and emergent wetland at an average replacement ratio of 1.5:1;

2 Consolidate impacts of many lower functioning wetlands into one large wetland ecosystem on a single site with long-term protection. Maximize habitat value of the new wetland by providing habitat connections or corridors to other significant habitat areas;

3 Provide in-kind wildlife habitat replacement while maximizing public safety and minimizing wildlife hazards to aircraft; and

4 Mitigate for all impacted hydrologic functions (water quality, flood storage, and stormwater storage) within the Miller Creek and Des Moines Creek watersheds, with an overall replacement ratio of at least 1:1.

Table 5-5-2 lists the goals of the mitigation site. The off-site wetland mitigation site is designed to provide in-kind replacement of wetland habitat functions affected by the proposed Master Plan Update improvements. Although not related to impacts of the proposed Master Plan Update improvements, additional Green River floodplain storage capacity would be created as part of the design process to assist issues being faced by the City of Auburn.

Wildlife Habitat - Construction of the forested, shrub, and emergent wetlands would create conditions that provide habitat for a variety of wildlife species. Habitat structure and availability would change as vegetation matures over the next several decades, and the wildlife species using the site are expected to change over time.

Post-construction habitat structure in proposed forested wetlands would be similar to regenerating forest, and would develop mature forest habitat attributes after several decades. The shrub understory would enhance the development, of habitat structure. Songbird use, in early stages of habitat development, would include foliage and bark-gleaning species (kinglet, chickadee, bushtit, vireo) that forage in the area. In later years, Oregon ash, vine maple, willow, red cedar, and hemlock seed production would be used by additional songbird species. Small mammals would likely forage on the forest floor for seeds and invertebrates, even though optimal habitat conditions would not occur for one or more decades. As a tree canopy begins to develop, it would provide nesting habitat and cover for predator avoidance.

Post-construction habitat structure in shrub wetlands would generally be similar to that of forested systems during the first several years of development. However, since shrub communities would periodically be flooded, ground-dwelling animals would be less common. The shrub community would reach functional maturity in 15 to 25 years following planting.

Emergent communities would provide resting and foraging habitat for shore and water birds within one (1) year of planting. Following two (2) to three (3) years, most of the intended wildlife functions should be present, and following five (5) to ten (10) years, relatively mature communities should be present.

Tree-nesting songbirds (such as thrushes, vireos, and warblers) are expected to use horizontal branches for nesting when the canopy closes enough to provide cover. Leaf litter and forest detritus would begin to accumulate, providing habitat for the invertebrates that amphibians (such as ensatina), small mammals, and ground-foraging birds feed on. Small mammals, in turn, are likely to become food for predators, such as barred owls. Over the course of several decades, competition for light, or disease would result in mortality. Dead and decaying trees would provide woody debris and snag habitat for flickers, woodpeckers, and small cavity-nesting birds.

The shrub and emergent wetlands should reach stable habitat conditions earlier than the forested wetland community. Shrub wetland communities should produce forage and nesting opportunities within two to ten years. Swainson's thrush and Wilson's warblers use moist shrub habitats for nesting and foraging. Berries produced by salmonberry, elderberry, and red-osier dogwood are used by several songbird species to supplement fall and winter diets. Shrews and other small mammals would consume insect and aquatic invertebrates that thrive in shrub and emergent wetlands. Wading birds, such as great blue herons and bitterns, can feed on small mammals and amphibians.

Although flooded emergent wetlands can provide substantial forage opportunities for ducks, habitat use would vary with proximity to upland predator cover. Waterfowl, which are wary of dense shrubs that allow predators to approach undetected, prefer interspersion of flooded emergent vegetation and open water. Slough sedge, spike rush, and scouring rush are all species preferred by dabbling ducks and geese during migration. Narrow-leaf burreed is preferred by dabblers and migrating wood ducks. As decaying vegetation builds up in flooded areas, shovelers, pintails and other diving species could use growing populations of plankton, algae, aquatic insects, and snails. Additionally, some amphibious species, such as Pacific giant salamander, northwestern salamander, and rough-skinned newt commonly migrate through terrestrial habitats and could use the mitigation site.

Construction of the mitigation wetland would require the excavation of about 375,000 cubic yards of soil. A basin would be excavated that would range in depth from 4 to 12 feet. Approximately one-third of the material would be selectively stockpiled on the site for use as backfill. The remaining material would be available for uses, including fill for nearby area developments, or possibly as part of the fill requirement at Sea-Tac Airport.

Stormwater runoff could cause erosion of the soils disturbed during ground clearing, excavation, and stockpiling of earth materials. Stormwater runoff may also carry other pollutants, such as oil or fuel, from construction equipment and vehicles into nearby water courses. Mitigation measures to control impacts from stormwater runoff during construction could include the following: 1) protection of disturbed areas by covering stockpiled soils with plastic and exposed soils with straw; 2) minimization of the extent and duration of exposed soils with revegetation as soon as possible; 3) use of silt fences, hay bales, sediment traps or other construction Best Management Practices to control eroded sediment from leaving the site; and 4) construction equipment would be well maintained to ensure that they are not leaking fuel or oil.

The construction equipment accessing the site would be expected to use South 277th Street and Auburn Way North. If material were transported to Sea-Tac, it would then use the haul routes discussed in **Section 5-4 "Construction Impacts"**. If it were used to satisfy fill requirements for other regional developments, access would be expected from Auburn Way to that site. Because Auburn Way is a major arterial, with significant average daily traffic levels, the addition of as many as 30-40 truck trips per hour would not be expected to have a significant effect (the truck trips would represent less than 3% of total traffic) on surface transportation conditions on any major arterial or highway in the vicinity of the mitigation site. No changes would be expected in levels of service on these roadways.

The Final EIS summarized a site assessment that was performed for this mitigation site. No new additional information has arisen concerning that assessment.

These and related topics are discussed in more detail in the document "Wetland Mitigation Plan for Proposed Master Plan Update Improvements at Seattle-Tacoma International Airport" dated December 1996, which is attached to the JARPA application noted previously.

(D) Proposed Relocation of Miller Creek

The proposed Master Plan Update improvements include fill activities that would directly affect three areas in the Miller Creek watershed due to the proposed third parallel runway embankment. The Miller Creek basin encompasses about 8 square miles and includes a small portion of Sea-Tac Airport, as well as parts of the cities of SeaTac and Burien. Sea-Tac Airport covers an estimated 5% of the entire basin. The Miller Creek watershed consists of drainage channels that originate at Arbor, Burien, and Tub lakes; surface water and seep drainages from the north end of Sea-Tac Airport; and overflows from the Reba Regional Stormwater Detention Facility and Lora Lake. The creek generally flows south and southwest toward Puget Sound. The areas of this basin that would be affected include:

1. Area 1 includes approximately 980 feet of Miller Creek. The affected portions extend approximately 1,000 feet south of Lora Lake.
2. Area 2 includes Class III drainage channels totaling 2,080 feet, that originate as seeps in the Airport Operations Area (AOA) then flow west to Miller Creek.
3. Area 3 includes 200 feet of the Class III headwaters of Walker Creek. These waters, which originate from seepage and storm water runoff at the corner of 12th Avenue South and South 176th Street, flow northwest to SR 509.

The primary mitigation goal is to replace the basic characteristics and functions of the three portions of Miller Creek and its associated drainage channels that would be affected by the proposed airport improvements. Miller Creek in Area 1 is no longer in a natural stream channel because the creek has been dredged and straightened for farmland reclamation and wetland drainage. Land development, roadway construction, and past airport development have also altered the segment. The goal of the Miller Creek relocation (Area 1) is to provide a new stream channel of at least the same length as the existing channel, with enhanced features.

A farm ditch located in the project area flows parallel to Miller Creek for approximately 800 feet. The ditch provides positive drainage for the westerly portion of the farm, connecting to the main channel near South 156th Way. A small segment of the side channel (approximately 250 feet) would be impacted by the fill; however, because this segment is at the upper end of the side channel, drainage and conveyance would not be affected. No habitat would be impacted, since the channel flows intermittently in response to rain, and has little riparian habitat due to farming. For these reasons, no mitigation is proposed.

Area 2 consists of two small intermittent drainage channels with an indication of minor seepage. Area 3, the headwater of Walker Creek, contains a short segment of drainage channel. All three drainage channels have been affected by existing airport drainage, perimeter road crossings, or channelization. The mitigation goal for Areas 2 and 3 is replacing the drainage function of the channels.

The proposed Miller Creek channel would be constructed near the bottom of a broad, flat valley located south of Lora Lake. The existing 1,080-ft-long main channel of Miller Creek would be displaced approximately 200 feet to the west. The new Miller Creek channel would be constructed near the lowest path through the broad flat trough that defines the creek floodplain in the project area, with the channel edge offset from the proposed fill a minimum of 25 feet to provide a buffer. Channel slope and minimum flow depth would influence final channel alignment. The new creek would connect with the existing Miller Creek channel downstream at the earliest possible point to

TABLE 5-5-3(Continued)

SUMMARY OF POTENTIAL MITIGATION SITES ANALYZED WITHIN THE MILLER CREEK AND DES MOINES CREEK WATERSHEDS

Site	Watershed	Acres	Existing Conditions	Mitigation Limitations
5	Miller Creek	11	The site is on a slope within the fenced airport security area. Patches of deciduous and ornamental trees are scattered throughout the site.	The majority of the site would be developed as part of the Master Plan Update Improvements. It appears that only about one or two acres would remain after construction. The close proximity to existing airport operations (approximately 2,000 ft from existing runways and 1,000 ft from the proposed runway) results in increased wildlife hazards to aircraft.
6 and 7	Miller Creek	45	These sites are grassy areas between the existing runways and taxiways within the airport operation area.	Locating wetland habitat within the airport operation are not feasible for safety reasons.
8	Miller Creek	23	This site consists of landscaped yards in a semi-rural residential area west of the airport. Miller Creek flows through portions of the relatively flat site.	The eastern portion of this site is within the fill footprint for the proposed runway. The remaining portion of the site is not large enough to mitigate for the wetland impacts associated with the project. The mitigation area would be isolated from other habitat areas by 154th Street South, the airport, and SR 509, which would not be conducive to optimal wildlife habitat. The mitigation area would be 3,100 ft southwest of the end of the nearest existing runway and 2,100 ft southwest of the end of the proposed runway. The site is approximately 1,000 ft directly west of the edge of the proposed runway. The close proximity of airport operations increases the wildlife hazard to low-flying aircraft.
9	Des Moines Creek	24	The site is a cemetery.	It would not be reasonable to locate wetland mitigation in a cemetery. The proximity of the site (3,600 ft southeast of the end of the nearest runway and 2,600 ft east of the edge of the nearest runway) to runways presents a wildlife hazard to aircraft.
10, 11, 13, and 14	Miller Creek (sites 10 and 13) and Des Moines Creek (sites 11	100	These sites are located between and adjacent to the existing runways and taxiways. They are grassy areas mowed and maintained for airport safety reasons.	Locating wetland habitat within the airport operations area is not feasible due to safety reasons.

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TABLE 5-5-3(Continued)

SUMMARY OF POTENTIAL MITIGATION SITES ANALYZED WITHIN THE MILLER CREEK AND DES MOINES CREEK WATERSHEDS

Site	Watershed	Acres	Existing Conditions	Mitigation Limitations
	and 14)			
12	Miller Creek	16	This relatively flat area consists of large expanses of lawn bordered by roads, houses, and a large scrub/shrub wetland.	Wetland mitigation at this site would require displacement of additional residents. The site is not large enough to mitigate all of the wetland impacts at one location. The area is bordered by major roadways (SR 509 and Des Moines Way South) on two of the three sides, which would not be conducive to optimal wildlife habitat. Mitigation would be about 1,800 ft west of the proposed runway and approximately 4,500 ft from either end of the proposed runway. The close proximity of the proposed runway to mitigation increases the wildlife hazard to aircraft.
15	Des Moines Creek	11	Site 15 is a horse pasture surrounded on three sides by steep slopes. A scrub/shrub wetland, which connects to Bow Lake, lies on the western side of the pasture. Single family homes, a trailer park, and a hotel overlook the site.	Less than half of the site would be available for wetland mitigation due to the surrounding topography and the presence of existing wetland. The close proximity of a trailer park, hotel, and single-family homes; and the small size of available upland area make this site undesirable for wetland habitat mitigation. The site is roughly 5,200 ft east of the ends of the existing runways, and 4,700 ft east of the edge of the nearest runway.
16	Des Moines Creek	35	Site 16 is located in the direct flight path and consists of the northern portion of Tyee Valley Golf Course. Currently, a safety area for Runway 34R, which encroaches on the golf course, is under construction.	Much of the area is included in the Master Plan Update Improvement area (including the safety area under construction and the SASA). If the preferred alternative for the airport expansion is implemented, there would not be enough suitable land remaining for wetland creation. Mitigation at this site may not be protected in perpetuity due to the close proximity of airport operations. It is approximately 1,500 ft south of Runway 34R which would increase wildlife hazards to aircraft.
17	Des Moines Creek	23	This site is the southern portion of Tyee Valley Golf Course. It is bordered by a mixed	The site would be confined by ongoing disturbances or developments including the airport, the SASA area, and borrow

TABLE 5-5-3(Continued)

SUMMARY OF POTENTIAL MITIGATION SITES ANALYZED WITHIN THE MILLER CREEK AND DES MOINES CREEK WATERSHEDS

Site	Watershed	Acres	Existing Conditions	Mitigation Limitations
			forest to the west and south, residential and recreational to the east, and the northern portion of the golf course to the north. Des Moines Creek divides the northern and southern portions of the golf course.	areas for construction of the proposed runway, which is not conducive for wildlife habitat replacement. It is 2,100 ft directly south of the end of runway 34R, which results in increased wildlife hazards to aircraft. There is not enough land to mitigate wetland impacts on one site that could be protected in perpetuity.
18	Des Moines Creek	16	This site consists of grass pastures and landscaped yards adjacent to a forested area on the west side, and residential areas to the north, east, and south. Most of the site is on a topographically high area.	The necessary acreage required for compensatory mitigation could not be attained at this site. It is fragmented by homes and active roads, and residents would have to be displaced for mitigation. The site is approximately 4,900 ft south of the existing runways, and increases wildlife hazards to aircraft.
19	Des Moines Creek	12	Site 19 consists of landscaped yards and some pasture area with large forested area to the north. Most of the site is topographically high.	Several roads and homes fragment this site. Mitigation would require displacing several residents, businesses, and possibly vacating roads. The necessary acreage required for compensatory mitigation could not be attained at this site. Site 19 is approximately 5,200 ft south of the existing runways, and increases wildlife hazards to aircraft.

Source: Parametrix December 1996.

D

U. S. DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

NORTHWEST MOUNTAIN REGION

RECORD OF DECISION

FOR THE

MASTER PLAN UPDATE DEVELOPMENT ACTIONS

SEA-TAC INTERNATIONAL AIRPORT

JULY 3, 1997

TABLE OF CONTENTS

I. INTRODUCTION

This Record of Decision (ROD) provides final Federal Aviation Administration (FAA) approval for the Master Plan Update development actions adopted by the Port of Seattle (POS) on August 1, 1996, in POS Commission Resolution # 3212, as amended on May 27, 1997, in POS Commission Resolution No. 3245.

This ROD provides final approval for those agency actions necessary in order to provide FAA support for a new 8500-foot dependent air carrier runway, for a 600 foot southerly extension of runway 16L/34R, for expanded runway safety areas for runways 16R and 16L, and for various landside Master Plan Update improvements scheduled to be completed through the year 2010. The phasing of these various projects is graphically presented on pages 2-22 to 2-23 of the Final Supplemental Environmental Impact Statement [FSEIS], and is also presented in Appendix A of this ROD.

II. BACKGROUND

Over the past decade, the Federal Aviation Administration (FAA) has worked closely with local and regional officials and with the Port of Seattle (POS) aviation planning staff to investigate ways in which to accommodate the increasing passenger and operational activity demands at Seattle-Tacoma International Airport (Sea-Tac). As documented in Chapter I of the Final Environmental Impact Statement (FEIS) and in Chapter 2 of the FSEIS, the present airport runway configuration, with two closely-spaced runways, is currently responsible for significant airside delays, particularly during poor weather conditions, and is forecast to be responsible for increasing such delays in the future. Furthermore, the present design and configuration of airport landside facilities cannot adequately accommodate projected increases in activity without severe landside congestion.

On the regional level, the FAA has worked for a number of years with the local metropolitan planning organization [currently entitled the Puget Sound Regional Council (PSRC)], and with other local planning agencies, to find solutions to the related problems of inadequate capacity and increasing delays which are forecast for Sea-Tac. The FAA participated in the 1989-1992 Flight Plan Study, which recommended a multiple airport system that included a new runway at Sea-Tac. The agency also funded a PSRC study of the feasibility of a major supplemental airport, which concluded on October 27, 1994, with PSRC Resolution # EB-94-01, determining that there were no feasible sites for such a airport, and deciding not to proceed with further such studies on a regional level (See FEIS Appendix B for detailed information on regional alternatives).

On January 5, 1994, the FAA began the public phase of the environmental process involving POS site-specific development proposals, which included a third Sea-Tac runway, by announcing in the Federal Register its intent to prepare an Environmental Impact Statement (EIS), and by requesting scoping comments (59 Fed. Reg. 645). Scoping meetings were held with the general public and with Federal, State and local agencies on February 9 and 10, 1994 (See FEIS Appendix A for detailed information on this scoping process).

During this same time frame, the POS began its Master Plan Update study, designed to develop recommendations for improvements to Sea-Tac which would reduce existing and forecasted poor weather aircraft operating delay and would accommodate forecasted growth in passengers, cargo, and aircraft operations. The Master Plan Update study process occurred concurrently with the initial environmental studies discussing the impacts of the development actions being proposed.

On April 24, 1995, the FAA published in the Federal Register a Notice of Availability of the Draft Environmental Impact Statement (DEIS) [60 Fed. Reg. 20149]. Public comments were taken on the DEIS from the date of its release until August 3, 1995. During the comment period, two public hearings were held, on June 1, 1995 and June 14, 1995. Final Environmental Impact Statement (FEIS) Appendix T, located in Volumes 5, 6, and 7, contains the transcript from the public hearings, and letters commenting on the DEIS which were received from the public and government agencies. FEIS Volume 4, Appendix R contains responses to the issues presented during the comment period.

The FEIS, approved by the FAA on February 1, 1996, was released to the public on February 9, 1996 (see 61 Fed. Reg. 5056). The FEIS addressed areas of public concern by way of modifications to the DEIS text and specific responses to public comments.

The U.S. Environmental Protection Agency (EPA) published a notice of the availability of the approved FEIS, pursuant to 40 CFR 1506.10 (61 Fed. Reg. 6243) in the Federal Register on February 16, 1996.

Although the FAA did not solicit public comments on the FEIS (on issues other than air quality conformity), several public agencies, community groups, and citizens nevertheless submitted written comments for agency consideration on the FEIS. Appendix A of the Final Supplemental Environmental Impact Statement

(FSEIS) responds to substantive agency and public comments on the FEIS, other than those pertaining to air quality conformity.

On July 11, 1996, in Resolution A-96-02, the PSRC General Assembly approved an amendment to the Metropolitan Transportation Plan to include a third runway at Sea-Tac Airport, with specific noise reduction measures based upon the recommendations of an expert Panel.

On August 1, 1996, the Commissioners of the Port of Seattle met to discuss the Master Plan Update proposals discussed in the FEIS. During the course of that meeting, by approving Resolution No. 3212, they adopted and approved a preferred development alternative, and authorized implementation of the first phase of those development actions. To date, due to the superseding events discussed below, no such implementation activity has taken place.

In May of 1996 the FAA Northwest Mountain region became aware of the fiscal year 1996 Terminal Area Forecast (TAF) prepared by the FAA headquarters Office of Policy and Plans. The TAF suggested that the air travel demand forecasts used in the Master Plan Update may have significantly understated the actual demand currently being experienced at Sea-Tac Airport and likely to be experienced at the airport in the foreseeable future. Over the next six months, a more detailed reexamination of those national forecasts, with more focus upon local conditions, was undertaken by the FAA and the Port of Seattle, together with their consultants. In December 1996, the FAA decided that a Supplemental EIS (SEIS) was necessary in order to reexamine, with public participation, how this anticipated growth might affect the conclusions reached in the February 1996 FEIS.

By Federal Register notice dated December 27, 1996 [61 Fed. Reg. 68327], the FAA published a Notice of Intent to prepare this SEIS. On February 4, 1997, the FAA and the POS released a Draft SEIS to the public. A public notice of availability of the Draft SEIS was published in local newspapers on February 9, 1997, in the Federal Register on February 13, 1997 [62 Fed, Reg. 6831] and by the Environmental Protection Agency [EPA] on February 14, 1997 [62 Fed. Reg. 6969]. A public hearing was held at the Sea-Tac International Airport on March 4, 1997, during which oral comments were taken from approximately 26 members of the public. By the March 31, 1997, close of the public comment period, 85 written public comments on the DSEIS had been received [reprinted at Final SEIS Appendix G]. All substantive oral and written public comments [including those pertaining to air quality conformity] are responded to in Appendix F of the FSEIS.

On May 13, 1997, the FAA signed and released the FSEIS to the public. A public notice of availability of the FEIS was published in local newspapers on May 19, 1997, in the Federal Register on May 21, 1997 [62 Fed. Reg. 27831] and by the Environmental Protection Agency [EPA] on May 23, 1997 [62 Fed. Reg. 28469]. Although not solicited, further public comments (not pertaining to air quality) were received on the FSEIS, which are responded to in Appendix D of this ROD. Public Comments on the FSEIS Air Quality analysis are responded to in Appendix E of this ROD.

On May 27, 1997, the Commissioners of the Port of Seattle met to discuss the Master Plan Update proposals discussed in the FSEIS. During the course of that meeting, by approving Resolution No. 3245, they again adopted and approved a preferred development alternative [as outlined in Appendix A of this ROD], and authorized immediate implementation of the first phase of those development actions.

III. THE PROPOSED AGENCY ACTIONS AND APPROVALS

FEIS page II-42 outlines a variety of actions that will require Federal approval prior to undertaking the proposed development actions. The majority of these actions will require FAA approval. However, the U.S. Army Corps of Engineers, a cooperating agency for the FEIS, will be responsible for permitting processes under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. The necessary FAA actions, determinations and approvals are summarized below.

a. Determination of project eligibility for Federal grant-in-aid funds (49 U.S.C. § 47101, et. Seq.) and Passenger Facility Charge [PFC] funds (49 U.S.C. § 40117), for land acquisition and relocation (49 CFR Part 24), site preparation, runway, taxiway, runway safety area, and other airfield construction, terminal and related landside development, navigational and landing aids, and environmental mitigation.

b. Conclusions regarding air quality conformance of the proposed facility with applicable air quality standards under the Clean Air Act, as amended. (42 U.S.C. § 7506, Section 176(c)(1)), and 40 CFR Part 93).

c. Approval for relocation/upgrade of the existing airport traffic control tower and various navigational aids (49 U.S.C. § 44502(a)(1)).

d. Decisions to develop air traffic control and airspace management procedures to effect the safe and efficient movement of air traffic to and from the proposed new runway, including the development of a system for the routing of arriving and departing traffic and the design, establishment, and publication of standardized flight operating procedures, including instrument approach procedures and standard instrument departure procedures (49 U.S.C. § 40103(b)).

e. Determinations, through the aeronautical study process, under 14 CFR Part 77, regarding obstructions to navigable airspace (49 U.S.C. § 40103(b) and 40113).

f. Determinations under 14 CFR Part 157 as to whether or not the agency objects to the airport development proposal from an airspace perspective, based upon aeronautical studies (49 U.S.C. § 40113(a)).

g. Determinations under the 49 U.S.C. Sections 47106 and 47107 pertaining to FAA funding of airport development [including approval of a revised airport layout plan (ALP), 49 U.S.C. § 47107(a)(16)], Environmental approval (see 42 U.S.C. §§ 4321-4347, and 40 CFR § 1500-1508), and approvals under various executive orders discussed in the ROD.

h. A certification that the proposed facility is reasonably necessary for use in air commerce or for the national defense (see 49 U.S.C. § 44502(b)).

IV. ALTERNATIVES ANALYSIS

The Master Plan Update Study process identified four broad development needs at Sea-Tac, which formed the basis for the site-specific EIS. These four needs, discussed in detail in FEIS Chapter I and in FSEIS Chapter 2, are summarized as follows:

(1) Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay;

(2) Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim;

(3) Provide Runway Safety Areas (RSA's) that meet current FAA standards; and

(4) Provide efficient and flexible landside facilities to accommodate future aviation demand.

FEIS Chapter II and FSEIS Chapter 3 discuss in detail the alternatives considered by the FAA and the POS during the EIS study process for each of these four identified needs. For each need, the no action alternative was also considered. A summary of the FAA's consideration of alternatives for each of these needs is set forth below:

(1) Improve the poor weather airfield operating capability in a manner that accommodates aircraft activity with an acceptable level of aircraft delay;

The Puget Sound region of Western Washington is renowned for its poor weather, characterized by frequent precipitation, clouds and fog. Under FAA aircraft separation criteria, the two existing Sea-Tac runways are too close together to permit simultaneous approaches to both runways during much of this poor weather. Under these weather conditions, therefore, there is but one usable approach path for aircraft landing at Sea-Tac. A one runway airport operates much differently from a multiple runway airport in terms of its ability to accommodate aircraft landings during periods of heavy air traffic demand. The FEIS and FSEIS document the current and forecasted aircraft delays resulting from the inadequate spacing of the two existing Sea-Tac runways, and the resulting single approach stream of air traffic during poor weather.

As noted at the beginning of this ROD, the FAA has participated for many years in regional attempts to find a solution to the Sea-Tac delay problem through the development of a replacement or supplemental airport or airports, or the expanded use of existing airports, in the Puget Sound region, in order to reduce the aircraft demand existing at and forecast for Sea-Tac (see FEIS Appendix B). However, for the reasons documented in the EIS and SEIS, the FAA has concluded that these regional solutions are currently not reasonable alternatives to meet the defined need. Likewise, the FAA has considered the reduction and management of demand at Sea-Tac through the use of other modes of transportation, demand and system management alternatives, and the use of additional air traffic and flight technology alternatives, and concluded that these alternatives would not meet the defined need.

As discussed at FEIS I-13 and at FSEIS 3-5 to 3-6, the FAA and the POS have in recent years made a number of procedural and technological improvements at Sea-Tac, which have increased the efficiency of the air traffic flow. However, we have now exhausted all known available and reasonable improvements of this nature. Additional technological and procedural alternatives which have been suggested are not reasonable solutions to the defined need, for the reasons explained at FEIS II-14 through II-

18, and in response to public comments in FEIS Appendix R and in FSEIS Appendix F.

Finally, the FAA has considered the use of delayed or blended alternatives as a means to avoid the immediate construction of a new runway at Sea-Tac. For the reasons discussed in FSEIS pages 3-6 to 3-7, the FAA and the POS have decided that limitations on financial resources, and a refined consideration of the construction process, require extending the runway construction period and delaying the commissioning of the runway until late in the year 2004. It is recognized that this delay will cause significant inconvenience to the traveling public and additional costs to airport users. However, the phasing plan outlined at FSEIS pages 2-22 to 2-23 represents a compromise which balances construction-related financial constraints with the costs associated with rapidly increasing airside delays.

As part of the POS Master Plan Update, an extensive evaluation was undertaken, summarized at FEIS pages II-12-14, to identify the appropriate alignment, spacing and length for a proposed third runway. The FAA worked closely with the POS to develop the assumptions and methodologies during this portion of the alternatives evaluation, which relied upon FAA design standards and the results of recent FAA Capacity Enhancement Plan updates. The FAA believes that this evaluation process was appropriately conducted, and therefore does not consider it necessary, in its independent Federal consideration of alternatives, to undertake a de novo comprehensive alternatives analysis of alignment, spacing, and length issues. The Port of Seattle, as the sponsor and airport operator, has the fundamental role of planning and developing aviation facilities at Sea-Tac.

Considered further in FEIS Chapter IV and in FSEIS Chapter 5, were the reasonably foreseeable environmental consequences of the Do-Nothing/No-Build alternative and the site-specific runway development alternatives. These evaluations concluded that the proposed third runway project would not result in any significant environmental impacts which could not be adequately mitigated [see ROD Section VI and Appendix F for summaries of mitigation].

The Port's decisions, at its August 1, 1996, and May 27, 1997, Commission meetings, to proceed with a third parallel runway spaced at 2500 feet from runway 34R/16L, and 8500 feet in length, are well supported by airspace, engineering, environmental, and financial considerations, as documented in the Master Plan Update and in the FEIS and FSEIS.

Under the Do-Nothing/No-Build alternative, a third runway at Sea-Tac would not be developed now or in the near future. However, Federal adoption of this alternative would fail to alleviate the current and forecast airside delays at Sea-Tac which are documented in the FEIS and FSEIS. Although the FEIS and FSEIS find that, with appropriate mitigation, the POS preferred alternative will have no significant environmental impacts, the Do-Nothing/No-Build Alternative would still be the least environmentally impacting alternative, and thus the Do-Nothing/No-Build alternative is environmentally preferable. However, since it would fail to accomplish the principal purpose and need for the project, this alternative is not supported by the FAA.

In its consideration of alternatives, the FAA has been mindful of its statutory charter to encourage the development of civil aeronautics and safety of air commerce in the United States (49 U.S.C. 40104). We have also considered the congressional policy declaration that airport construction and improvement projects that increase the capacity of facilities to accommodate passenger and cargo traffic be undertaken to the maximum feasible extent so that safety and efficiency increase and delays decrease (49 U.S.C. 47101(a)(7)).

As a further policy consideration, the construction and operation of the proposed third Sea-Tac runway will alleviate delays and congestion at Sea-Tac International Airport, as extensively documented in the administrative record for this ROD. Although the $587 million cost for property acquisition, runway construction, and environmental mitigation (as specified in the SEIS) is significant by any standard, the annual delay savings from an 8500 foot new runway are expected to be approximately $438 million by the year 2005, and $646 million by the year 2010. ROD Appendix G presents a recent Benefit-Cost Analysis for the third runway project, prepared by the agency's System and Policy Analysis Division at FAA headquarters. That analysis reflects that the total benefit of the proposed runway exceeds the total project cost by a factor of approximately 5, based upon a comparison of present values of benefits and costs. Based upon the Appendix G figures, discounted to present value, it is evident that if the third runway becomes operational by the year 2005, the delay savings will compensate for the runway costs within a two year period.

Although the benefit/cost analysis reflects savings from both airline operation and passenger delays, there are other more qualitative considerations. The FAA and the POS seek to relieve passenger and public inconvenience, and to make travel to and from this region more attractive by reducing travel delay and uncertainty. The FAA therefore concludes that the third runway project is both cost effective, and otherwise worthy of Federal support through the approvals in this ROD.

This support and these approvals do not, however, suggest that an FAA commitment to provide a specific level of financial support for the new runway project has yet been made. Future FAA discretionary funding decisions will be based upon the statutory criteria set forth in 49 U.S.C. § 47115(d), and upon the FAA policy announced in the Federal Register on June 24, 1997 (62 Fed. Reg. 34108), or under subsequent revisions to that agency policy.

After careful consideration of the analysis of the impacts of the various alternatives considered, and of the ability of these alternatives to satisfy the identified purpose and need for this proposal; and after review and consideration of the testimony at the various public hearings, of the comments submitted in response to the circulation of the DEIS, FEIS, DSEIS and FSEIS and of coordination with Federal, state and local agencies; and after considering the policy matters discussed above; the FAA hereby selects the runway alternative adopted and approved for construction by the POS on August 1, 1996, and on May 27, 1997, as the FAA's preferred runway alternative.

(2) Provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads for aircraft types operating to the Pacific Rim.

The FEIS documents the inability of existing Sea-Tac runways (at 9,425 and 11,900 feet) to service unrestricted warm weather non-stop operations to Pacific Rim destinations. The inability of Sea-Tac to accommodate unrestricted operations to these destinations is expected to result in ever-increasing airline economic losses throughout the planning period (estimated at $1.2 million in the year 2000 and $2 million by the year 2010).

The Master Plan Update determined that a 12,500 foot runway is the minimum length necessary to permit unrestricted B747-200B operations at 76°F. Although consideration was given to meeting this need by extending runway 16R/34L to a length of 12,500 feet, this alternative was rejected as unreasonable due to impacts on wetlands and the expense of roadway relocations, as discussed in the FEIS. Consideration was also given to development of a new third runway with a 12,500 foot length, but this alternative was also rejected due to the extensive disruption of existing development and the expense associated with roadway relocation, as discussed in the FEIS. The FEIS identifies a 600 foot southward extension of Runway 16L/34R as being the most cost effective and least environmentally damaging development alternative. The net cost of this runway extension is estimated at $12,700,000.

With regard to the Delayed/Blended alternatives, although these were considered at FEIS page II-21, they were dismissed from further study and not chosen as the preferred alternative. Although the POS had not earlier identified a preferred development date for this aspect of the Master Plan Update (see FEIS footnote #19, page II-44), the Final SEIS [at page 2-22] states an intent to proceed with this development aspect of the Master Plan Update in the year 2010, when it is anticipated that this development project will become cost-effective (payback period estimated at 11.1 years in year 2000 but reduced to 6.5 years by the year 2010). In order to maintain the integrity of the FEIS environmental process, which requires the consideration of connected, cumulative and similar actions in one document, the FEIS and FSEIS evaluated this runway extension project during this EIS process. Under FAA Order 5050.4A paragraph 102.b., a written environmental reevaluation of this project will likely be required prior to the commencement of construction.

Under the Do-Nothing/No-Build alternative, a runway extension at Sea-Tac would not be developed now or in the foreseeable future. Although the FEIS and FSEIS find that, with appropriate mitigation, the POS preferred alternative will have no significant environmental impacts, the Do-Nothing/No-Build Alternative would still be the least environmentally impacting alternative, and thus the Do-Nothing/No-Build alternative is environmentally preferable. However, since it would fail to accomplish the principal purpose and need for the project, this alternative is not supported by the FAA.

Having considered the policies set forth at 49 U.S.C. sections 40104 and 47101, the ability of the available alternatives to meet the articulated need, and the administrative record which concerns the proposed runway extension, the FAA hereby selects as its preferred alternative the runway extension alternative identified in the FEIS as the POS planning staff's preferred alternative, as adopted by the POS as part of its Master Plan Update and ALP at its August 1, 1996, and on May 27, 1997, meetings.

The FAA's approval of the runway extension project in this ROD signifies that the project meets FAA standards for approval of the agency actions discussed in Section II of this ROD. It does not, however, signify an FAA commitment to provide financial support for the runway extension, which is a decision which may not be made unless and until the project can be justified under the criteria prescribed by 49 U.S.C. § 47115(d), and under the agency policy announced in the Federal Register on June 24, 1997 (62 Fed. Reg. 34108), or under subsequent revisions to that agency policy.

(3) Provide Runway Safety Areas (RSA's) that meet current FAA standards.

The FEIS documents the fact that existing Sea-Tac runways do not meet current FAA safety design standards, in that three of the four runway ends have RSA's which are of insufficient length to ensure safe operations in the event of aircraft runway overruns [As noted at FEIS I-18 and at FSEIS 4-3, the RSA for runway end 34L was brought into compliance in 1995]. FAA approval of the RSA for runway end 34R was provided in a FAA Record of Decision dated April 18, 1996, notice of which was given through publication of an announcement in several local newspapers [discussed at FSEIS 3-8 and 4-3]. Construction is expected to be completed in late 1997.

For the remaining two RSAs (16R and 16L), consideration was given to the Do-Nothing/No-Build alternative during the EIS process. A literal do nothing approach (See FEIS II-24, footnote #12) was rejected as an unreasonable option early in the process, since it would not address the immediate need to correct a runway design which does not meet current FAA standards. Considered further as part of the detailed analyses of development alternatives 2, 3, and 4, were the No-Build alternative (requiring the establishment of displaced threshold/declared distance procedures for each runway), and the POS preferred alternative, involving the construction of a 1,000 foot RSA for the two remaining runway ends, as well as standard size RSAs on both ends of the new proposed third runway.

Under the Do-Nothing/No-Build alternative, these runway safety area improvements at Sea-Tac would not be developed now or in the near future. Although the FEIS and FSEIS find that, with appropriate mitigation, the POS preferred alternative will have no significant environmental impacts, the Do-Nothing/No-Build Alternative would still be the least environmentally impacting alternative, and thus the Do-Nothing/No-Build alternative is environmentally preferable. However, since it would fail to accomplish the principal purpose and need for the project, this alternative is not supported by the FAA.

As explained at FEIS page II-23, the FAA does not favor the establishment of displaced threshold/declared distance procedures at Sea-Tac, for reasons of safety and efficiency. Accordingly, having considered the policies set forth at 49 U.S.C. sections 40104 and 47101, the ability of the available alternatives to meet the articulated need, and the administrative record which concerns the proposed RSA extensions, the FAA hereby selects as the FAA's preferred alternative the RSA extension alternative adopted by the POS as part of its Master Plan Update and ALP, at its August 1, 1996, and May 27, 1997, meetings.

The FAA's approval of the RSA extension projects in this ROD signifies that the projects meet FAA standards for approval of the agency actions discussed in Section II of this ROD. It does not, however, signify an FAA commitment to provide a specific level of financial support for the RSA extensions, which is a future decision which will be made under the agency policy announced in the Federal Register on June 24, 1997 (62 Fed. Reg. 34108), or under subsequent revisions to that agency policy.

(4) Provide efficient and flexible landside facilities to accommodate future aviation demand.

The FEIS and FSEIS document the need to incrementally improve existing terminal and other landside facilities at Sea-Tac over the next several decades, in order to alleviate the congestion and passenger inconveniences anticipated to result from regional growth and increased demand for airport services.

During the EIS process, the FAA considered but rejected for further detailed evaluation, the reduction of demand at Sea-Tac landside facilities through the development of a replacement or supplemental airport or airports in the Puget Sound region, through the use of other modes of transportation, or through demand and system management alternatives. For the reasons discussed in the FEIS, the FAA concluded, as it did in the case of the proposed third runway project, that these alternatives were unreasonable.

Although Delayed/Blended alternatives were also rejected in the FEIS as not meeting the need for landside improvements, it should be noted that the POS originally planned to incrementally expand and improve the Sea-Tac landside facilities discussed in the FEIS over the next 25 years, as the need for specific improvements was justified by the rate of increased demand placed upon existing facilities. With the accelerated demand forecast in the FSEIS, the terminal and landside facilities are now needed even sooner than originally forecast in the FEIS, and accordingly, the Delayed/Blended alternative is an even more unreasonable alternative. The current project phasing plans documented at FSEIS pages 2-22 to 2-23 and in Appendix A to this ROD represent earlier timeframes for many of these terminal and landside facilities, in order to accommodate these increased demand forecasts.

Carried forward for detailed evaluation in FEIS Chapter IV, and considered also in FSEIS Chapter 5, were the Do-Nothing/No Build alternative, along with three development alternatives, centered around a central terminal concept, a north unit terminal concept, and a south unit terminal concept. As part of the POS Master Plan Update, an extensive engineering and financial evaluation was undertaken by the POS, to evaluate these proposed landside improvements. The FAA worked closely with the POS to develop the assumptions and methodologies during this portion of the alternatives evaluation. The FAA believes that this evaluation process was appropriately conducted, and therefore does not consider it necessary, in its independent Federal FEIS consideration of alternatives, to undertake a de novo comprehensive alternatives analysis of these landside improvements. The Port of Seattle, as the sponsor and airport operator, has the fundamental role of planning and developing aviation facilities at Sea-Tac. The preferred alternative recommended in the FEIS and FSEIS by the POS's planning staff (the North Unit Terminal concept), is well supported by airspace, engineering, environmental, and financial considerations, as documented in the Master Plan Update and in the FEIS and FSEIS.

Under the Do-Nothing/No-Build alternative, these landside improvements would not be developed now or in the next several decades. However, Federal approval of this alternative would fail to alleviate the congestion and passenger inconveniences anticipated to result from regional growth and increased demand for airport services. Although the FEIS and FSEIS find that, with appropriate mitigation, the POS preferred alternative will have no significant environmental impacts, the Do-Nothing/No-Build Alternative would still have the fewest developmental impacts. However, the Do-Nothing/No-Build Alternative would not be the environmentally preferable alternative, since it would fail to alleviate the significant environmental impacts associated with increased surface transportation congestion, which the preferred alternative is designed to remedy. Furthermore, since the Do-Nothing/No-Build Alternative would fail to accomplish the principal purpose and need for these landside development projects, this alternative is not supported by the FAA.

Accordingly, having considered the policies set forth at 49 U.S.C. sections 40104 and 47101, the ability of the available alternatives to meet the articulated need, and the administrative record which concerns these landside development projects, the FAA hereby selects as the FAA's preferred alternative the landside development recommended in the FEIS and FSEIS by the POS's planning staff (alternative #3, North Unit Terminal), as adopted as Part of its Master Plan Update and ALP, and as partially approved for immediate construction by the POS at its' August 1, 1996, and May 27, 1997, meetings.

The FAA's approval of these landside expansion and improvement projects in this ROD signifies that these projects meet FAA standards for approval of the agency actions discussed in Section II of this ROD. It does not, however, signify an FAA commitment to provide a specific level of financial support for these projects, which must await future decisions to be made under the criteria prescribed by 49 U.S.C. § 47115(d), and under the agency policy announced in the Federal Register on June 24, 1997 (62 Fed. Reg. 34108), or under subsequent revisions to that agency policy.

V. THE AGENCY FINDINGS

The FAA makes the following determinations for this project, based upon the appropriate information and analysis set forth in the FEIS and FSEIS and upon other portions of the administrative record:

A. The project is consistent with existing plans of public agencies for development of the area surrounding the airport. [49 U.S.C. 47106(a)(1)].

The determination prescribed by this statutory provision is a precondition to agency approval of airport project funding applications. It has been long-standing policy of the FAA to rely heavily upon actions of metropolitan planning organizations (MPOs) in amending regional airport system plans (RASPs) to satisfy the project consistency requirement of 49 U.S.C. 47106(a)(1) [see, e.g., Suburban O'Hare Com'n v Dole, 787 F.2d 186, 199 (7th Cir, 1986)]. Furthermore, both the legislative history and consistent agency interpretations of this statutory provision make it clear that reasonable, rather than absolute consistency with these plans is all that is required.

Under the provisions of both Federal and State Law (see FEIS Appendix S, and FEIS Appendix R, response to comment R-2-1), the Puget Sound Regional Council (PSRC) has been designated as the MPO for the Puget Sound metropolitan area, and given primary responsibility for transportation planning in the region. On April 29, 1993, the PSRC adopted Resolution No. A-93-03 amending the Puget Sound area RASP, to provide for a third runway at Sea-Tac. That resolution stated that a third Sea-Tac runway shall be authorized by April 1, 1996, subject to the following three conditions:

1. Unless shown through an environmental assessment, which will include financial and market feasibility studies, that a supplemental site is feasible and can eliminate the need for the third runway. [By PSRC resolution EB-94-01, dated October 27,

1994, the PSRC determined that a supplemental airport site was not feasible].

2. After demand and system management programs are pursued and achieved or determined not to be feasible, based upon independent evaluation. [By final order dated December 8, 1995, the expert panel appointed by the PSRC to independently evaluate this issue, determined that that demand and system management programs were not feasible].

3. When noise reduction performance objectives are scheduled, pursued and achieved based on independent evaluation and based on measurement of real noise impacts. [By final order dated March 27, 1996, a PSRC expert panel found that the POS had not satisfied this condition. However, on July 11, 1996, in Resolution A-96-02, the PSRC General Assembly approved an amendment to the Metropolitan Transportation Plan to include a third runway at Sea-Tac Airport, with specific noise reduction measures based upon recommendations of the expert panel].

In consideration of the above-described actions of the PSRC in amending the local RASP to authorize the third runway project [more fully described at FSEIS pages 4-1 to 4-2], the FAA is satisfied that 49 U.S.C. 47106(a)(1) has been fully complied with.

With regards to this issue, however, the FAA has also reviewed the substantial documentation in the administrative record demonstrating that throughout the EIS process the POS has shown great concern for the impact of the proposed development actions on surrounding communities, and has attempted to ensure the consistency of its project proposals with the planning efforts of neighboring communities. The administrative record for this Record of Decision includes a detailed chronology of coordination between the POS and neighboring jurisdictions concerning local planning proposals, along with documents describing the extensive public meetings, hearings, and other means by which public participation in project planning was accommodated. Further discussion of consistency of the proposed development projects with public agency planning is summarized at FEIS pages IV.2-7 through IV-2-18, and at FSEIS Chapter 4.

As noted in the referenced text, Sea-Tac Airport lies almost totally within the boundaries of the City of SeaTac. The extent to which City of Sea-Tac regulations apply to Sea-Tac Airport development is unresolved, and the POS is currently involved in a process with the City to resolve this question. Meanwhile the POS has committed itself to participating in the City's land use planning activities, to address any issues relating to the proposed Sea-Tac Airport development to the extent required.

As discussed at FEIS IV.2-10 through IV.2-16, the cities of Des Moines, Normandy Park, Burien, and Tukwila have each engaged in recent land use planning actions which appear designed to limit airport expansion. These local plans and ordinances establish land use compatibility guidelines with noise levels for residential and other noise-sensitive areas that are substantially more restrictive than those established by the FAA. Some of these local plans and ordinances also establish zoning policies (a prohibition on use of lands acquired by public entities to be used for new commercial activities). These ordinances purport to restrict the use of some lands within these jurisdictions (e.g., for the third runway northern Runway Protection Zone), needed by the POS in order to implement important safety and aircraft operation aspects of its preferred alternative.

It has not yet been decided under Washington state law whether the Master Plan Update proposed development actions would be subject to any of these plans and ordinances adopted by these adjacent cities. Thus there may be little or no inconsistency here. With regard to noise planning, the FAA has considered the fact that implementation of the POS preferred alternative will not result, after mitigation, in any significant increases in noise impacts on lands of these neighboring jurisdictions. To the extent that these adjacent cities impose restrictions on land acquisition by the POS for essential aviation safety and aircraft operation purposes, the FAA believes that such planning policies are inapplicable and invalid under Federal law.

In making its determination under 49 U.S.C. 47106(a)(1), the FAA has considered the fact that each of these local governments has been represented on the PSRC, and has participated as a member of that organization in its decision to authorize the third runway project at Sea-Tac (although some of these local governments may have disagreed, as individual PSRC members, with that ultimate decision). The FAA has also recognized the fact that none of these jurisdictions has regulatory authority over airport operations, since long-established doctrines of Federal preemption preclude these communities from regulating aircraft operations conducted at Sea-Tac.

Furthermore, these local government planning policies, which appear designed to obstruct the proposed Sea-Tac development, appear to be in conflict with provisions of the Washington State Growth Management Act, 1990, such as those found at RCW §§ 36.70A.100 and 36.70A.200, which require these city comprehensive plans to be coordinated with and consistent with regional policy decisions (e.g., the 1995 update of the Vision 2020 Growth and Transportation Strategy. Vision 2020 is the region's long-range growth management, economic, and transportation strategy. The transportation component of Vision 2020 specifically incorporates PSRC Resolution A-93-03 which authorizes the third runway project).

The Growth Management Act also requires these local plans to be coordinated with and to be consistent with King County countywide planning policies and the comprehensive plans of King County and neighboring cities such as Sea-Tac, and prohibits any local comprehensive plan from precluding the siting of essential public facilities such as airports.

Given the FAA determination in this ROD, under appropriate Federal law, that there is a compelling need for the proposed Sea-Tac improvements, as documented in the FEIS, it is inappropriate for these local communities to attempt to exercise local zoning control in a manner which would conflict with the domestic and international aviation requirements of this airport. If there were to be a conflict between Federal and local policies, the local policies must give way to the Federal policies, under the doctrine of Federal preemption.

B. The interests of the community in or near which the project may be located have been given fair consideration. [49 U.S.C. 47106(b)(2)]

The determination prescribed by this statutory provision is a precondition to agency approval of airport development project funding applications. The regional planning process over the past decade and the environmental process for this project-specific EIS which began in 1994 and extended to this point of decision, provided numerous opportunities for the expression of and response to issues put forward by communities in and near the project location. Nearby communities and their residents have had the opportunity to express their views during the Draft EIS public comment period, at several public hearings and a congressional hearing, as well as during the comment periods following public issuance of the FEIS, the DSEIS, and the FSEIS,. The FAA's consideration of these community views is set forth in FEIS Appendix R, in FSEIS Appendix F, and in Appendix A of this ROD.

C. The State of Washington has certified in writing that there is reasonable assurance that the project will be located, designed, constructed, and operated in compliance with applicable air and water quality standards [49 U.S.C.§ 47106 (c)(1)(B)].

The determination prescribed by this statutory provision is a precondition to agency approval of airport development project funding applications involving a major runway extension or new runway location.

By letter dated December 20, 1996 [see Appendix B to this ROD], the Washington State Department of Ecology, acting under delegated authority from the Governor of the State of Washington, provided this certification, conditioned upon a number of mitigation measures to be undertaken by the Port of Seattle. Pursuant to general principles of agency and administrative law, and absent evidence that delegation is unauthorized or unlawful as a matter of state law, the FAA has interpreted this statute to permit state chief executive officers to delegate this certification responsibility to lower state officials with appropriate subject matter jurisdiction over state air and water quality [see FAA Order 5050.4A, paragraph 47e.(5)(e)]. As described at FSEIS Appendix F, page F-79, the delegation to the Department of Ecology which occurred in this case was appropriate under Washington State law.

However given the public controversy which has arisen over this delegation, by letter dated June 30, 1997, (see Appendix C to this ROD], the Governor of the State of Washington further certified that the airport project evaluated in the FEIS and FSEIS will be located, designed, constructed and operated so as to comply with applicable air and water quality standards.

D. <u>Effect On Natural Resources</u> [49 U.S.C. § 47106(c)(1)(C)]

Under this statutory provision the FAA may approve funding of a new runway or runway extension having a significant adverse effect on natural resources, only after determining that no possible and prudent alternative to the project exists and that every reasonable step has been taken to minimize the adverse effect.

As documented in the FEIS and FSEIS, for several natural resource impact categories which have established significance levels, the agency finds that, without implementation of the mitigation summarized in Section VI and Appendix F of this ROD, the preferred alternative would have a significantly adverse affect. However, given the inability of other alternatives discussed in the FEIS and FSEIS, to satisfy the purposes and needs for the preferred alternative, we have concluded that no possible and prudent alternative exists to development of the proposed alternatives. As discussed in Section VI and Appendix F of this ROD, and documented throughout the FEIS, FSEIS and the administrative record, every reasonable step has been taken to minimize adverse environmental effects resulting from the project.

As discussed generally in FSEIS Chapters 1 and 2, and more specifically at FSEIS Appendix F, response to comment 2-J, specific airport activity levels and their associated environmental impacts were determined not to be reasonably foreseeable at this time following the year 2010. Accordingly, that year was set as the end of the planning horizon for the revised master plan update proposal evaluated in the FSEIS. However, FSEIS Appendix D did present possible activity levels and their associated environmental impacts for three test cases through the year 2020, based upon an extrapolated quantification of anticipated impacts prior to the year 2010. Although that extrapolated presentation is quite speculative, for the reasons explained in FSEIS Appendix F, the FSEIS does acknowledge that after the year 2010 there will likely be some level of adverse noise and land use impacts resulting from the approval of the preferred development alternatives, when compared to the no action alternative after that date.

Accordingly, in order to consider further mitigation under NEPA, and to address any possible adverse environmental effects resulting from the projects approved in this ROD, the FAA has decided to condition such approval upon the following additional noise and land use mitigation measure:

Following commencement of operations on the new runway, but prior to the year 2010, the POS and the FAA will undertake a further supplemental evaluation of noise and land use impacts anticipated after the year 2010. That supplemental evaluation may be included as part of a future Part 150 study undertaken by the POS. Following completion of that evaluation, if significant additional adverse environmental impacts are found, the Port of Seattle will be required to adopt further noise and land use mitigation measures designed to minimize any significant adverse affects found in that evaluation. This conditional approval will be enforced through a special condition included in future Federal airport grants to the Port of Seattle.

The FAA has reviewed the amount of such additional mitigation which would be required if the maximum additional adverse environmental effects estimated in FSEIS Appendix D should occur. This additional mitigation required would be similar to mitigation programs that have been implemented by the POS in the past, and are expected to be implemented as mitigation in connection with the projects approved in this ROD. Therefore, the FAA concludes that such additional mitigation is feasible. The POS has indicted that such additional mitigation would be financially feasible if it were to be required, based on this special condition. The FAA also concludes that even if the maximum additional adverse environmental effects estimated in Appendix D should occur, it would still make the decisions set forth in this ROD and would approve the projects, subject to the special condition with respect to additional mitigation.

E. Appropriate action, including the adoption of zoning laws, has been or will be taken to the extent reasonable to restrict the use of land next to or near the airport to uses that are compatible with normal airport operations. [49 U.S.C. § 47107(a)(10)].

The sponsor assurance prescribed by this statutory provision is a precondition to agency approval of airport development project funding applications. In addition to the actions described in section IV.A. of this ROD, the Port of Seattle has worked extensively with local jurisdictions over the past two decades to develop and implement plans and policies to ensure compatible land use in the airport vicinity.

FEIS pages III-2 through III-4 and FSEIS chapter four, describe the current status of zoning and land use planning for lands near the airport. FEIS Appendix C, pages 3-9 outline former and existing noise programs which have been designed to either reduce noise at the source or mitigate the noise received by sensitive land uses in the airport vicinity. As explained in FEIS Chapter IV, sections 1 and 2, and FSEIS Section 5-3, with planned mitigation, development of the Master Plan Update proposals will not result in any increased significant impacts on non-compatible land uses. Based upon the entire administrative record for this ROD, the FAA has concluded that existing and planned noise reduction programs at Sea-Tac provide for appropriate action to ensure compatible land use in the airport vicinity.

F. Clean Air Act, Section 176(c)(1) Conformity Determination regarding Seattle-Tacoma International Airport Master Plan Update Development Actions (42 U.S.C. § 7506(c).

The determination prescribed by this statutory provision is a precondition for Federal agency support or approval of airport development actions which are projected to exceed the *de minimis* air emission levels prescribed at 40 CFR § 93.153. USEPA regulations more generally governing the conformity determination process are found at 40 CFR Part 93, Subpart B.

In the 1996 FEIS, the FAA made a Draft Conformity Determination on the POS Master Plan Update proposals [FEIS pages IV.9-10 and IV.9-11]. Pursuant to the provisions of the USEPA regulations, the FAA published notice of this draft conformity determination in the Federal Register on February 9, 1996 (61 Fed. Reg. 5055), announced the availability of the draft determination in several local newspapers, and provided notice to appropriate Federal, state and local public agencies. In these notices, the agencies and the general public were invited to review and comment on the draft conformity determination. Through a series of Federal Register notifications, the FAA ultimately extended this comment period until June 6, 1996 (61 Fed. Reg. 27944). Comments received during this 1996 comment period are presented at FSEIS Appendix B, Attachment D and are addressed at FSEIS Appendix B, Attachment A.

In February 1997, a Revised Draft Conformity Analysis was issued as part of the Draft SEIS, with a 30 day comment period announced in a February 9, 1997, Seattle Times advertisement. On March 7, 1997, the FAA announced an extension of the comment period on this draft analysis until March 31, 1997 [62 Fed. Reg. 10606]. FSEIS Appendix G presents all public and agency comments on the draft SEIS, including those pertaining to air quality issues. FSEIS Appendix F, section six, responds to those comments which concern air quality and conformity issues.

Due to a number of changes in the nature and timing of the Master Plan Update Development Proposals from those originally evaluated in the FEIS, the draft SEIS air quality analysis projected air quality emission levels below the 40 CFR § 93.153 *de minimis* levels.

Several commenters on the draft SEIS air quality and conformity analyses stated that factual errors had been made in those analyses. At the FAA's request, the EIS consultant then performed a detailed quality assurance reevaluation for the data input to the air emissions and dispersion models. This led to a revised air emissions inventory, with several revisions to the specific emission estimates presented in the draft SEIS. However, this quality assurance process confirmed the overall conclusion of the draft SEIS, which projected air quality emission levels below the *de minimis* levels set forth in 40 CFR § 93.153. FSEIS Appendix B details the basis for this conclusion. Accordingly, a formal conformity determination is not legally required under applicable EPA regulations.

ROD Appendix E presents letters dated June 23, 1997, from the United States Environmental Protection Agency, the State of Washington Department of Ecology, and the Puget Sound Air Pollution Control Agency. In their letters, each of these air quality agencies has concurred with the FSEIS analysis conclusion that the *de minimis* thresholds have not been exceeded for general conformity under the Clean Air Act.

However, in order to achieve maximum public disclosure and to address community concerns, the FSEIS nevertheless presents an analysis of air quality impacts utilizing the regulatory structure set forth in the EPA conformity regulations. The FSEIS Appendix B analysis demonstrates that if the FAA were legally obligated to make a conformity determination for the projects approved in this ROD, the project would not cause or contribute to any new exceedences of air quality standards. As confirmed by the Washington State Department of Ecology, the project conforms to the Washington State Implementation Plan.

As noted above, the Final SEIS, approved on May 13, 1997, included as Appendix B a Final Air Quality Conformity Analysis. At the request of several air quality agencies, the FAA agreed to provide an additional 30 day comment period on the FSEIS air quality analysis, due to the revisions which had been made to that analysis since issuance of the DSEIS. Notice of the availability of that analysis for public review and comment was published in the Federal Register on May 21, 1997 [62 Fed. Reg. 27830]. Appendix E to this ROD presents the comments received in response to this notice and the agency's response to those comments.

Based upon the air quality information and discussion presented in the FEIS, the FSEIS, and Appendix E of this ROD, and upon other supporting material in the administrative record, the FAA finds that the development actions summarized in ROD Appendix B will not cause air emissions that exceed de minimis thresholds set forth in 40 CFR § 93.153, and conform to the provisions of the Washington State Implementation Plan and the National Ambient Air Quality Standards (AAQS).

Because projects at Sea-Tac Airport are governed by the maintenance area designation, the FSEIS shows that the project will not cause or contribute to any new violations of any of the AAQS in the project area or the metropolitan area. Because the computer modeling predicts that exceedances of the Carbon Monoxide AAQS could occur in the future without the proposed improvements (Do-Nothing/No-Build), consideration was also given to the two non-attainment area principles, and the FSEIS showed that the project will not increase the frequency or severity of any existing violations of any AAQS, and that the project will not delay timely attainment of the AAQS or any required interim emission reduction in the project area.

G. <u>For this project, involving new construction which will directly affect wetlands, there is no practicable alternative to such construction. The proposed action includes all practicable measures to minimize harm to wetlands which may result from such use.</u> [Executive Order 11990, as amended]

This executive order requires all Federal agencies to avoid providing assistance for new construction located in wetlands unless there is no practicable alternative to such construction and all practicable measures to minimize harm to wetlands are included in the action.

FEIS Chapter IV Section 11, and FSEIS Section 5-5 document that the preferred development alternative (North Terminal with 8500 foot runway) selected by the POS from the Master Plan Update study will directly affect approximately 12.23 acres of wetlands. Given the extensive FEIS and FSEIS alternatives analyses (summarized at FEIS IV.11-5 and FSEIS Chapter 3) showing that there are no other reasonable alternative to developing a third runway at Sea-Tac, the FAA additionally concludes that there is no practicable alternative to constructing such a runway, resulting in these wetland impacts, given the purposes and needs documented in the FEIS, consideration of environmental and economic factors, and land use issues.

FEIS Chapter IV, Section 11 and FSEIS Section 5-5, state that for each of the three landside development alternatives, an 8,500 foot runway would result in impacts to slightly more wetlands than would 7,000 foot or 7,500 foot runways. Additional runway length beyond 7,500 feet would require filling additional wetlands. Extending the runway to 8,100 feet requires filling 0.19 additional acres of wetlands, and extension to the full 8,500 feet requires filling a yet additional 0.86 acres. The FEIS and FSEIS demonstrate that these are low quality wetlands. Two of their significant functions, floodwater attenuation and floodwater storage, would be fully mitigated within the airport basin. Additional wetland functions for these wetlands will be mitigated at the Auburn site as part of the overall wetlands mitigation program.

An important purpose of the additional 600 and 400 feet of runway (to 8,100 or 8,500 feet) beyond the 7,500 foot runway is to provide the maximum air transportation service and efficiency available to the POS and the national air transportation system. Although a 7,500 foot runway provides many of the benefits of a new runway, it does not provide all of the desirable benefits. Alternatives of staggering runway ends or relocating the entire runway are not practicable, because, among other reasons, they would require considerable additional cost and complicate air traffic control procedures. Considering these and other reasons described more fully in Appendix C of this ROD, considering the standards set forth at 40 CFR 230.10(a)(2), and taking into consideration cost, existing air traffic control and aviation technology and logistics, in light of the overall purpose of the runway project, the FAA finds that there is no practicable alternative to the wetland loss associated with an 8500 foot runway.

As noted in FEIS Chapter IV, Section 11, FEIS Appendix P, and FSEIS Section 5-5, the U.S. Army Corps of Engineers (COE) has worked with the FAA and the POS as a cooperating agency to ensure that all practicable measures will be taken to minimize harm to wetlands which will be impacted through development of the preferred alternative, through Best Management Practices during construction and the development of a wetland compensatory mitigation site. Following issuance of this ROD , the COE, in consultation with the Washington State Department of Ecology, will complete its processing of a Section 404 permit, required for the POS to proceed with development impacting wetlands. The project approvals in this ROD and this wetlands determination are expressly conditioned upon permit approval and conditions to be outlined by the U.S. Army Corps of Engineers, and upon the POS accomplishing the wetlands mitigation measures identified in the FEIS, FSEIS, and any COE permit approval.

Although it is generally preferable to attempt to mitigate wetland loss through replacement wetlands in the same watershed [a goal reflected in the local regulations discussed at FSEIS Appendix F, page 127], this is not the case where such replacement would create man-made wetlands adjacent to airport aircraft movement areas. Included at the end of FSEIS Section 5-5 is a reprint of FAA Advisory Circular 150/5200-33, dated May 1, 1997, which states the FAA's strong opposition to wetland mitigation projects located within 10,000 feet of airports serving turbine-powered aircraft [such as SEA-TAC], due to the safety hazard such wetlands present as attractants of wildlife, which significantly increase the risk of bird/aircraft strikes.

The safety standards set forth in this FAA policy statement are recommended for the operators of all public-use airports. Furthermore, for airport sponsors who are the recipients of Federal grant funding, adherence to safety standards set forth in FAA advisory circulars are a requirement of standard grant assurance #34, as acknowledged in paragraph 4-6.a. of Advisory Circular 150/5200-33.

This recent agency policy determination supports the FEIS and FSEIS determinations that the replacement wetlands for the Sea-Tac Master Plan Update development actions should not be located in the vicinity of the airport. Given the limited land area in the Sea-Tac watershed available for wetland replacement, and the hazard associated with the creation of wildlife attractions within 10,000 feet of jet runways, there is no practicable alternative to the replacement of these impacted wetlands outside of the Sea-Tac watershed.

As detailed in FEIS Appendix P, and FSEIS Section 5-5, a detailed wetland mitigation program has been developed to offset the impacts of the project and to recognize other long-term biological problems. The mitigation plan calls for replacing the filled wetlands on a 47 acre mitigation site located on a 69 acre parcel of land along the Green River in Auburn Washington.

H. <u>For this project, involving a significant encroachment on a floodplain, there is no practicable alternative to the selected development of the preferred alternative. The proposed action conforms to all applicable state and/or local floodplain protection standards.</u> (Executive Order 11988)

This executive order, together with applicable DOT and FAA orders, establish a policy to avoid supporting construction within a 100 year floodplain where practicable, and where avoidance is not practicable, to ensure that the construction design minimizes potential harm to or within the floodplain.

Chapter IV Section 12 of the FEIS explains that, without mitigation, construction and operation of the Master Plan Update preferred alternative could result in significant adverse floodplain impacts in both the Miller and Des Moines Creek basins. The FSEIS analysis does not alter the FEIS analysis, but presents additional information at FSEIS Appendix F, pages 123-124, based on a 1997 POS Stormwater Review Study.

As outlined in the "alternatives" discussion earlier in this ROD and in the FEIS and FSEIS, there is no practicable alternative to the preferred alternative. Development of this alternative achieves the purposes and needs for the projects in the most cost-effective manner with the least impact on the surrounding land uses. As shown in FEIS Appendix P, a mitigation program has been designed which will create an equivalent amount of floodplain so that there would be no net loss of flood storage capacity or increased risk of loss of human life or property damage. This program has been designed to comply with applicable requirements of the permitting agencies, with whom the FAA and the POS have been coordinating in order to ensure that the construction design minimizes potential harm to or within the floodplain. Each of these agencies have agreed with the mitigation plan in concept and the coordination will continue throughout the permitting process.

I. <u>Relocation Assistance</u> (42 U.S.C. § 4601 *et. seq.)*

These statutory provisions, imposed by Title II of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (URA), require that state or local agencies undertaking Federally-assisted projects which cause the involuntarily displacement of persons or businesses, must make available relocation benefits to those persons impacted.

As detailed in FEIS Chapter IV, Sections 6 and 8, the preferred development alternative would displace up to 391 single family, 260 condos/apartments, and 105 businesses. Of the 105 businesses identified by the FEIS, 88 are located in the Runway Protection Area. While the FAA prefers airport sponsors to have control over the land in the RPZ, exceptions to property ownership can occur as long as the use of the land does not represent a hazard to aircraft operation. The Port has surveyed these property owners and their use.

The FAA will continue to coordinate with the POS concerning the need for acquisition versus the purchase of easements to ensure the appropriate land use control. The FAA will require the POS to provide fair and reasonable relocation payments and assistance payments pursuant to the provisions of the URA. Comparable decent, safe, and sanitary dwellings are available for occupancy on the open market. (See FEIS, pages IV.6-5 to IV.6-7).

J. <u>For any constructive use of lands with significant historic sites, there is no prudent and prudent and feasible alternative to using the land, and the project includes all possible planning to minimize harm resulting from the use.</u> [49 U.S.C. § 303(c)]

FEIS Chapter IV, Section 4, concluded that the Master Plan Update development actions would not involve either the use or constructive use of resources protected by this statutory provision, more commonly referred to as "4(f)" resources.

However the FSEIS, at Section 5-5, pages 8-19, shows that when comparing the no action and the preferred alternative using the updated airport activity forecasts, several structures (one school and three homes) which may be of local historical significance, will experience noise impacts which exceed the Federal standard (a 1.5 DNL increase within the 65 DNL contour).

As discussed at FSEIS Section 5-5, pages 13-14, the FAA questions whether most of these structures are truly of historical significance, despite their designation as such by communities surrounding the airport. The FAA also questions whether these structures will be "constructively used" under the circumstances discussed in the referenced FSEIS text, because there will be no significant degradation of the noise environment of these structures since the time when they were designated as locally significant, and thus there will likely be no significant degradation of their historic or architectural values.

Nevertheless, assuming such "local historical significance" and such a "constructive use", the referenced FSEIS text demonstrates that there is no prudent or feasible alternative to any such constructive use. Furthermore, based upon the acoustical insulation planned for these structures by the POS (discussed at FSEIS Section 6-6, pages 17-19), the FAA concludes that there has been all possible planning to minimize any harm resulting from any such constructive use.

K. <u>There are no disproportionately high and adverse human health or environmental effects from the project on minority or low-income populations.</u> [Executive Order 12898]

Environmental justice concerns were addressed in Chapter IV.6, page IV.6-6 and IV.6-7 of the FEIS, and it was concluded that no minority, age or income group would be disproportionately affected by displacements that would occur as a result of the Preferred Alternative. Individual comments regarding environmental justice were also addressed on page R-102 of FEIS Appendix R. The FSEIS contained an extensive discussion of environmental justice issues on page F-98 through F-101 in response to comments on this issue. It was concluded that the proposed noise exposure impacts from the Proposed Master Plan Update improvements will not disproportionately affect minority and low-income communities and that the impacts of the higher demand forecasts were not different than those discussed in the FEIS.

L. <u>The FAA has given this proposal the independent and objective evaluation required by the Council on Environmental Quality.</u> [40 CFR 1506.5]

As outlined in the FEIS, there was a lengthy process that led to the ultimate identification of the preferred alternative and appropriate mitigation measures. This process began through the FAA competitive selection of an independent EIS contractor which was financially-disinterested in the project outcome, and continued throughout the NEPA process. The FAA provided input, advice, and expertise throughout the planning and technical analysis, along with an administrative and legal review of the project. From its inception, the FAA has taken a strong leadership role in the environmental evaluation of this project, and has maintained its objectivity.

VI. MITIGATION

In accordance with 40 CFR 1505.3, the FAA will take appropriate steps, through Federal funding grant assurances and conditions, airport layout plan approvals, and contract plans and specifications, to ensure that the following mitigation actions are implemented during project development, and will monitor the implementation of these mitigation actions as necessary to assure that representations made in the FEIS and FSEIS with respect to mitigation are carried out. The approvals contained in this Record of Decision are specifically conditioned upon full implementation of these mitigation measures. These mitigation actions will be made the subject of a special condition included in future Federal airport grants to the POS.

FEIS Chapter V, and Appendix F to this ROD include summaries of the mitigation actions discussed more fully in FEIS Chapter IV and FSEIS Chapter 5, for each environmental impact category. Based upon these discussions, the FAA finds that all practical means to avoid or minimize environmental harm have been adopted, through appropriate mitigation planning. Mitigation measures for those impact categories where mitigation measures are necessary to avoid or minimize significant environmental impacts, as well as identified or adopted monitoring and enforcement programs, are summarized below:

A. Noise and Land Use

As discussed in FEIS Chapter IV, Sections 1 and 2, and FSEIS Chapter 5, Sections 3 and 6, future noise impacts within the study area will be less than current noise exposure due to the continued phase-out of Stage II (noisier) aircraft. However in the future the preferred alternative is expected to still result in greater significant [1.5 DNL within the 65 DNL contour] noise exposure in comparison to the future do-nothing alternative. [See FSEIS Exhibit 5-6-1 for a graphic comparison of noise exposure for no action alternative and the preferred alternative in the year 2010].

To facilitate continued noise reduction, the following noise and land use mitigation programs now in effect will continue to be implemented.

- Noise Budget – The goal of the Noise Budget of an all Stage 3 fleet is anticipated to be reached by the year 2001.
- Nighttime Limitations Program – limiting the hours of operation for Stage 2 aircraft.
- Ground Noise Control – reducing the noise of ground events such as powerback operations, run-ups, and reverse thrust on landing.
- Flight Corridorization – maintenance of north flow east turn runway heading flight track by departing jets until reaching altitudes above 4,000 feet.
- Flight Track and Noise Monitoring – maintenance of noise level records and flight track location information for identification of deviations and communication with the public and users.

The FEIS concluded that since relatively few properties were projected to experience significant impacts, and since they already fall within the boundaries of one or more of the POS's existing noise remedy programs designed to mitigate to non-significance airport noise levels, no additional project-related mitigation would be needed, as described at FEIS page IV.2-6,7.

However, the updated airport activity forecasts evaluated in the FSEIS resulted in an increase of noise exposure of approximately 7.69 square miles, and 11 percent more persons [approximately 1,280 persons, in an additional 460 dwelling units) being significantly affected by the preferred alternative in contrast to the do-nothing alternative, by the year 2010.

Furthermore, by the year 2010, a small portion of this area [with approximately 170 newly impacted residents], would be located outside of the POS existing noise remedy boundary [This is graphically shown in FSEIS exhibit 5-6-1]. The POS will be required to modify its mitigation strategy, as described at FSEIS pages 5-6-5 to 5-6-7, and in the following paragraph #4, to include these 170 newly-impacted residents within in its Noise Remedy Program.

To address changes in specific noise conditions, primarily associated with the third parallel runway, the Port will be required to undertake the following specific mitigation actions:

1. <u>Mitigating Significant Noise Impacts on Public Facilities and Historic Sites</u>: The following nine public facilities or historic sites would experience significant increased noise impacts (i.e. an increase of 1.5 DNL or more) in the year 2010 in comparison to the Do-Nothing alternative:

   - Sea-Tac Occupational Skills Center;
   - Woodside Elementary School;
   - Sunnydale Elementary;

- Albert Paul House;
- Homer Crosby House;
- Sunny Terrace Elementary School;
- Brunelle Residence;
- Coil House;
- Bryan House.

Impacts on the facilities incompatible with noise associated "With Project" will be mitigated by acoustical insulation that would allow their uses to be compatible with increased noise levels. Because of their historic value, the five residences and Sunnydale School (locally significant historic facilities) could require custom treatment to avoid significant alteration of the architectural style. In pursuing sound insulation of these structures, the Port's Noise Remedy Office will work with a historian to preserve such characteristics.

2. Provide Directional Soundproofing: Residences that were insulated prior to 1992 may need additional directional soundproofing to mitigate noise generated from a new flight path from the operation of the proposed new third runway. To mitigate noise caused by the proposed airport improvements, the Port will conduct audits and sound insulate these facilities if additional insulation is warranted.

3. Acquisition in the Approach Transitional Area: In recognition of the fact that the standard Runway Protection Zone (RPZ) dimensions do not always provide sufficient buffer to the satisfaction of nearby residents, the FAA has indicated that funding could be available to airport operators acquiring up to 1,250 feet laterally from the runway centerline, and extending 5,000 feet beyond each end of the primary surface. Based on the configuration of current airport land, local streets, and residential development patterns, the approach and transitional area selected for use as a mitigation area includes the standard Runway Protection Zone and a rectangular extension of the RPZ outward another 2,500 feet.

   Acquisition would include all residential uses, and any vacant, residentially zoned properties which cannot be compatibly zoned, within selected areas both to the north and the south of the new runway ends. Commercial land uses, which make up most of the eligible area to the south, will not be acquired. Input from the affected residents is necessary to design and initiate an acceptable relocation program. The Port will develop the appropriate implementation program for this action during the forthcoming Sea-Tac Airport FAR Part 150 Update, which the Port anticipates undertaking during 1997. The implementation plan will include coordination with eligible residents concerning their desire to participate and then establish relocation objectives, timing and funding priorities.

<u>Sound insulation of residences affected by 1.5 DNL or greater within 65 DNL noise exposure</u>: About 170 of these homes within 65 DNL would be exposed to 1.5 DNL or higher noise levels as a result of the proposed improvements and are not already subject to the Port's existing Noise Remedy Program. The Port will develop an implementation strategy to sound insulate these 170 additional homes within the 65 DNL noise contours as part of the Part 150 Noise Compatibility Plan study effort. The purpose of delegating finalization of the implementation approach for this action to determination during the Part 150 process is to ensure that consideration is given to the proposed Approach Transition Area acquisition and the relationship of that area to the existing Noise Remedy Program boundary, as well as the westerly expansion of the Noise Remedy Program to accommodate this added insulation.

In Port Resolution No. 3125 dated November 1992, the POS committed to develop and implement a plan to insulate up to 5,000 eligible single family residences in the existing noise remedy program included on the waiting list as of December 31, 1993, before commencing construction of the proposed runway. The remaining eligible single family residences on the waiting list are to be insulated prior to operation of the proposed runway. In addition, the Port has committed to complete insulation of all single-family residences that become eligible for insulation as a result of actions taken based on the site-specific EIS and are on the waiting list as of December 31, 1997, prior to commencing operations of said runway.

Pursuant to PSRC Resolution A-96-02, the POS will be required to conduct a Part 150 study with the goal of assessing needed additional noise abatement and mitigation. This study began late in 1996, and is expected to take several years.

The FAA will consider as required mitigation a standard insulation package for homes that fall both inside and outside the 65 DNL project contours, which are within the POS noise remedy program boundaries, since this was the intent of the PSRC in conditioning its regional approval of the 3rd runway upon the accomplishment of additional noise mitigation measures.

The FAA will continue to support and monitor the POS's existing and future noise programs, in order to ensure that any anticipated significant project noise and land use impacts are fully mitigated by the time the third runway becomes operational.

Finally, for significant project noise impacts which might occur after the year 2010, the FAA will also require a supplemental environmental evaluation and appropriate mitigation, as described in Section V.D. of this ROD.

B. Archaeological, Cultural and Historical Resources

FEIS Chapter IV, Section 3, finds that no known significant archaeological or cultural sites would by physically impaired as a result of the preferred alternative, and that mitigation is therefore not anticipated to be necessary. The FSEIS [Chapter 5, Section 5-6] does not alter that conclusion. ROD Section V.J. addresses the issue of mitigating any noise-based "constructive use" of these resources.

Both the FEIS and the FSEIS state that in the event artifacts are discovered during construction activities, construction in the area will be halted immediately in order to record the finding, determine its level of significance, and develop appropriate mitigation measures.

As noted in FSEIS Section 5-6, the Sunnydale Elementary School could receive significant increased noise in the future when a comparison is made between noise associated "with project" versus noise associated with the "do nothing" alternative. Because of this noise increase, the agency, through its EIS consultant team, initiated consultation with the Washington Department of Community, Trade and Economic Development, Office of Archeology and Historic Preservation (the State Historic Preservation Officer, or SHPO).

At the time that the FEIS was published in February 1996, a significant change in noise impact to this school associated with the project was not anticipated. However, since that time, through preparation and publication of the FSEIS, the data suggests that noise impacts associated with the higher forecast operations might result in a significant noise impact to this school. The following summarizes the noise impact at Sunnydale Elementary School:

	Do-Nothing	With-Project
Existing	65.8	NA
Year 2000	61.6	61.6
Year 2005	61.7	63.7
Year 2010	62.3	65.1

As is shown in the above noise exposure data, "with-project" will be less than existing or past noise exposure. During earlier years, this school was exposed to even greater noise exposure. The 1984-1985 noise contour indicates that this school was exposed to between 70-75 DNL sound levels during that period (Sea-Tac International Airport Part 150 Study Noise Compatibility Planning, dated February 1985, Exhibit 3-5).

While this site is not currently listed on the National Register of Historic Places, during consultation on the 1996 FEIS, the SHPO indicated that it could be eligible. Because of the change in impacts, a follow-up request concerning eligibility was made of the SHPO. On February 10, 1997, the SHPO stated "It is my opinion that the Sunnydale School is eligible for National Register listing. Information provided indicates that the school has played a significant role in the development of the Burien area, and retains character defining features conveying its historic function as a school". As suggested by the SHPO, a April 14, 1997, letter was forwarded to the Advisory Council on Historic Preservation (ACHP) for the purpose of determining if the ACHP wished to participate in the development of a Memorandum of Agreement to address mitigation.

Because the school is currently affected by noise above 65 DNL, and could continue to be affected in the future, the POS has proposed to sound insulate this school. Recognizing it's historic context, the FSEIS notes that "Because of their historic value, these facilities [*several homes which the SHPO has since determined not eligible for inclusion on the National Register, and Sunnydale school*] could require custom treatment to avoid significant alteration of the architectural style. In pursuing sound insulation of these structures, the Port's Noise Remedy Office will work with a historian to preserve such characteristics" [*emphasis added*]. The City of Burien Public Hearing Draft Proposed Comprehensive Plan dated April 1997 (page II-96) states "Cedarhurst and Sunnnydale elementary schools will be remodeled to increase capacity to 650 students by the year 2002". The current capacity of Sunnydale is 525 students. Thus, the sound insulation could be done as part of the scheduled remodel and can be conducted to ensure compatibility of the structure relative to its continued use as an educational facility.

On April 14, 1997, at the request of the SHPO, the FAA's EIS historic consultant sent a letter to Ms. Claudia Nissley of the ACHP Western Office of Project Review summarizing this situation and stating: "In response to a request from the SHPO, we are asking if the Advisory Council would like to be involved in the MOA...If I do not hear from you within (30) days after your receipt of this letter, I will assume that you do not wish to participate in the MOA". This letter was addressed to the ACHP Western Office address of record and was not returned to the sender. However, as a courtesy, the consultant contacted the ACHP Western Office in June 1977 to follow up on the letter. As part of this contact, the ACHP verbally indicated that it had not received the letter, but that it would refer the issue to the Washington DC office of ACHP. No response has been received from either the ACHP Western Office or the ACHP Washington DC office as of the date of approval of this ROD.

For the reasons discussed in FEIS section 5-6, the FAA questions whether the consultation procedures under the National Historic Preservation Act apply to the Sunnydale School. Nevertheless, the FAA has attempted to consult with the appropriate agencies. As is noted in the Final Supplemental EIS, relative to the National Historic Preservation Act, this school is the only property arguably affected. The FAA is approving the Master Plan Update project at this time having considered the following:

- The noise impacts that would be experienced at this school would be less than the current noise exposure;
- The noise exposure has not altered the use of this site as a school and is not related to its historic significance;
- Appropriate mitigation has been proposed and will be required by the FAA to address any significant aircraft noise exposure impacts;
- In light of the failure of the ACHP to respond to correspondence concerning this project, the FAA and the POS have initiated additional consultation with the SHPO concerning the development of a Memorandum of Agreement to address sound insulation mitigation.

Consultations have occurred with the SHPO and have been attempted with the ACHP as part of the FAA's comprehensive efforts to involve all appropriate commenters and as a courtesy, the FAA and the POS will continue to work with the appropriate agencies. In reaching its conclusions relative to the National Historic Preservation Act, the FAA's findings are supported by the FSEIS and ROD evaluation performed relative to DOT Section 4(f).

C. Social and Induced Socio-Economic Impacts

As detailed in FEIS Chapter IV, Section 6, the preferred development alternatives would displace up to 391 single family, 260 condos/apartments, and 105 businesses. Of the 105 businesses identified by the FEIS, 88 are located in the Runway Protection Area. While the FAA prefers airport sponsors to have control the land in the RPZ, exceptions to property ownership can occur as long as the use of the land does not represent a hazard to aircraft operation. The Port has surveyed these property owners and their use and will continue to coordinate with the FAA concerning the need for acquisition versus the purchase of easements to ensure the appropriate land use control. Given the anticipated displacement and relocation of people, the FAA will require the POS to provide fair and reasonable relocation payments and assistance payments pursuant to applicable provisions of 42 U.S.C. § 4601 *et. seq.* and implementing regulations.

D. Air Quality

As noted in ROD section V.C., the Governor of the State of Washington has certified to the FAA after reviewing the FEIS and FSEIS that the project will be located, designed, constructed, and operated in compliance with applicable air quality standards.

In Section V.F. of this ROD air quality conformity under 42 U.S.C. § 7506(c) is discussed, and it is concluded that the project will, although not exceeding the *de* minimis thresholds for general conformity, nevertheless conforms to the Washington State Air Quality Implementation Plan and the National Ambient Air Quality Standards. With no significant air quality impacts, no air quality mitigation is necessary.

FEIS Chapter IV, section 9 and its supporting Appendix D, had included a worst-case intersection "hot spot" analysis of the preferred alternative, which predicted slight potential exceedences of air quality standards for carbon monoxide at two key intersections at the northeast side of the airport, as the year 2010 approached. The FEIS had contemplated future air monitoring and evaluation in order to determine whether specific mitigation of these exceedences would be required.

However, as explained at FSEIS page 5-2-10, project planning of the surface transportation features for those two intersections has since been modified so as to eliminate these modeled potential exceedences, thus avoiding the necessity for future mitigation of this nature. Specifically, the POS will accomplish the following:

- At the time that the North Unit Terminal is undertaken, the Port will develop additional southbound right turn and northbound left turn capability at the intersection of S. 170th Street at International Blvd., unless shown by then current conditions that these improvements are no longer necessary; and
- At the time that the North Employee Parking Lot is undertaken, the Port will develop additional intersection turning capability at the intersection of South 154th Street at 24th Avenue S.

- To ensure that construction emissions do not exceed the air conformity de-minimis levels, the Port will ensure that annual construction-related truck haul does not exceed 280,700 two-way trips by Heavy Duty Diesel Vehicles.
- To minimize construction related particulate emissions, the Port will implement construction Best Management Practices (BMPs) as noted in Table 5-4-8 in the Final Supplemental EIS.

E. Water Quality

As noted in ROD section V.C., the Governor of the State of Washington has certified to the FAA after reviewing the FEIS and FSEIS that the project will be located, designed, constructed, and operated in compliance with applicable water quality standards. Furthermore, the approvals in this ROD are expressly conditioned upon the POS accomplishing the water quality mitigation measures identified in the FEIS and FSEIS.

With implementation of the preferred alternative developments, there would be widespread surface area disturbance throughout the study area, which has the potential to significantly affect area hydrology. Absent mitigation, the extensive earthmoving required during project construction has the potential to significantly impact the flow rates and water quality of soil infiltration, surface runoff, and stream flow.

FEIS pages IV.10-16 through IV.10-20 provide an extensive set of mitigation measures designed to avoid or minimize these hydrological impacts. These include a set of stormwater management measures based upon Department of Ecology standards, BMPs (best management practices) required by applicable Federal, state and local laws, policies and design standards, as well as other requirements set forth in existing and additional NPDES permits to be required of the POS.

Specifically, the POS will be required to implement the following water quality and hydrology mitigation:

a. Construction Erosion and Sedimentation Control Plan. Prepare a construction erosion and sedimentation control plan for the construction of the new runway. The plan shall require use of Best Management Practices (BMPs) including but not limited to the following:

    - Erosion control measures such as use of mulching, silt fencing, sediment basins, and check dams that are properly applied, installed, and maintained pursuant to agreements with contractors.

- Spill containment areas to capture and contain spills at construction sites and prevent their entry into surface or ground waters. Install proper temporary fuel storage areas and maintenance areas to reduce the potential for spills and contamination.

- Phasing of construction activities to minimize the amount of area that is disturbed and exposed at any one time.

- Where feasible, use of temporary and permanent terraces for fillslopes and cutslopes to reduce sheet and rill erosion and reduce transport of eroded materials from the construction site.

- Install gravel and wheel wash facilities on construction equipment access roads and encourage covering of loads to minimize sediment transport onto nearby roads.

b. Stormwater Management Plan. Prepare a stormwater management plan for the new runway that includes the following:

- Detention criteria should be based upon Department of Ecology standards limiting 2-year peak flow rates from the developed portions of the site to 50% of the existing 2-year rate, limiting the developed 10-year rate to the existing 10-year rate, and limiting the developed 100-year flow rate to the existing 100-year rate.

- Design stormwater facility outlets to reduce channel scouring, sedimentation and erosion, and improve water quality. Where possible, flow dispersion and outlets compatible with stream mitigation will be incorporated into engineering designs.

- Maintain existing and proposed new stormwater facilities. Stormwater management facilities will be maintained according to procedures specified in the operations manuals of the facilities.

C. NPDES Permit Requirements. Comply with the requirements of the National Pollution Discharge Elimination System permit for the airport dated June 30, 1994, as may be revised from time to time.

FSEIS pages 5-7-4 through 5-7-6 discuss additional mitigation measures relating to groundwater concerns of the Seattle Water Department. Additional related mitigation measures are set forth in a June 20, 1997, agreement between the POS and The City of Seattle Public Utilities Department, pertaining to the proposed North Employee Parking Lot at SEATAC. That agreement is incorporated by reference in this ROD.

F. Wetlands

FEIS Chapter IV, Section 11, documents that the preferred development alternative (North Terminal with 8500 foot runway) will directly affect approximately 10.37 acres of wetlands. FSEIS Section 5-5 modifies this figure to approximately 12.23 acres of wetlands. As noted in FEIS Chapter IV, Section 11, FEIS Appendix P, and FSEIS Chapter 5, section 5-5, the U.S. Army Corps of Engineers (COE) has worked with the FAA and the POS as a cooperating agency to develop a wetland compensatory mitigation site. The mitigation plan calls for replacing the filled wetlands on a 47 acre mitigation site located on a 69 acre parcel of land along the Green River in Auburn Washington. As explained in this ROD at Section V.G., this off-site, out-of-watershed mitigation is consistent with FAA policy, and will be required as a condition of FAA grant assurances associated with Federal funding of the Master Plan Update development projects.

In December 1996, the Port submitted an application to the Army Corps of Engineers for a permit to fill wetlands at Sea-Tac Airport associated with the Master Plan Update improvements in compliance with the Clean Water Act, Section 404. The 404 permit application submitted to the Corps of Engineers includes a completed Joint Aquatic Resources Project Application (JARPA) form, in a report entitled "JARPA Application for Proposed Improvements at Seattle-Tacoma International Airport" dated December 1996. Upon issuance of this ROD, the COE, in consultation with the Washington State Department of Ecology, will complete its processing of a COE Section 404 permit, required for the POS to proceed with development impacting wetlands.

G. Floodplains

Chapter IV Section 12 of the FEIS explains that, without mitigation, construction and operation of the Master Plan Update preferred alternative could result in significant adverse floodplain impacts in both the Miller and Des Moines Creek basins. As shown in FEIS Appendix P, a mitigation program has been designed which will create an equivalent amount of floodplain so that there would be no net loss of flood storage capacity or increased risk of loss of human life or property damage. This program has been designed to comply with applicable requirements of the permitting agencies, with whom the FAA and the POS have been coordinating in order to ensure that the construction design minimizes potential harm to or within the floodplain. Each of these agencies have agreed with the mitigation plan in concept and the coordination will continue throughout the permitting process. The FSEIS does not alter the conclusions or mitigation approach discussed in the FEIS.

H. Surface Transportation

FEIS Chapter IV, Section 15, presented the results of both an initial analysis and a refined analysis of level of service volumes for the preferred alternative, at relevant intersections and freeway ramp junctions in the airport vicinity. The initial analysis indicated a slight and nonsignificant degradation of level of service at only one intersection, not requiring any mitigation.

The FEIS refined analysis of the preferred alternative included two scenarios, one assuming the construction of a SR 509 extension, and one assuming no such extension. This refined analysis showed adverse impacts (defined as a significant degradation in level of service when compared with the do-nothing alternative) at a number of intersections and at one freeway ramp junction, with and without SR 509, requiring a variety of intersection and ramp junction improvements as mitigation.

However, the revised surface transportation analyses presented in the FSEIS reflected changes in the design and timing of the surface transportation components of the Master Plan Update development actions. The FSEIS analysis concluded that no significant adverse changes in Levels of Service would result from the preferred alternative for any of the evaluated intersections and freeway ramp junctions in the airport vicinity during the project planning period. Accordingly, no surface transportation project-related mitigation is required.

I. Plants and Animals

FEIS Chapter IV Section 16 discusses the impacts of the preferred alternative upon vegetation and wildlife communities. Absent mitigation, the greatest project-related impacts to these resources would result from the degradation of area hydrology, water quality, aquatic habitat and biota of Miller and Des Moines Creeks, due to the realignment and relocation of portions of these waterways.

FEIS pages IV.16-11 through IV.16-15 and FEIS Appendix P discuss these anticipated impacts and planned measures to mitigate these biological impacts. These mitigation measures include a wetlands replacement plan, creek relocation and habitat improvement plans, a stormwater pollution prevention plan, and a spill prevention control and countermeasures plan. These plans are subject to approval of a number of other Federal, state and local agencies, as conditions to issuance of required permits.

The FSEIS presents no additional information which would alter the FEIS conclusions with regard to this mitigation.

J. Services/Utilities

FEIS Chapter IV Section 18 discusses the impacts of the preferred alternative upon public services and utilities serving the immediate airport vicinity. The greatest project-related impacts to these resources would result from relocation or abandonment of fresh water, sanitary sewer, electrical power and telephone pipes and lines which transverse the project area. FEIS page IV.18-7 discusses the required mitigation, which includes POS assuming the cost of these relocations and abandonments. The FSEIS presents no additional information which would alter the FEIS conclusions with regard to this mitigation.

K. Earth

FEIS Chapter IV Section 19 discusses the impacts of the preferred alternative upon the geology, soils and hazard areas in the immediate airport vicinity. The greatest project-related impacts to these resources would result from the extensive clearing, grading, excavation, and fill placement required throughout the project area. FEIS page IV.18-7 discusses mitigation measures, which include the design and implementation of an erosion and sedimentation control plan subject to approval by state and local authorities, and a landscaping plan. The FSEIS presents no additional information which would alter the FEIS conclusions with regard to this mitigation. Specifically, the POS will implement the following earth-related mitigation:

- The FEIS identifies two seismic hazard areas on the site of the new runway, referred to as "relatively small areas of loose shallow sediment". The Port will remove the sediment and replace it with compacted fill, or other appropriate engineering approach to stabilizing these areas, should be included in the final engineering plans.

- Prepare a landscaping plan for the new runway area, including plans for seeding and planting of vegetation to stabilize areas of fill that will not be covered by impervious surface.

L. Hazardous Substances

FEIS Chapter IV Section 21 discusses the impacts of the preferred alternative associated with hazardous substances. Concerns in this area include the exposure of contaminated soils during excavation activities, release of hazardous substances during underground storage tank removal and building demolition activities associated with facility relocations, and spills of construction-related hazardous materials. FEIS pages IV.21-8,9 discuss mitigation measures, which include the development of a spill pollution, control and countermeasures plan for the transport, storage and handling of hazardous materials, and a hazardous substances management and contingency plan for the removal, storage, transportation and disposal of hazardous wastes. The FSEIS presents no additional information which would alter the FEIS conclusions with regard to this mitigation.

M. Construction

FEIS Chapter IV Section 23 and FEIS Appendix J, discussed the temporary impacts to the environment associated with the construction activities necessary to implement the preferred alternative. These temporary impacts included air, water and noise pollution, social and socio-economic impacts, and the disruption of surface transportation patterns. Since detailed design and construction plans for the proposed projects had not yet been prepared, it was not then possible to identify the specific types of construction equipment or the frequency of its usage. Accordingly, the FEIS discussed a range of construction-related impacts, using worst-case assessments which assume a range of excavation sources and means of transporting fill material.

Under the FEIS worst-case analysis, absent mitigation, the most significant construction-related impacts would be a temporary degradation of the level of service levels on freeways, highways, arterials, and permitted local streets used for truck hauling of fill material through congested areas during peak travel times.

The FEIS construction impacts section discussed mitigation measures, including the development of a construction and earthwork management plan, which will specify hours of operation, haul routes, and similar controls, and would discourage haul activities along extremely congested routes and during extreme roadway congestion periods. This plan would also provide for signalization and other improvements to several intersections in the vicinity of the airport which may be impacted by construction hauling activity.

Additional construction-related mitigation measures include property acquisition to minimize potential social and neighborhood disruption, fill spillage prevention and removing procedures, fugitive dust prevention, and an erosion and sediment control plan.

FSEIS Chapter 5, section 5-4, presents additional information developed since publication of the FEIS, including changes to construction phasing, a lengthening of the runway haul duration, the identification of additional haul routes, and the identification of two temporary interchanges on SR 518 and SR 509. This additional information permitted a refined analysis of possible construction impacts in the FSEIS, and the identification of additional mitigation measures presented at FSEIS Table 5-4-8.

Based on the selected fill hauling plan, the FAA will require the POS to include essential provisions of its construction and earthwork management plan in construction earthwork bid documents as contractual requirements.

VII. DECISION AND ORDER

Although the "No Action" alternatives have fewer developmental impacts than the preferred alternative, they fail to achieve the purposes and needs for these projects. For the reasons summarized earlier in this ROD, and supported by detailed discussion in the FEIS and FSEIS, the FAA has determined that the preferred alternatives are the only possible and prudent alternatives as well as the most practicable.

Having made this determination, the two remaining decision choices available for the FAA are to approve the agency actions necessary for the projects' implementation, or to not approve them. Approval would signify that applicable Federal requirements relating to airport development planning have been met, and would permit the Port of Seattle to proceed with the proposed development and receive Federal funds for eligible items of development. Not approving these agency actions would prevent the Port of Seattle from proceeding with Federally supported development in a timely manner.

I have carefully considered the FAA's goals and objectives in relation to various aeronautical aspects of the proposed master Plan Update development actions discussed in the FEIS, including the purposes and needs to be served by the projects, the alternative means of achieving them, the environmental impacts of these alternatives, the mitigation necessary to preserve and enhance the environment, and the costs and benefits of achieving these purposes and needs in terms of effective and fiscally responsible expenditure of Federal funds.

Based upon the administrative record of this project, I make the certification prescribed by 49 U.S.C. § 44502 (b), that implementation of the preferred alternatives approved in this ROD are reasonably necessary for use in air commerce.

Therefore, under the authority delegated to me by the Administrator of the FAA, I find that the projects summarized in this ROD at Appendix B are reasonably supported, and for those projects I therefore direct that action be taken to carry out the agency actions discussed more fully in Section II of this Record, including:

A. Approval under existing or future FAA criteria of project eligibility for Federal grant-in-aid funds and/or Passenger Facility Charges, including the following elements:

1. Land Acquisition
2. Site Preparation
3. Runway, Taxiway, and Runway Safety Area Construction
4. Terminal and Other Landside Development
5. Certain POS-Installed Navigational Aids
6. Environmental Mitigation

B. Approval of a revised airport layout plan (ALP), based on determinations through the aeronautical study process regarding obstructions to navigable airspace, and that the agency does not object to the airport development proposal from an airspace perspective.

C. Approval for relocation/upgrade of the existing Airport Traffic Control Tower (ATCT), radars, and various navigational aids. I specifically reaffirm, in the context of the policy considerations set forth in this ROD, my April 4, 1997, approval of the SEA-TAC ATCT Siting Study. As demonstrated by that study, a replacement ATCT at SEA-TAC is required immediately, whether or not the other Master Plan Update development actions are approved.

D. The development of air traffic control and airspace management procedures to effect the safe and efficient movement of air traffic to and from the proposed new runway, including the development of a system for the routing of arriving and departing traffic and the design, establishment, and publication of standardized flight operating procedures, including instrument approach procedures and standard instrument departure procedures.

Lawrence B. Andriesen
Regional Administrator,
Northwest Mountain Region

7-3-97
Date

RIGHT OF APPEAL

This decision constitutes the Federal approval for the actions identified above and any subsequent actions approving a grant of Federal Funds to the Port of Seattle. Today's action is taken pursuant to 49 U.S.C. Subtitle VII, Parts A and B, and constitutes a Final Order of the Administrator, subject to review by the courts of appeals of the United States in accordance with the provisions of 49 U.S.C. § 46110.

E

(Cite as: 165 F.3d 35, 1998 WL 833628 (9th Cir.))

NOTICE: THIS IS AN UNPUBLISHED OPINION.

(The Court's decision is referenced in a "Table of Decisions Without Reported Opinions" appearing in the Federal Reporter. Use FI CTA9 Rule 36-3 for rules regarding the citation of unpublished opinions.)

United States Court of Appeals,
Ninth Circuit.

CITY OF NORMANDY PARK; City of Des Moines; City of Burien; City of Federal Way; City of Tukwila; Highline School District, No. 401, individually and collectively as the Airport Communities Coalition; Petitioners,
v.
PORT OF SEATTLE, a Washington municipal corporation, Intervenor-Respondent,
v.
FEDERAL AVIATION ADMINISTRATION; U.S. Department of Transportation, Respondents.

No. 97-70953.
Argued and Submitted Nov. 6, 1998.
Decided Nov. 24, 1998.

Petition to Review a Decision of the United States Department of Transportation Federal Aviation Administration.

Before CANBY and HAWKINS, Circuit Judges, and SILVER, [FN**] District Judge.

FN** Honorable Roslyn O. Silver, United States District Judge for the District of Arizona, sitting by designation.

MEMORANDUM [FN*]

FN* This disposition is not appropriate for publication and may not be cited to or by the courts of this circuit except as provided by Ninth Circuit Rule 36.3.

**1 Petitioners ("the Cities") appeal the Federal Aviation Administration's decision granting final approval of the Master Plan development project adopted by the Port of Seattle for the expansion of the Seattle-Tacoma International Airport ("Sea-Tac"). We affirm.

The Cities argue that the Administrator's decision improperly relied on a "no growth" demand model and a limited prediction forecast thereby failing to accurately assess the project's environmental impacts and necessary mitigation measures. Under the Airport and Airway Improvement Act ("AAIA"), 49 U.S 47106(c)(1)(C), an Administrator may approve an airport development project that is found to have significant environmental effects "only after finding that ... every reasonable step has been taken to minimize the adverse effects." Here, the Administrator's lengthy decision indicates a careful review of the project's potential environmental impacts, a host of mitigation measures and the entire administrative record. Moreover, it was within the agency s discretion to select a testing method for determining airport deman *S Seattle Comm. Council Federation v. Federal Aviation Admi* 961 F.2d 829, 833-34 (9th Cir.1991). Because intervening circumstances called into question the 2020 model's accuracy, the Administrator was also entitled to rely on a prediction forecast to the year 201 *See City of Los Angeles v. Federal Aviation Adn* 138 F.3d 806, 808 (9th Cir.1998).

Next, the Cities argue that the Administrator's decision violates the AAI 47106(a)(1), which requires that "the project is consistent with plans ... of public agencies authorized by the State in which the airport is located to plan for the development of the area surrounding the airport." The Cities' argument is unavailing because the Administrator was allowed to rely on the approval of the Puget Sound Regional Council, the designated Metropolitan Planning Organization responsible for transportation planning in the region, to satisfy the consistency requiremen *Se Suburban O'Hare Comm'n v. Dole,* 787 F.2d 186, 199 (7th Cir.1986) . Moreover, the administrative record indicates that every effort was made to ensure consistency with planning efforts of local communities.

Finally, the Cities contend that the Sea-Tac project violates the Clean Air Act, 42 U.S. § 7506(c), that prohibits federal agencies from supporting "any activity which does not conform to [the State's] implementation plan." This contention also fails because the FAA conducted extensive environmental analyses, including a conformity analysis, and ultimately found that the air emissions levels would be "de minimis." 40 §F.R. 93.153(c)(1). Moreover, the United States Environmental Protection Agency, the State of Washington Department of Ecology, and the Puget Sound Air Pollution Control Agency all agree with the FSEIS conclusion.

The FAA Administrator's decision was supported by substantial evidence.

**2 AFFIRMED.

END OF DOCUMENT

F

RESOLUTION NO. 3211

A RESOLUTION of the Port Commission of the Port of Seattle, King County, Washington, repealing sections 15.4 and 21 and subections 21.1, 21.2, 21.3, 21.4 and 21.5 of Port Resolution 3028, State Environmental Policy Act (SEPA) procedures under ch. 43.21C RCW, and adopting new Port SEPA appeal procedures.

WHEREAS, the State Environmental Policy Act (SEPA), ch. 43.21C Revised Code of Washington (RCW), and implementing rules in chapter 197-11 Washington Administrative Code (WAC) require the Port to enact a resolution integrating SEPA into the Port's procedures, and

WHEREAS, on December 17, 1987, the Port adopted Resolution 3028 in accordance with chapter 43.21C RCW and chapter 197-11 WAC, containing sections 15.4 and 21 and subections 21.1, 21.2, 21.3, 21.4 and 21.5 providing for optional SEPA reconsideration procedures, and

WHEREAS, it is necessary to amend Resolution 3028 to repeal the reconsideration procedures in sections 15.4 and 21 and subections 21.1, 21.2, 21.3, 21.4 and 21.5 and to establish a new SEPA administrative appeal process to provide the public and interested parties with a consistent, predictable and timely administrative review process for certain determinations it makes under SEPA, consistent with the intent of regulatory reform legislation enacted by the State Legislature in 1995 (ch. 347, Laws of 1995), and

WHEREAS, under WAC 197-11-800 (20), the adoption of SEPA procedures by local governments are categorically exempt from SEPA review, and

WHEREAS, the Port has provided public notice regarding this resolution and an opportunity for public comment on the resolution,

NOW THEREFORE BE IT RESOLVED, by the Port Commission of the Port of Seattle, Washington, as follows:

Section 1. Appeals. Port SEPA decisions may be appealed as provided in this section.

Section 1.1 SEPA Decisions Subject to Appeal. The following SEPA decisions of a Port responsible official are appealable under this section: (a) adequacy of an environmental impact statement (EIS), and (b) issuance of a mitigated determination of nonsignificance (MDNS). Other Port SEPA decisions and documents are not subject to administrative appeal.

Section 1.2 Who May Appeal. A party wishing to file an administrative appeal of a Port SEPA determination under this section (Petitioner) must demonstrate that his or her interests are arguably within the zone of interests protected by SEPA and that the SEPA determination under appeal will cause the Petitioner injury-in-fact.

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Section 1.3 Timing of Appeals.

1. Appeals may not be filed before the Port's final decision on the underlying proposal for which the EIS or MDNS was prepared.

2. Appeals must be filed by 5 p.m. of the 15th calendar day following the date the Port has made a final decision on the underlying proposal for which the EIS or MDNS was prepared. When the last day of the appeal period is a Saturday, Sunday, or a national, state, or Port holiday, the appeal period runs until 5 p.m. on the next business day.

Section 1.4 Notice of Decisions on Underlying Proposals. The Port shall provide public notice of a final decision on an underlying proposal for which an EIS or MDNS was prepared, in accordance with this subsection. Failure to provide such notice does not waive the appeal deadline or otherwise affect the timing within which the appeal must be filed, if the Port has substantially complied with such notice requirements. The Port must:

1. Publish notice in a newspaper of general circulation in the county, city, or general area where the proposal is located (if there is more than one newspaper, the responsible official may select one newspaper for publication);

2. Furnish notice to anyone or any group who has specifically requested in writing to be notified about the particular proposal.

3. At its discretion, use any of the optional notice methods set forth in Section 15.2 of Port Resolution No. 3028.

Section 1.5 Filing Appeals. Appeals must:

1. Be in writing;

2. Contain a statement that sets forth:

   a. the basis for the Petitioner's standing, including:

      i. how the Petitioner's interests are arguably within the zone of interests protected by SEPA; and

      ii. how the SEPA decision being appealed will cause the Petitioner injury-in-fact. If the alleged injury-in-fact has not already occurred, Petitioner must set forth facts establishing the immediate, concrete, and specific future injury-in-fact that will occur to that Petitioner as a result of the SEPA determination under appeal;

   b. the specific alleged errors in the SEPA decision appealed;

   c. the relief requested; and

   d. the signature, address, and phone number of the Petitioner and the name and address of Petitioner's designated representative, if any;

3. be accompanied by an appeal fee of $300;

4. list as respondents all necessary parties set forth herein. In any administrative appeal brought under this section, the following are necessary parties to any appeal under this section and must be served by Petitioner within 7 days after the filing of an appeal with a copy of the appeal document: the applicant of the underlying action that is the subject of SEPA review and the Port's responsible official. Intervention during the course of an administrative appeal under this section shall not be permitted; and

5. be mailed or delivered to the General Counsel, Port of Seattle, Pier 69, P.O. Box 1209, Seattle, WA 98111.

Failure to comply with the procedural requirements of this section is grounds for dismissal of an appeal.

Section 1.6 Hearing Notice. Notice of the appeal hearing must be mailed to parties of record at least 15 days before the scheduled hearing date.

Section 1.7 Hearing Examiner. The Port Commission will appoint an individual familiar with SEPA and hearing procedures as Hearing Examiner (Examiner) for the Port. The Examiner will hear and decide SEPA appeals in accordance with this Section 1.

Section 1.8 Appeal Procedures.

1. Rules and procedures. The Examiner shall follow the procedures set forth in this Section 1, including Attachment A to this resolution, unless the Examiner and parties agree to modify them in any particular case. Attachment A to this resolution contains the basic procedural framework that shall govern any appeals brought under this section. Port staff will prepare a more detailed set of rules and procedures, consistent with the basic procedures set forth herein and in Attachment A.

2. Consolidation of appeals. All procedural SEPA appeal challenges will be heard by the Examiner in one single simultaneous appeal hearing.

3. Burden of proof. The burden of proof is on the Petitioner to show that the Port responsible official's decision does not comply with SEPA.

4. Standard of review. The determination of the Port responsible official shall be accorded substantial weight by the Examiner in accordance with RCW 43.21C.075(3)(d). An MDNS shall be overturned only if found to be clearly erroneous. An EIS shall be overturned only if found to not be adequate under the rule of reason.

5. Scope of review. Review by the Examiner is limited to the validity of the challenged MDNS (i.e., whether an EIS is required) or the adequacy of the challenged EIS. The issues shall also be limited to those set forth in the Petitioner's notice of appeal.

6. Examiner's decision. The appeal decision shall be issued within 30 days of the conclusion of the hearing and closing argument. The appeal decision shall be in writing and shall contain findings and conclusions that support the decision. The Examiner may affirm, reverse, remand, or modify the responsible official's decision.

7. Notice of decision. Copies of the Examiner's decision shall be mailed to parties of record and those requesting notice.

Section 1.9 Exhaustion of Administrative Appeal Procedures. A party seeking judicial review of a Port SEPA decision subject to appeal under this Section 1 must, before seeking any judicial review, exhaust the appeal procedure of this Section 1.

Section 1.10 Judicial Review.

1. Decisions of the Examiner under this Section 21 may be appealed to the King County Superior Court by application for writ of review by an appellant within 21 days of the date the decision is issued.

2. Port SEPA decisions not subject to administrative appeal under this Section 1 may be appealed to the King County Superior Court by application for writ of review by an appellant within 21 days of the date the decision is issued.

Section 1.11 Transition to SEPA Appeal Procedures. Port SEPA decisions issued by the responsible official after the effective date of this resolution shall be subject to the SEPA appeal provisions of this resolution and any hearing rules of practice and procedure adopted by the Port.

Section 1.12 Authority of Executive Director to Adopt Hearing Examiner Rules of Practice & Procedure. The Executive Director shall have the authority to adopt rules of practice and procedure for the Hearing Examiner to utilize in implementing this Resolution and may delegate this authority to appropriate Port staff.. Adoption or amendment to these rules of practice and procedure by Port staff does not require legislative action by the Commission

Section 2. Severability. If any provision of this resolution is held invalid, the remainder of this resolution remains in effect.

Section 3. Adoption. This resolution is adopted by the Port Commission of the Port of Seattle this 8th day of February, 1996, and duly authenticated in open session by the signatures of the Commissioners voting in favor thereof and the seal of the Commission duly affixed.

JACK BLOCK

PAIGE MILLER

GARY GRANT

PAUL SCHELL

PATRICIA DAVIS

Port Commission

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ATTACHMENT A TO PORT RESOLUTION NO. 3211

BASIC PROCEDURAL FRAMEWORK GOVERNING SEPA ADMINISTRATIVE APPEAL RULES AND PROCEDURES.

1. Prehearing Conference. Once an appeal has been filed, the Examiner shall schedule a Prehearing Conference within 21 days. Each party shall bring to the Prehearing Conference a written list preliminarily designating witnesses (both expert and lay) and exhibits they intend to use in the appeal. For each witness identified, a short written summary of the witness' testimony and, in the case of expert witnesses, opinions, shall be provided. At the Prehearing Conference, the Examiner shall include discussion of the following, in addition to other items he or she deems appropriate:

a. Review of the Petitioner's legal issues to, if possible, simplify them for the hearing; and

b. Procedures for the appeal, hearing date, and schedules for prehearing submissions.

2. Administrative Record. Within one week after the Prehearing Conference, the Port shall issue the index to the administrative record of the SEPA determination under appeal. The Petitioner may file proposed supplementation of the record within seven days after the Port's index has been filed. The Examiner shall expeditiously rule on any objections relevant to the record.

3. Final Witness and Exhibit Lists.

3.1 Within five weeks after the Prehearing Conference, the Petitioner shall file its final witness and exhibit list. The witness list must include a summary of each witness' testimony.

3.2 Within seven weeks after the Prehearing Conference, the Respondent shall file its final witness and exhibit list. The witness list must include a summary of each witness' testimony.

4. Hearing Memorandum/Expert Testimony.

4.1 Within eight weeks after the Prehearing Conference, the Petitioner shall file its hearing memorandum. The Petitioner shall also file at the same time any direct expert testimony in writing, along with copies of any exhibits introduced through or relied upon by the expert witnesses.

4.2 Within 10 weeks after the Prehearing Conference, the Respondent shall file its hearing memorandum. The Respondent shall also file at the same time any direct expert testimony in writing, along with copies of any exhibits introduced through or relied upon by the expert witnesses.

5. Production of Exhibits. Ten weeks after the Prehearing Conference, the parties shall file with the Examiner and exchange a complete set of the exhibits they intend to use at the hearing. Absent a showing of good cause, no further exhibits shall be permitted at the hearing.

6. Prehearing Evidentiary Motion. These motions must be filed seven business days before the hearing date. Reply memoranda to any motions may be submitted, but they must be filed four business days before the hearing date. The Examiner will issue a decision on any prehearing evidentiary motions one day before the hearing date.

7. Appeal Hearing. The appeal hearing shall be conducted 12 weeks after the Prehearing Conference. The hearing shall consist of the following:

7.1 Opening Statements.

7.2 Petitioner's Case. The Petitioner's case at the hearing shall be limited to the presentation of lay testimony, the Respondent's cross-examination of any expert testimony offered in writing by the Petitioner before the hearing, and the Petitioner's redirect of any such expert witness.

7.3 Respondent's Case. The Respondent's case at the hearing shall be limited to lay testimony, the Petitioner's cross-examination of any expert testimony offered in writing by the Respondent before the hearing, and the Respondent's redirect of any such expert witness.

8. Closing Argument. The Examiner shall determine whether closing argument will be delivered orally or in writing. The parties will have the option of submitting proposed findings and conclusions along with their closing argument.

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BEFORE THE HEARING EXAMINER
OF THE PORT OF SEATTLE

CITY OF DES MOINES, et al., **Petitioners** **vs.** **THE PORT OF SEATTLE, et al.,** **Respondents**	)))))))	**NO. HE 96-04** **FINDINGS, CONCLUSIONS, AND DECISION**

PROCEDURAL BACKGROUND

This appeal challenges the adequacy of the environmental evaluation done by the Port of Seattle ("Port") pursuant to the State Environmental Policy Act ("SEPA") for the expansion of Seattle-Tacoma International Airport ("STIA"). The Port issued a Final Environmental Impact Statement ("FEIS") for its Airport Master Plan Update in February of 1996. Four appeals were filed of that FEIS. Appeals one and two were filed by Christopher P. Clifford and Ray Akers. The City of SeaTac filed appeal number three, and appeal number four was filed by the Airport Communities Coalition ("ACC"), which is made up of the City of Des Moines, the City of Burien, the City of Federal Way, the City of Normandy Park, the City of Tukwila, and Highline School District #401.

A pre-hearing conference was held on September 6, 1996 at STIA pursuant to the rules set forth in Port Resolution #3211, which are the rules governing administrative appeals of environmental determinations by the Port. On September 10, 1996, the Deputy Hearing Examiner for the Port issued a pre-hearing order which set a schedule for the submission of documents, including exhibits, witness lists, and witness testimony. The order stated that the Examiner would commence hearing testimony on January 27,1997. Subsequent to the issuance of that order, the Deputy Hearing Examiner recused herself from hearing this matter.

At just about this same time, the Port and the Federal Aviation Administration ("FAA") determined that additional environmental analysis was necessary based upon new forecasts for the nation's airports conducted by FAA. The Port issued a Draft Supplemental EIS ("DSEIS") in February of 1997 based upon the new information as well as agency and public comments. A Final Supplemental EIS ("FSEIS") was published by the Port on May 13, 1997. The appeals of the same four parties were reinstated.

While the supplemental environmental analysis was being conducted by the Port and the FAA, this Examiner was retained to hear this matter. A pre-hearing conference was conducted by telephone conference call on July 2, 1997. Pursuant to the rules, a new pre-hearing schedule was established by order dated July 8, 1997, with deadlines for the submission of documents, including exhibits, witness lists, and witness testimony. A hearing was to be commenced on December 1, 1997.

On July 10, 1997 the Port filed a Motion to Dismiss Petitioners Christopher Clifford and Ray Akers for failure to perfect their appeals. Both Petitioners responded and by Memorandum Decision and Order dated August 14, 1997, the Hearing Examiner dismissed the appeals of Petitioners Clifford and Akers.

On September 22, 1997, the Port submitted a Stipulation and Proposed Order dismissing the City of SeaTac's appeal. The Stipulation was based on the fact that the City of SeaTac and the Port had reached a settlement agreement which included dismissal of the City's appeal. An Order dismissing the City of SeaTac's appeal was signed by the Examiner on September 25, 1997. That left the ACC as the sole remaining petitioner in this action. Both the Port and the ACC adhered to the pre-hearing schedule except as modified by stipulation, and the hearing on this matter commenced December 1, 1997 in Seattle at the King County Courthouse. During a recess on the first day, the Examiner conducted a site visit by driving around the perimeter of STIA.

Three primary issues were raised by the Petitioners. The first is whether the EIS/SEIS are inadequate because they are based on the assumption that: (1) The proposed additional runway at STIA would have no effect on the growth in passengers or aircraft operations at the airport, and (2) That the same number of passengers would use STIA regardless of whether the project is built or not. The second issue is whether the EIS/SEIS are inadequate because they did not adequately evaluate the impacts of the STIA expansion after the year 2010. And the third issue is whether the EIS/SEIS are inadequate because they failed to properly analyze reduced impacts alternatives as required by SEPA.

The Hearing lasted for five days from December 1, 1997 to December 5, 1997. On December 18, 1997, the Petitioners filed a Closing Argument and Brief in support of its position, along with Proposed Findings, Conclusions, and Exhibits. On December 24, 1997, the Port similarly filed its Closing Argument and Brief in support of its position, along with Exhibits and Proposed Findings and Conclusions.

After reviewing the Exhibits submitted before and after the hearing, reviewing expert testimony submitted before the hearing, and considering the testimony at the hearing, the Hearing Examiner hereby makes the following Findings of Fact and Conclusions of Law:

I. FINDINGS OF FACT

A. General Findings of Fact.

1. In 1993, the Port initiated an Airport Master Plan Update, which identified and studied alternate means of meeting the following needs at STIA: (1) improve the poor weather airfield operating capacity to an acceptable level of delay, (2) provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads, (3) provide Runway Safety Areas that meet current FAA standards, and (4) provide efficient and flexible landside facilities to accommodate future aviation demand.

2. Also in 1993, pursuant to the National Environmental Policy Act (NEPA) and the State Environmental Policy Act (SEPA), the FAA and the Port initiated preparation of a joint EIS

thoroughly analyzing the alternatives to, environmental impacts of, and possible mitigating measures for the improvements identified in the Master Plan Update.

3. In 1995, the FAA and the Port issued the Master Plan DEIS conducted two public hearings, accepted and responded to written and oral comments, conducted additional studies and prepared project revisions in response to public comments. On February 9, 1996, the Port issued the Master Plan FEIS, which included all comments on the DEIS and the Port/FAA responses to each comment.

4. On August 1, 1996, the Port Commission adopted Resolution No. 3212, which attached and adopted the Airport Master Plan Update for STIA, and granted approval to develop the third runway at STIA.

5. Subsequent to the publication of the FEIS, the FAA Office of Aviation Policy and Plans in Washington, D.C., issued its fiscal year 1996 Terminal Area Forecast ("TAF") for the nation's airports, including STIA. The fiscal year 1996 FAA TAF predicted levels of aircraft operations and passenger enplanements at STIA that exceeded the numbers of operations and enplanements in the Master Plan Update FEIS, which had relied on the 1994 Master Plan Update aviation demand forecasts.

6. When the FAA's 1996 TAF was released, a review of forecast aviation conditions at STIA was initiated to identify why the forecast was higher and how it would affect the Master Plan Update. P&D Aviation, the Port's Master Plan Update contractor, evaluated the FAA TAF and supported its general conclusions that activity could grow faster than identified by the 1994 Master Plan Update aviation demand forecasts. This evaluation led to the development of new Port forecasts which showed aircraft operations and passengers estimated to be approximately 17% greater (for planning year 2010) than the primary Master Plan Update FEIS forecast. In order to fully evaluate the possible project-level impacts (and potential mitigation measures) based on the new Port forecasts, the FAA Northwest Region and the Port commissioned a Supplemental EIS.

7. The DSEIS (containing a draft Clean Air Act Conformity Analysis) was released in February 1997. After receiving and responding to extensive agency and public comments, the FSEIS (and final Conformity Analysis) was published on May 13, 1997.

8. The Port Commission considered the potential environmental impacts and mitigating measures discussed in the FEIS and FSEIS, and weighed that information with other relevant considerations including the need for improved air transportation facilities to meet growing demand and reduce poor weather air traffic delay.

9. In light of the FSEIS, the Commission reaffirmed the approvals and commitments made in Resolution No. 3212, including adoption of the Airport Master Plan, approval of the third runway, and commitment to undertake additional noise reduction measures as called for in The Puget Sound Regional Council's ("PSRC") Resolution A-96-02. This appeal to the Port's Hearing Examiner followed.

10. The primary need for new runway improvements at STIA is the delay experienced at STIA during poor weather. While STIA operates efficiently during good weather conditions (Visual

Flight Rule 1 or VFR1 conditions), those conditions prevail only 56 percent of the time at the airport. During the remaining 44 percent of the time (VRF2 and all Instrument Flight Rule or IFR conditions), STIA presently operates with an unacceptable level of delay. That delay is expected to rapidly worsen as the region grows and demand for commercial aviation service correspondingly rises. A primary purpose of the proposed facility improvements is to increase the operating efficiency of STIA so that the region's residents and industry are provided with an acceptable level of commercial aviation service under the maximum range of weather conditions.

B. Findings On Reasonableness of EIS Forecast Methodology and Analysis Relating to Numbers of Passengers and Aircraft Operations

11. The ACC argued that the S8EIS is inadequate because the forecasts on which it is based show the same number of enplanements (passengers) under both the With Project and No Action alternatives. The ACC argued that the number of operations and enplanements with the project would be higher than the EIS forecasts and the number without the project would be lower than the EIS forecasts.

12. When the Port and the FAA began preparation of the Master Plan Update EIS, they retained P&D Aviation to prepare the forecast that served as the basis for the Master Plan Update EIS (the "1994 forecast"). Later, in 1996, when a decision was made to update the forecast, the Port again retained P&D Aviation to prepare the updated forecast (the "1996 forecast"). P&D Aviation had experience in preparing aviation forecasts for the Puget Sound Region, having prepared the forecast that served as the basis for a Flight Plan EIS issued by the Port and the PSRC in 1992.

13. The person at P&D Aviation primarily responsible for the preparation of the STIA forecasts was Stephen L. Allison, Senior Aviation Planner. Mr. Allison has 30 years experience in the aviation planning and consulting field, having served as project manager or lead aviation planner on the development of over 30 airport master plans and regional aviation system plans. While he functions as project manager or lead aviation planner on a variety of airport planning assignments, his specialty is the preparation of forecasts of aviation activity for individual airports and multiple-airport regions.

14. The approach used in preparing the STIA forecasts is widely accepted and used throughout the aviation industry. Mr. Allison generally described the process as consisting of the following steps:

a. Analyze historic airport activity data and trends (such as passengers, air cargo, and aircraft operations).

b. Assess the conditions and factors which influence the demand for aviation activity, including the local and national economies, air fares, changes in airline service, competing airports, technological advances in telecommunications, and international economic growth and bilateral agreements.

c. Obtain input from the aviation community, particularly the airlines serving STIA, to obtain their opinions regarding the future of aviation demand in general and at STIA.

d. Develop a mathematical relationship between a component of airport activity (e.g., domestic passengers) and the factors (explanatory variables) which are historically shown to strongly affect it. Evaluate this mathematical relationship, or "model," to ensure that it is logical for forecasting aviation demand and passes key statistical tests.

e. Obtain projections of the factors in the model affecting airport activity, then use the model with the projected factors to derive a forecast of the airport activity.

f. Evaluate the probable effects of the forecast of factors not explicitly accounted for in the model, such as telecommunications, demand management techniques, and high speed rail.

g. Develop alternative forecast approaches as a check against the results of the model.

h. Prepare upper-range and lower-range forecasts based on the alternative approaches to illustrate the potential range of outcomes.

i. Compare the master plan forecast with forecasts prepared in other studies and by the FAA and evaluate differences in the purpose for the forecast, the forecast approach, and assumptions.

15. The evidence showed that three factors stand out as generally having the greatest influence on aviation demand, and at STIA these are the three factor which have the greatest predictive value for estimating future aviation demand. These three factors are (a) the population of the airport's service area, (b) personal income in the service area, and (c) average air fares. Higher population and personal income have a positive effect on demand for air travel, and higher air fares influence demand negatively.

16. The models used by P&D Aviation for the 1994 and 1996 forecasts were tested against actual aviation activity at STIA from 1973 through 1993. The 1994 model showed a 99.6% correlation with domestic passenger variation and the 1996 model showed a 99% correlation. These statistics indicate that the factors used in the P&D forecasting models are excellent in explaining past variations in numbers of passengers at STIA.

17. The forecasts prepared by P&D Aviation were reviewed by the FAA's Northwest Mountain Region. The FAA reviewed the forecasts in terms of the methodology, forecast variables used, statistical measures, and reasonableness of the overall results. The FAA accepted the P&D forecasts and approved their use for the preparation of the EIS/SEIS.

18. The forecasts were also reviewed by Landrum & Brown, Inc., the prime consultant selected by the Port and the FAA to prepare the Master Plan Update EIS and SEIS. The individual at Landrum & Brown primarily responsible for the review of the forecasts was Douglas F. Goldberg, Vice President and Leader of the firm's Facilities and Operations Practice. Mr. Goldberg has 14 years of experience in aviation and airport planning, has been involved in the planning of over 30 airports in the U.S. and abroad, and has participated in demand forecasts at a variety of major U. S. airports.

19. Mr. Goldberg reviewed the forecasts prepared by P&D Aviation and found them to be consistent with the industry accepted methodology and properly prepared. He testified that the methodology used by P&D Aviation has been used to provide the basis for implementing improvements at most of the major airports throughout the U.S. Landrum & Brown has applied this technique to develop aviation forecasts for many airport clients around the world, including the City of Chicago Department of Aviation and its two primary airports O'Hare and Midway.

20. The ACC presented the testimony of Dr. Clifford Winston, Senior Fellow at the Brookings Institution, in support of its challenge to the aviation forecasts. Dr. Winston stated that expanded airport facilities, including a third runway, would themselves cause a growth in demand for air travel. It was his position that, by not taking this factor into account, the STIA forecasts understated the actual demand that will occur once the improvements are constructed. The ACC argued that, as a result of understated forecasts, the EISs failed to consider and disclose the real environmental impacts of the proposed improvements when compared to the Do Nothing scenario. Dr. Winston had several bases for his position that expanded airport facilities would cause a growth in aviation demand which are discussed below. The ACC also argued in favor of the corollary to Dr. Winston's theory. That is, under the Do Nothing scenario, if the Port does not build the airport improvements, the number of operations and enplanements will be constrained. Thus, they allege, the EISs overstated the activity levels in the Do Nothing scenario and further understated the differences between the With Project and Do Nothing scenarios.

21. In response to Dr. Winston, the Port presented the testimony of Mr. Allison, Mr. Goldberg and Ms. Mary Vigilante who disagreed with Dr. Winston's positions. The testimony of the Port's witnesses was credible that aviation demand at STIA is not caused by expanded airport facilities and not constrained by the delay characteristics at STIA so long as there is sufficient airport capacity to serve the passengers who wish to fly. Thus, aviation demand at STIA can be adequately predicted by using population and income characteristics of the market area, along with air fares, and not by expanded airport facilities. This is particularly true for STIA, because there are no other airports in the region that can meet the demand, because the delays occur during poor weather conditions which are not predictable, and for other reasons set forth below.

22. Dr. Winston stated that a reduction in delays associated with air travel, and the uncertainties associated with that reduction, would generate increased demand for air travel. He asserted that eliminating the inconvenience and unreliability associated with delay would cause potential travelers to use more air services. Messrs. Allison and Goldberg disagreed with Dr. Winston's position. Their testimony was credible that delay at STIA occurs in poor weather conditions and poor weather primarily affects arrivals rather than departures. Because poor weather, particularly on arrivals, is not predictable, the delay is not likely to have a significant impact on travelers' decisions. Moreover, airlines can incorporate expected and routine delay into their flight schedules and incorporate sophisticated flight consolidation procedures. There are no other airports in the Puget Sound Region that provide an alternative to STIA. Therefore, even with the average delays projected for STIA during the planning horizon, alternative modes of travel (such as automobile travel) will still be considerably longer than air travel. For all these reasons, it is unlikely that reductions in delay at STIA caused by the preferred alternative will result in substantial additional demand for air travel.

23. In response to the ACC's argument that increasing delay at STIA without the project will reduce demand, Mr. Goldberg and Mr. Allison testified credibly that there will be sufficient capacity at STIA to accommodate passenger demand through the Master Plan Update's planning horizon (beyond the year 2010). That is, through modest adjustments in the number of passengers per airplane and the size of aircraft, as well as the hours of operation, STIA has the capacity to accommodate all the projected demand through the planning horizon. This available capacity at STIA would likely accommodate the demand even as average delays increased, because that has been the experience at other congested airports. Other airports in the U.S. currently operate with levels of delay at or greater than the delay levels projected for STIA beyond 2010. At some of these airports,

such as O'Hare, the level of activity is such that the FAA has imposed limits on the number of operations during most of the day. Despite the high levels of delay and the limits on operations, the activity levels at these airports have continued to increase in response to the demand. Therefore, it is not likely that increasing delays at STIA will significantly constrain demand between now and 2010.

24. Dr. Winston also stated that an increase in runway capacity and an expansion of terminal and ground transportation facilities would enable the airport to expand the number of aircraft operations at the hours most convenient to the traveling public. He asserted that this will result in an increase in discretionary travel by persons who otherwise might have been discouraged from flying because of the inconvenience. However, as testified to by Mr. Goldberg, the addition of the proposed third runway will not add significant new capacity at STIA during good weather conditions, which occur approximately 56% of the time. The purpose of the new runway is to improve efficiency in poor weather conditions, i.e., to provide two streams of aircraft traffic during poor weather conditions, the same as occurs now (and in the future with the new runway) in good weather conditions. Because poor weather is not predictable, the addition of capacity in poor weather conditions should not have a significant effect on the demand for air travel.

25. Based on Dr. Winston's testimony, the ACC also argued that expansion of the airport facilities will lead to greater airline competition and reduced operating costs, thereby reducing air fares and inducing more air travel. The testimony of the Port's witnesses was more credible that the improvements at STIA will not result in greater airline competition because airlines add flights in response to increasing demand not in response to increased airport capacity. STIA already enjoys a high level of airline competition and comparatively lower air fares than the rest of the country. In addition, reduced airline delay costs will not likely result in lower air fares. Savings from delay costs will be partially offset by the airlines' share of the capital improvement expenses. Also, the savings from reduced delay costs, when spread among all airline passengers, represents a very small percentage of air fares and will not likely have a major impact on travel demand.

26. Dr. Winston also stated that more efficient and reliable air service would be a stimulant to regional economic growth which, in turn, would generate increased demand for air travel. For economic growth in a region to be affected by airport improvements, there would have to be a major change from extremely inadequate service to adequate or better service. STIA already provides adequate or better air service so the airport improvements should not result in significant new economic growth in the region. In addition, as Mr. Goldberg testified, the EIS/SEIS aviation forecasts did not assume any constraints in airport capacity, so it would be illogical to include in the forecasts a factor for increased aviation activity resulting from the airport improvements. Also, Mr. Goldberg testified that Denver, which recently constructed a new five-runway modern airport, has experienced a decline in the number of passengers and operations following completion of the new airport.

27. Finally, Dr. Winston testified that he developed a model to test whether the addition of a runway fuels growth in aviation demand. Applying his model to the top 150 airports in the country, he concluded that there is a statistical correlation between the number of runways and the amount of aviation activity at an airport. This, he argued, is empirical evidence demonstrating that an additional runway at STIA would cause additional growth. The testimony of Mr. Allison and Mr. Goldberg was credible on this point. As they testified, Dr. Winston's analysis did not test for a cause and effect relationship and can only show that a correlation exists between airports with high demand and airports with multiple runways. That is, the Winston analysis merely demonstrated that airports with greater

aviation activity generally have more runways than airports with less activity. This does not demonstrate that the additional runways were the cause of greater activity levels and it could demonstrate nothing more than that busy airports build runways.

28. Mr. Allison also testified that the addition of the second runway at STIA did not result in increased aviation demand. The second runway was built after a period of rapid growth at the airport, but this growth was not sustained after the construction of the runway. The number of passengers grew at an annual average rate of 14.8 percent in the five years before the runway was completed and at an average rate of 3.8 percent in the three years after the runway was completed. A similar pattern occurred with regard to the number of operations. As Mr. Allison credibly testified, this is not an unusual occurrence. Airport activity is typically cyclical (reflecting economic cycles), with activity growing rapidly for several years then growing more slowly for several years. Once an airport expansion has occurred, the airport will sometimes enter a period of slow or no growth.

29. The FEIS included at Appendix R, and the FSEIS included at Appendix D, analyses of certain "what if" scenarios that respond to the comments that growth might be higher than forecast. In these appendices, the Port considered the possible impacts if the ACC allegations are correct and added airport capacity results in higher aviation activity. In Appendix D, the Port considered in "Case 3" the potential differences in impacts between (a) a With Project scenario in which operations and enplanements grew at a 10% faster rate than forecasted and (b) a Do Nothing scenario in which it was assumed that the number of operations and enplanements would be limited to their 2010 levels. This analysis, which was based on an extrapolation of pre-2010 impacts, compared potential impacts in the areas of noise, air quality, surface traffic, and other areas.

30. The ACC asserted in its Closing Memorandum that the SEIS was internally inconsistent in that it predicted in Appendix D that the number of passengers would be the same in 2020 under both the With Project and Do Nothing scenarios and yet the SEIS also stated that severely congested conditions would prevent the airport from accommodating the predicted level of passengers in 2020. However, as testified by Mary Vigilante who prepared it, Appendix D was not a forecast of passengers and operations in the year 2020. It was an analysis of "what if" scenarios in response to comments from the ACC. Cases 1 and 2, relied on by the ACC in its assertion, merely considered the impacts if the number of operations and enplanements were the same in 2020 under the With Project and Do Nothing scenarios. Case 3 considered the situation if the ACC assertions were correct, that aviation activity would be different under the With Project and Do Nothing scenarios.

31. The ACC asserted that if Dr. Winston's theory is correct, that air pollution and noise would increase with the number of operations. However, increased number of operations under the With Project scenario does not necessarily translate to a comparable increase in air pollution. Eugene R. Peters is a Director with Landrum & Brown. He has over 10 years of environmental planning experience and has conducted the analysis of airport-related activity on regional air quality on airports throughout the country. Mr. Peters, one of the principal air quality professionals working on the EIS, provided a detailed analysis in his written testimony that was consistent with the SEIS conclusion that NOx will decrease even as the number of operations increases out to 2010, due to the impact of the reductions in delay which accompany the construction of the 3rd Runway.

32. With respect to noise, the Port presented credible testimony from Mr. Jon Woodward. Mr. Woodward has more than 25 years experience in program design and common noise assessment

and land use analysis. He has prepared over 1500 noise contour studies in his career. He has worked on noise studies at major airports throughout the country, including Dallas-Ft. Worth, Los Angeles International, Cincinnati, St. Louis, Chicago O'Hare and Toledo. Mr. Woodward was in charge of preparing the noise contours for the EIS. Mr. Woodward corroborated analysis in the EIS which demonstrated the declining size of the 65 DNL noise contours under a do-nothing scenario between 1994 and the year 2010. Despite the anticipated increase in operations at STIA, noise impacts are expected to decline in the future relative to existing conditions. As Mr. Woodward testified, even if the operations forecast projected by Dr. Winston were to occur, the resulting effect would be an expected increase of 7/10 of one decibel (0.7 dBA) on average noise levels. Based on the FAA threshold of significant impact of 1.5 DNL, the 0.7 dBA would not be significant. If any of the current technological initiatives now under way by NASA achieve even 10% of their goals (i.e., one decibel reduction), this would more than offset the increased noise levels associated with the difference in forecasted operations predicted by Dr. Winston.

C. Findings of Fact on Reasonableness of Decision to Limit Detailed Analysis in SEIS to the Year 2010

33. At the time the Master Plan Update EIS was prepared in 1994, the airfares nationally and at STIA had been relatively stable. Thus, those charged with preparing long-term airport forecasts could with some assurance forecast for longer periods.

34. Several factors came together in the time period between the Master Plan Update EIS in 1994 and the SEIS in 1996, each of which added significant uncertainty to the planning efforts of those professionals charged with attempting to meaningfully evaluate long-term impacts under SEPA and NEPA. The EIS consultants uniformly agreed with the EIS Project Manager that these factors made it very difficult to meaningfully evaluate the environmental impacts of the Master Plan Update beyond the year 2010. The factors included, but are not limited to:

a. A dramatic drop in air fares nationwide which led to radically different FAA forecasts in 1996;

b. A calibrated aviation forecast which indicated an 17% increase in the operations at STIA in the year 2010;

c. A major decision by Boeing to discontinue production of an entire line of aircraft, the MD-80;

d. The major impact of the arrival of one of the nation's lowest airfare airlines, Southwest Airlines, on STIA and the changes in the fleet mix of both Southwest and the airlines which were competing with Southwest, an impact which added great uncertainty to the number of operations, fleet mix, engine type, day/night split, and other factors which are essential to the analysis of noise and air quality impacts;

e. The drastic downsizing of the Regional Transportation Authority's road network and light rail system, with the resulting uncertainty in analyzing traffic at STIA and inability to rely on the PSRC's regional traffic model;

f. New investments in noise and air pollution research which are likely to significantly reduce engine noise in new aircraft by ten dBs in ten years, starting in the year 2005 and in new aircraft starting in the next 5-10 years; and

g. The 1996 work of NASA, in conjunction with GE and other aircraft and engine manufacturers to start a program with a specific goal of reducing aircraft NO_x emissions by 70% by the year 2001.

35. The testimony of the professionals participating in the preparation of the EIS establishes that in various key areas, the SEIS-projected period of analysis of 13 years falls squarely within the typical range for studies of this type throughout the country. Mr. Peters testified that the air quality studies varied the study period from 5-15 years in the future. In the noise area, Mr. Woodward testified that noise contour studies for new runways typically run on a 10-12 year planning horizon.

36. While the ACC emphasizes the relationship of the planning period to the anticipated date of the runway in the year 2004 or 2005, a more proper context is to review the length of the planning period from the date of the EIS in 1996, rather than the year 2004. Thus the appropriate planning period to be evaluated is 13 years.

37. One of the principal decision makers in the determination of the planning horizon in SEIS was the EIS Project Manager, Mary Vigilante. Ms. Vigilante has, in addition to extensive airport project management experience, specialized experience in both air quality and noise analysis fields. She conducted much of the original analysis, as well as the response to comments in all of the project level environmental documents. In addition to the reasons set forth in Appendix D of the SEIS, she testified credibly as to the 13-year planning horizon. As Ms. Vigilante noted, there were rapid changes in aviation activity during the mid-1990s at STIA, which made forecasting aviation activity very difficult. Ms. Vigilante reasonably concluded that detailed analysis of the years beyond 2010 in the EIS would be speculative and could lead to a substantially inaccurate evaluation of environmental effects. The quantification of environmental impacts is dependent on factors such as total aviation activity, the time of day the activity occurs, the aircraft types, and the engines on the aircraft. Even slight changes in aircraft types and their associated engine types, for instances, can result in substantially different impact analysis. Due to the various volatile factors identified and because aircraft fleet mix and air fares could not be reasonably predicted beyond 2010, the SEIS concluded that impacts cannot be reasonably evaluated beyond this time period. Ms. Vigilante also described in detail the different forms of future environmental review, both state and federal, which will analyze possible adverse environmental impacts of the Master Plan Update during the period 2010-2020.

38. One of the greatest changes following issuance of the Master Plan EIS was in the 1996 change in projected airfares announced by the FAA. With respect to the Port's updated aviation demand forecast prepared for the SEIS, after calibrating for local data, this resulted in an 17% increase in the number of operations anticipated at STIA for the year 2010 over the number of operations anticipated under the 1994 Master Plan forecasts. The volatility in projected airfares represented by the FAA's changed airfare projections makes it more difficult to reasonably estimate long-term trends in number of aircraft operations, fleet mix, or day/night operations beyond 2010.

39. The forecasting uncertainty that surfaced in 1996 significantly changed the ability to analyze long-term forecasts, fleet mix, day/night operations, and created a corresponding uncertainty for the professionals charged with evaluating long-term air quality and noise impacts. In many aspects, this uncertainty did not exist two years earlier, when the Master Plan EIS was being prepared.

40. The preparation of the air quality analysis in the SEIS was the product of collaboration among the three agencies with regulatory authority in this area, the Puget Sound Air Pollution Control Agency ("PSAPCA"), the Washington State Department of Ecology ("DOE") and the U.S. Environmental Protection Agency ("EPA"). DOE retained an independent consultant to assist in detailed review and preparation of comments in its review of the SEIS. All three agencies participated in the air quality analysis which found that the year 2010 was the logical planning horizon for air quality impacts. Although the three agencies had many questions during the process and in their comments on the DSEIS, they all approved the final air quality analysis contained in the F SEIS.

41. Mr. Gene Peters also testified that the volatility in airfares, forecasts, fleet mix, and other areas in the period following 1994 made it difficult in 1996 to predict or reasonably foresee air quality impacts beyond the year 2010.

42. The uncertainty of long-term airfare projections and the resulting fluctuation in aircraft operation forecasts at STIA added a significant element of uncertainty in the ability of the noise measurement professionals to prepare reliable long-term noise contours in the SEIS. While it is theoretically possible to run noise contours, the experienced noise professionals hired by the Port, Paul Dunholter and Jon Woodward, testified credibly that the reliability of this modeling diminishes significantly as one goes further out in time. While a range of assumptions or alternatives is theoretically possible to do and it is also possible to run contour models at any time, the usefulness of such an exercise is questionable, particularly given the time and cost involved in modeling, as it is not likely to lead to meaningful evaluation.

43. Because of the lack of reliable data beyond the year 2010 to input into the standard noise model (the INM model), the noise professionals preparing the SEIS limited detailed analysis to thirteen years from the 1996 date of the SEIS, because noise impacts analysis beyond that time would be speculative and not likely to lead to meaningful evaluation. Moreover, there are several additional steps of environmental review which will be completed in the future at a time when those impacts are more capable of being meaningfully evaluated. These include the Part 150 Noise Compatibility Program, future chapters of the Port's Master Plan Update process, and any future planning and environmental review required under the terms of the FAA Record of Decision. Although many of these have federal components, the Port will be taking actions under all of them which will be subject to SEPA review.

44. The advent of Southwest Airlines to STIA has since 1994 had a significant impact on the fleet mix at the Airport by Southwest and its airline competitors. There has been a significant change from three and four-engine aircraft to medium-sized two-engine jet aircraft. The change in fleet mix translates directly into significant changes in the resulting air pollution emissions. This recent volatility made long term analysis of air quality impacts more difficult in 1996 than in 1994

45. In addition to the inability to reasonably forecast aviation demand beyond 2010, there were also independent changes following issuance of the Master Plan EIS which made meaningful

evaluation of surface transportation impacts speculative in and around STIA beyond 2010. This analysis depends to a large extent on the reliability of the PSRC's regional model, which was used by INCA Engineers as the foundation for its analysis in the Master Plan EIS and the SEIS. When the SEIS was getting underway, there were three major changes affecting arterials and intersections in the vicinity of the Airport, none of which was included in the PSRC model.

46. First, the state's largest public infrastructure project, the Regional Transportation Authority ("RTA") dramatically changed in scope following issuance of the EIS, from $13 billion to $3-4 billion. This change would radically alter the impact at intersections and arterials in and around STIA after 2010 in ways that could not be fully understood in 1996, as the impacts of this change were not yet included in the PSRC model.

47. Second, the state highway adjacent to the Airport, SR 509, also experienced major planning changes following issuance of the Master Plan EIS. The route and connections for the proposed extension of SR 509 to Interstate 5 was changed. Given its proximity to the Airport, this change would also have very significant impacts on the analysis of traffic intersections in the area after the year 2010. None of these new impacts were evaluated or included in the PSRC traffic model on which INCA relied to conduct its analysis.

48. Third, the City of SeaTac's proposed Personal Rapid Transit system, which was very conceptual in 1994 when the Master Plan Update EIS was issued, was two years further into the planning process by 1996. As this was proposed in the jurisdiction surrounding the Airport, if constructed it too could have significant impacts on traffic in the area, which impacts were not yet evaluated and not included in the PSRC model.

49. The record reflects numerous examples of ongoing environmental review which will be conducted by the Port and other state agencies of the future impacts following the year 2010 of the Master Plan Update improvements. Those include, but are not limited to:

a) **Additional Master Plan-related SEPA review by the Port.** The Port Director of STIA, Gina Marie Lindsay, testified this process would likely get underway in the next several years,

b) **The Port's portion of the Part 150 Noise Compatibility Program.** While ACC correctly notes this is a FAA-authorized activity, there was testimony outlining the Port's role in approving a plan for FAA consideration. The Port decisions will be subject to SEPA requirements. The scope of this review includes consideration of noise impacts on affected schools. The Port has a well-established track record of conducting Part 150 review at regular intervals, and is currently collecting data for the Part 150 process now underway.

c) **Port Review and Action Mandated by the FAA in its Record of Decision ("ROD").** This will be required prior to 2010 and must include an "adequacy, accuracy, and validity of the final statement." Under the terms of the ROD, "if this review identifies additional significant adverse environmental impacts, the Port **will be required** to adopt further noise and land use measures designed to minimize any significant adverse effects found in that evaluation." (Emphasis added.)

d) **Supplemental Environmental Review for Projects Not Underway by June 2000.** Because many of the Master Plan Update improvements will not be initiated until after the year 2000, it is likely that a new or updated environmental analysis will occur to cover these projects.

e) **Air Quality Conformity Review** is required under state law (although the state is applying the duties of the federal Clean Air Act, which have been delegated to the state and regional agencies.) Under federal law, any action in the Port's Master Plan Update which is not commenced within five years must undergo environmental review again.

f) **NPDES Permit Renewal Process.** Although not directly included in the ACC appeal, the future SEPA review will include consideration of stormwater and water quality impacts associated with the Master Plan Update, as the Port must every five years submit a detailed application for renewal. WAC 173-220-180 (1), (2).

C. Findings of Fact Relating to the Issue of Whether the EIS/SEIS Adequately Evaluated Reasonable Alternatives

50. The third issue for decision is whether the lead agency, under the rule of reason, considered a reasonable range of alternatives in the Master Plan EIS and SEIS.

51. Petitioners allege that the Port should have considered a runway shorter (6000 to 6700 feet) than the preferred alternative runway (8500 feet). Petitioners' proposed runway would also have a staggered north threshold -- i.e., the north end of the new runway would not align with the north ends of the existing two parallel runways at STIA. Instead the north end of the petitioners' proposed runway would be 2000 to 2500 feet further south than the north end of the existing runways. Petitioners allege that such a runway would require less fill and would, therefore, have fewer impacts.

52. Both the preferred alternative third runway and petitioners' suggested runway would be located 2500 feet to the west from the existing inboard runway at STIA.

53. The threshold stagger and runway separation are important factors in air traffic control operations at STIA. The existing inboard runway is Runway 16L/34R, which is the runway closest to the terminal and is currently 11,900 feet in length. The Port's proposed new third runway is located with its centerline 2500 feet west of the centerline of the existing inboard runway. A 2500-foot runway separation is the minimum runway separation distance for conducting (1) dependent arrivals at STIA (two coordinated streams of arrivals) <u>and</u> (2) independent departures at STIA from the inboard runway at the same time as arrivals to the new outboard runway during poor weather conditions subject to Instrument Flight Rules ("IFR") and south flow. Unlike most airports in the U.S., IFR conditions are common at STIA, occurring approximately 25 percent of the time. During approximately 3/4 of the IFR conditions, or approximately 17 percent of the time, STIA is also operating in a "south flow" condition.

54. Independent arrivals and departures during IFR conditions (departures from the inboard runway at the same time as arrivals on the new third runway) would be a relatively common occurrence at STIA. The ability to conduct those independent arrivals and departures is a factor in reducing bad weather delay at STIA. The situation would be common (as often at 15 to 17 percent of the time) because the inboard runway, being the longest runway at STIA, is best suited for departures of all aircraft types. In addition, from an air traffic control perspective, it is preferable to taxi aircraft

across a runway where departures rather than arrivals are occurring. For both reasons, the situation where departures are occurring on the inboard runway while arrivals are taking place on the new third runway would be a relatively common occurrence at STIA. Moreover, it is desirable, in order to reduce aircraft operation delay at STIA, for the inboard departures and outboard arrivals to be "independent" so that the air traffic controllers do not need to create a temporal separation between departing and arriving aircraft.

55. Under FAA planning guidelines and air traffic control requirements, 2500 feet is the minimum runway separation at STIA, during south flow IFR conditions, for independent takeoffs from the inboard runway while landings are taking place on the proposed third runway. However, this is only true when the ends of the runways are aligned. For every 500 feet of stagger on a runway threshold, the FAA advisory and air traffic control requirements would require an additional 100 feet of separation between the two runways.

56. One of the reasons for this FAA requirement is to keep departing aircraft a safe distance away from the wake vortices of arriving aircraft.

57. In order to maintain the ability to do independent landings on the new runway and landings on the existing inboard runway, in south flow IFR conditions, the proposed alternative runway proposed by petitioners would have to be moved to the west by 400 to 500 feet. This would result in additional environmental impacts to wetlands, require significant additional construction fill hauling, would necessitate the relocation of additional stream channels, and would likely require relocating State Route 509, the construction of expensive retaining structures, and the hauling of large additional amounts of fill material. In addition, any movement westward of the runway would require filling several additional wetland areas.

58. In its Record of Decision approving the Port's Master Plan Update, the FAA has stated that a staggered north threshold runway is not practical or desirable at STIA.

59. Although the primary function of the new runway is to serve arrivals, which require less runway length than departures, the new runway is planned for use by limited departures during certain conditions. This will enable air traffic controllers to offload departures from the primary departure runway during limited peak periods and during conditions in which the existing runways are unavailable. Limited use of the new runway for departures will also provide added flexibility for air traffic controllers.

60. A significant percentage of the fleet mix projected to use STIA in the planning period could not use the shorter runway proposed by the ACC for departures.

61. A great majority of the fleet mix could use the proposed ACC runway for landings, based on the standard book value used for runway planning purposes. These "book value" numbers assume "still wind" conditions. Still wind conditions are frequently not present at STIA and cannot be counted upon during bad weather conditions.

62. The testimony demonstrated that many pilots would refuse a 6000 to 6700-foot runway, given the availability of a longer parallel runway. The statistics used in the EIS and by ACC witness Stephen Hockaday for aircraft landing/takeoff ability on runways of various lengths are based

on the technical capabilities of the aircraft, the "book value." However, pilots are ultimately responsible for the control of their aircraft, and it is likely that pilots may frequently refuse the runway length proposed by the ACC, especially during bad weather or crosswind conditions. Any time a pilot does so, additional delays and increased air traffic controller workload will result. The availability of an 8500-foot runway would provide more flexibility to accommodate arrivals, regardless of aircraft type and weather conditions.

63. Because a smaller percentage of the fleet would be able to use a 6000 to 6700-foot runway, as compared to an 8500-foot runway, the shorter runway would complicate air terminal management under some circumstances, based on routine air traffic control procedures at STIA. In particular, certain long-haul traffic would have to be segregated from other traffic and resequenced into the approach pattern of the existing longer runway. This procedure would tend to increase controller work load, aircraft flying time and delays.

64. The administrative record shows that the Port considered shorter-length runway alternatives in the Master Plan EIS/SEIS, including a 7000-foot runway located 2500 feet from the existing inboard runway. The EIS/SEIS also considered alternative runway configurations with staggered north thresholds of 935 feet and 1435 feet. In addition to the information in the Master Plan EIS/SEIS, the detailed Airside Options Evaluation prepared by P&D Aviation for the Master Plan is incorporated by reference into the EIS and discusses runway configurations.

65. The Port conducted an assessment of airfield options before the preparation of the Master Plan DEIS. That analysis considered the following representative alternatives: the existing airfield (Option 1 — No-Action); two separate 5200-foot commuter-length runway configurations (Options 2, 3); a 7000- to 7500-foot runway in three separate configurations (Options 4A, 4B, 4C); and an 8500-foot runway in two configurations (Options C, D). Based on this early analysis, the Port determined that the commuter-length runway configurations (Options 2, 3) would not meet the proposal's purpose and needs.

66. Because the commuter-length runway options (Options 2, 3) did not meet the proposal's purpose and needs, they were not analyzed in detail in the EIS. A range of other runway length options (Options 4A, 4B, 4C, 5, 6), including runway lengths from 7000 to 8500 feet separated by at least 2500 feet from the existing inboard runway, were analyzed in the Master Plan EIS/SEIS.

67. The ACC claims that shorter runways were not discussed because one of the Option 4 alternatives (Option 4B) was only discussed in a representative manner in the Master Plan EIS/SEIS. As explained in the EIS/SEIS, this option's environmental impacts were considered to be similar to Options 4A, 4C, and 5.

68. The runway alternatives analysis in the Master Plan EIS/SEIS is organized to present representative alternatives and to use the preferred alternative as a benchmark for the discussion of other alternatives. The possible variations are first presented. Representative alternatives were then used for some groups of alternatives. And the proposed action was used as a baseline to make the discussion of all alternatives understandable. When the environmental impacts of shorter runway lengths differ from an 8500-foot runway, those impacts are identified in the EIS/SEIS.

69. The ACC argues that the Port did not discuss the impacts that could be avoided by adopting its suggestion of a runway with a staggered north threshold. However, the EIS discusses alternative runway configurations with a staggered north threshold and discloses that a runway with a staggered north threshold would have different impacts from the preferred alternative (8500-foot runway). The Master Plan Final EIS, for example, shows that a 1,435-foot staggered north threshold, for example, would require 5 million cubic yards less fill material than the Port's preferred alternative. The Master Plan Final EIS also discloses that a 935-foot staggered north threshold would require 4 million cubic yards less fill than the preferred alternative. The extent to which other environmental impacts, including wetland impacts, would be different for a staggered north threshold options is also disclosed.

70. The ACC criticizes the EIS for not considering the difference between the volume of fill material at the mining site (where the material would be mined) and the volume of that material in the trucks coming to the STIA construction site. The ACC also argues that the EIS/SEIS underestimated the amount of truck trips needed to import the required volume of fill because the "swell" factor was underestimated. As Port engineering expert Bob Maruska explained, the "swell" factor translates the compacted in-place volume (at the construction site) to the volume required to haul that material to the site in trucks, so that the number of trucks can be predicted.

71. As Mr. Maruska and the Port's traffic engineering expert James Edwards credibly testified, the Port's analysis of construction impacts used a "swell factor" of 15 percent, which was based on regional conditions, empirical evidence from local contractors and material suppliers, and their experience obtained in similar projects. Moreover, the construction traffic analysis in the Master Plan EIS/SEIS used an overall conservative approach to traffic volumes that likely overestimates the probable construction traffic required for the material haul.

72. The ACC alleges that the Master Plan EIS/SEIS ignored the impact of Boeing Field on the operation of STIA. The evidence presented by the testimony of Mr. Goldberg discussed an analysis performed by the FAA in 1992 which considered interactions with Boeing Field. That analysis concluded that the STIA Master Plan Update could achieve its delay reduction objectives. As Mr. Goldberg's testimony points out, the EIS analysis did, in fact, consider the effect of airspace interactions between STIA and Boeing Field (King County airport).

73. In its briefing to the Examiner, the ACC alleges that the Port's EIS/SEIS failed to consider the potential socioeconomic impacts which could result from hauling the required fill dirt to the third runway construction site. The ACC did not present any evidence at the hearing showing that socioeconomic impacts, such as property devaluations, would actually occur.

74. The ACC alleged in its briefing to the Examiner, that the Port has failed to finalize a plan for mitigating impacts from hauling fill dirt. The testimony of Mr. James Edwards and Ms. Gina Marie Lindsay discussed the potential Best Management Practice mitigation measures which the Port will incorporate into its hauling contracts in order to mitigate potential impacts associated with the construction haul traffic, including both short-term and long-term impacts to area roadways.

II. CONCLUSIONS OF LAW

A. General Conclusions Of Law.

1. EIS adequacy has been characterized as a question of law. Questions of law generally are subject to a de novo standard of judicial review. Leschi Improvement Council v. Washington State Highway Commission, 84 Wn.2d 271, 280-87, 525 P.2d 774 (1974). However, the de novo standard of review is specifically qualified by SEPA's statutory requirement that agency determinations of EIS adequacy are entitled to substantial weight in administrative and judicial appeals. RCW 43.21C.090. OPAL v. Adams County, 128 Wn. 2d 869, 875, 913 P.2d 793 (1996).

2. The legal standard by which EIS adequacy must be determined is the "rule of reason."

3. Washington courts consistently have articulated the "rule of reason" as a "broad, flexible cost-effectiveness standard." E.g., Citizens Alliance v. Auburn, 126 Wn.2d 356, 362, 894 P.2d 1300 (1995). Under this standard, an EIS is not to be a "compendium of every conceivable effect or alternative to a proposed project." E.g., Toandos Peninsula Ass'n v. Jefferson County, 32 Wn. App. 473, 483, 648 P.2d 448 (1982), and is required to include only a "reasonably thorough discussion of the significant aspects of the probable environmental consequences," e.g., OPAL v. Adams County, supra, 128 Wash. 2d at 875, and provide "sufficient information to make a reasoned decision." Citizens Alliance v. Auburn, supra, 126 Wash. 2d at 362.

4. Under the "rule of reason," an EIS is not required to identify or analyze impacts that are "remote and speculative." E.g., Cheney v. Mountlake Terrace, 87 Wash. 2d 338, 344, 552 P.2d 184 (1986)

5. The lead agency's determination that potential environmental impacts are remote or speculative and need not be addressed in an EIS is entitled to substantial weight in an appeal of EIS adequacy. RCW 43.21C.090. E.g., OPAL v. Adams County, supra.

6. Under the rule of reason, only a "reasonable" number and range of alternatives need be addressed in an EIS, e.g., Citizens Alliance v. Auburn, supra; SWAP v. Okanogan County, 66 Wn. App. 439, 444-446, 832 P.2d 503 (1992), and the word "reasonable" is intended to limit the number and range of alternatives. WAC 197-11-440(5)(b)(i).

7. An agency has discretion to choose the reasonable alternatives to be addressed in an EIS. SWAP v. Okanogan County, supra. Under RCW 43.21C.090, an agency's choice of reasonable alternatives should be given substantial weight. Id. at 66 Wn. App. at 445.

8. Under the rule of reason, an agency has broad discretion in deciding what potential mitigation measures should be included in an EIS. SWAP v. Okanogan County, supra; Robertson v. Methow Valley Citizens Coun., 490 U.S. 332, 359, 109 S. Ct. 1835, 104 L.Ed.2d 351 (1989). Neither SEPA nor NEPA require that an EIS include a complete or detailed mitigation plan or a commitment to mitigate. Id., 66 Wn. App. at 447; 490 U.S. at 359.

9. An agency determination of the nature and extent of potential mitigation to include in an EIS is entitled to substantial weight. RCW 43.21C.090. SWAP v. Okanogan County, supra, 66 Wn. App. at 447-448.

B. Conclusions Of Law Relating to the Aviation Forecast Issue.

10. Washington courts have followed federal NEPA cases when construing SEPA. Eastlake Community Council v. Roanoke Associates, 82 Wn.2d 475, 488 (fn. 5), 513 P.2d 36 (1973).

11. The Port and the FAA are agencies with expertise in forecasting aviation demand and should be granted deference in choosing the appropriate methodology for forecasting aviation activity. City of Grapevine v. Dept. of Transportation, 17 F.3d 1502, 1507 (D.C. Cir. 1994) (court deferred to the agency's expertise in choosing the appropriate way to measure noise); Seattle Community Council Federation v. Federal Aviation Administration, 961 F.2d 829, 833-34 (9th Cir. 1992) ("[I]t is within an agency's discretion to determine which testing methods are most appropriate."); Citizens Against Burlington v. Busey, 938 F.2d at 200-201 (FAA's choice of methodology to measure the impacts of noise on the environment was an informed decision to which the court should defer); Sierra Club v. Dept. of Transportation, 753 F.2d 120, 128 (D.C. Cir. 1985) (it is within the expertise and discretion of the FAA to determine the proper method to measure airport noise); Florida Wildlife Federation v. Goldschmidt, 506 F. Supp. 350, 376-77 (1981) (the traffic forecasting methodology used in an EIS was adequate where the modeling was consistent with the state of the art at the time). The United States Supreme Court has agreed that a reviewing court must be its most deferential when examining the decision of an expert agency which is making predictions within its area of special expertise. Baltimore Gas and Electric Co. v. Natural Resources Defense Council, 462 U.S. 87, 103, 76 L.Ed.2d 437, 103 S. Ct. 2246 (1983).

12. When an agency is presented with conflicting expert opinion on an issue, it is the agency's job and not the job of the reviewing appellate body, to resolve those differences. Webb v. Gorsuch, 699 F.2d 157, 160 (4th Cir. 1983).

13. The Port and the FAA used a forecasting methodology for the SEIS that was consistent with industry-accepted standards and was proven reliable over time. The Master Plan Update forecasts were reviewed and approved by the FAA's Northwest Mountain Region and the Forecast Branch of the FAA Headquarters in Washington, D.C. The decision to measure aviation demand by the aviation forecast methodology chosen is legally adequate under the rule of reason.

14. Under the rule of reason, the Port and FAA reasonably exercised their discretion in determining that, during the planning horizon for the Master Plan Update, (a) the construction of the proposed improvements, including the third runway, would not cause significant new growth in aviation demand and (b) not constructing the proposed improvements would not cause significant decrease in demand. Therefore, the aviation demand forecasts that served as the basis for the SEIS analysis did not understate aviation activity under the With Project scenario and did not overstate activity under the Do Nothing scenario.

15. The EISs analyzed the potential impacts of a higher aviation forecast and compared these impacts to those of a constrained forecast in Appendix R to the FEIS and Appendix D to the

FSEIS. Based on the difficulty to reasonably conduct aviation demand forecasting beyond the year 2010, this analysis was sufficient under the rule of reason.

16. The difference of opinion between the ACC's expert witness and the Port's expert witnesses was discussed in the EISs, which allowed the decision-makers to be informed on this issue prior to making their decisions. The lead agency's decision of which expert opinion to follow and which forecasting methodology to adopt was legally sufficient under the rule of reason.

C. Conclusions of Law Relating to the Lead Agency's Decision to Limit Detailed Environmental Impact Analysis to the 2010 Planning Horizon.

17. Under SEPA, the contents of environmental review depend on the lead agency's existing planning and decision-making process, and on the time when alternatives can be most meaningfully evaluated. WAC 197-11-060(2)(a)

18. SEPA's provisions relating to analyzing the long-term impacts of a proposal over the life-time of the project must be viewed and applied in the context of related SEPA provisions such as WAC 197-11-060(4)(a), which require consideration of impacts that are "likely, not merely speculative."

19. SEPA only requires a reasonably thorough discussion of the probable environmental consequences of an agency's decision. OPAL v. Adams County, 128 Wn.2d 869, 875, 913 P.2d 793 (1996).

20. When discussing potential impacts, an EIS is only required to consider impacts that are "likely, not merely speculative" and remote or speculative impacts need not be discussed. WAC 197-11-060(4)(a); Mentor v. Kitsap County, 22 Wn. App. 285, 289, 588 P.2d 1226 (1978); Cheney v. Mountlake Terrace, 87 Wn.2d 338, 346, 552 P.2d 184 (1976).

21. The decision in the SEIS to limit the detailed analysis of impacts to the 13-year planning horizon, or the year 2010, was a reasonable decision and was legally sufficient under the rule of reason.

22. The conclusion in the SEIS that detailed analysis of environmental impacts beyond the year 2010 would not be capable of meaningful evaluation was a reasonable decision and sufficient under the rule of reason, particularly given the extent to which subsequent environmental review and additional mitigation, if appropriate, would take place under both state and federal processes.

23. The purpose of SEPA was well served with this SEIS. Even though detailed evaluation beyond the year 2010 was speculative and thus not likely to lead to meaningful evaluation, the drafters of the SEIS included at Appendix D an extrapolated estimate of possible impacts in the year 2020 in order to provide decision-makers with the analysis of possible impacts through the year 2020 prior to their taking action. The confirmation in Port Resolution 3245 by the Port Commissioners of the information in the EIS through the year 2020 indicates that this goal was accomplished. Moreover, the discussion of the information contained in the EIS at Attachment A to

Resolution No. 3245 shows that SEPA's goal of providing decision-makers with information to ensure an informed decision was well served in this case.

D. **Conclusions of Law Relating to the Alternatives Issue.**

24. Rather than require agencies to discuss every possible option repetitiously and at length, SEPA gives agencies great discretion in how to discuss alternatives and encourages agencies to simplify that discussion by using benchmark or representative alternatives. WAC 197-11-440(5).

25. The amount of space devoted to each alternative may vary. One alternative (including the proposed action) may be used as a benchmark for comparing alternatives. The EIS may indicate the main reasons for eliminating alternatives from detailed study. WAC 197-11-440(5)(c)(v).

26. A range of alternatives or a few representative alternatives, rather than every possible reasonable variation, may be discussed. WAC 197-11-440(5)(c)(vi).

27. An EIS need not discuss alternatives that are not reasonable, and reasonable alternatives include actions that could feasibly attain the project's goals with a lower environmental cost. WAC 197-11-440(5)(b).

28. The evidence shows that the ACC's proposed alternative is not a reasonable alternative (i.e., not practically feasible) and the Port was not required to consider it in the EIS.

29. In the alternative, assuming that the ACC's proposed alternative is a reasonable alternative, the EIS/SEIS considered representative shorter runways, including runways with staggered north thresholds, and identified their impacts to the decision-maker to the extent those impacts differed from the preferred alternative. Under the rule of reason and under the SEPA Rules that allow the lead agency to consider a few representative alternatives, rather than every possible configuration of runways that could possibly be placed on the STIA site, the Port's consideration of alternatives in the EIS/SEIS is legally sufficient. Here, the Master Plan EIS/SEIS clearly considered a reasonable range of runway lengths and configurations, including shorter-length runways and runways with staggered north thresholds, and correspondingly lesser construction fill impacts. This satisfies SEPA's rule of reason.

30. Under the rule of reason, the EIS/SEIS adequately disclosed the potential for less fill hauling from a staggered north threshold runway configuration.

31. The EIS adequately disclosed the potential numbers of truck trips from construction fill. With respect to the "swell factor" issue, the only relevant difference is the "swell" or "shrink" factor difference between the compacted in-place volume at the construction site and the volume in the trucks bringing the material to the construction site. The difference in volume between the in-bank material at a mining site and the product carried by a truck is not relevant in determining how many truckloads of fill material will be required to construct the proposed new runway improvements. With respect to the difference in "swell factor" between the compacted in-place volume at the STIA construction site and the volume in the trucks hauling the dirt to that construction site, the Port's analysis of construction impacts was legally adequate under the rule of reason. The Port's EISs used a

"swell factor" of 15 percent, which was reasonably based on regional conditions, empirical evidence from local contractors and material suppliers, and their experience obtained in similar projects. Moreover, the construction traffic analysis in the Master Plan EIS/SEIS used an overall conservative approach.

32. An EIS is not required to include a completed mitigation plan. Therefore, the ACC's argument that a final dirt haul mitigation plan is not in place has no legal merit. In addition, the Examiner concludes that the Best Management Practices proposed by the Port to mitigate potential impacts from construction hauling is more than adequate under SEPA's rule of reason.

33. Socioeconomic impacts are not "environmental" impacts cognizable under SEPA. Based on the evidence presented, the Port's EIS/SEIS was not legally required to discuss socioeconomic impacts. SEAPC v. Cammack II Orchards, 49 Wn. App. 609, 615-16, 744 P.2d 1101 (1987); WAC 197-11-448.

34. Any finding of fact deemed to be a conclusion of law is hereby adopted as a conclusion of law.

DECISION

Based upon the Findings of Fact and Conclusions of Law set forth above, it is the decision of the Hearing Examiner to uphold the adequacy of the Port's Master Plan Update EIS and SEIS and deny the appeal of the ACC.

DATED this 30th day of January, 1998.

Greg Smith

GREG SMITH
PORT OF SEATTLE HEARING EXAMINER

H

Honorable Robert H. Alsdorf
Trial Date: June 23, 1998

IN THE SUPERIOR COURT FOR THE STATE WASHINGTON IN AND FOR THE COUNTY OF KING

CITY OF DES MOINES, et al., Plaintiffs, v. PUGET SOUND REGIONAL COUNCIL, et al., Defendants.	No. 96-2-20357-2 KNT No. 97-2-13908-2 KNT No. 97-2-22276-1 KNT No. 98-2-04911-1 KNT
CITY OF DES MOINES, et al., Plaintiffs/Petitioners, v. PORT OF SEATTLE, et al., Defendants/Respondents.	**(CONSOLIDATED)** FINDINGS OF FACT, CONCLUSIONS OF LAW AND FINAL ORDER
CITY OF DES MOINES, et al., Plaintiffs, v. CENTRAL PUGET SOUND GROWTH MANAGEMENT HEARINGS Board, et al., Defendants.	

Judge Robert H. Alsdorf
King County Superior Court
Regional Justice Center
Kent, WA 98032
(206) 205-2620

AIRPORT COMMUNITIES COALITION, et al., Plaintiffs, v. PORT OF SEATTLE, et al., Defendants.	

This consolidated actions in this lawsuit challenge: (1) the legislative decisions of the Commissioners of the Port of Seattle adopting Port Resolution 3212 and Port Resolution 3245, which approved the Master Plan Update development actions at the Seattle-Tacoma International Airport, including construction of a new runway; (2) the Final Decision and Order ("FDO") of the Central Puget Sound Growth Management Hearings Board ("Board") in CPSGMHB Case No. 97-3-0014, which determining that the comprehensive plan of the City of Des Moines does not comply with the Growth Management Act ("GMA") and invalidating two plan provisions; and (3) the quasi-judicial Findings, Conclusions And Decision of the Port of Seattle Hearing Examiner upholding the adequacy of the Port's Master Plan Update environmental impact statement ("EIS") and supplemental environmental impact statement ("SEIS"). The court has read and considered the briefs of the parties and the administrative record as filed with the Court and as supplemented by order of the Court. On June 23, 1998, the court heard oral argument on all of the remaining claims in these four consolidated actions. On July 1, 1998, the Court received and reviewed supplemental briefing on HB 1487.

At oral argument, the petitioner Airport Communities Coalition and its constituent member cities ("Coalition") were represented by Cutler & Stanfield, L.L.P., and Perry Rosen, and by Cairncross & Hempelmann, P.S., and John Hempelmann. Respondents Port of Seattle, the Port of Seattle Commissioners, the Port of Seattle Responsible SEPA Official, and the Port of Seattle

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Hearing Examiner were represented by Foster Pepper & Shefelman PLLC and Tayloe Washburn and Roger Pearce. Respondent Central Puget Sound Growth Management Hearings Board was represented by the Washington Attorney General and Marjorie Smitch, and respondent Puget Sound Regional Council ("PSRC") was represented by Bricklin & Gendler, LLP, and Jennifer Dold.

Based on the its review of the administrative record and the briefs of the parties, and its rulings entered today concerning the application of WAC Ch. 365-195, the Court enters the following Findings of Fact, Conclusions of Law and Final Decision.

I. FINDINGS OF FACT

1. The Seattle-Tacoma International Airport ("STIA") is the primary commercial service airport for the Pacific Northwest region. STIA is the only airport that provides scheduled commercial air carrier service to the 2.8 million residents of the four-county Central Puget Sound area.

2. The Port of Seattle ("Port"), which operates STIA, is a special district unit of government under state law and is governed by an elected commission. The Port's governing commission is elected by the voters of King County.

The Background Regional Planning Studies Address the Region's Need for Improved Commercial Air Transportation Facilities at STIA.

3. In the mid-1980s, the Port completed the Airport Comprehensive Planning Review And Airspace Update Study, which concluded that the existing runway system at STIA would not be capable of efficiently serving the increasing demand for air traffic past the year 2000. The Federal Aviation Administration ("FAA") initiated an Airport Capacity Enhancement Study, which concluded that there was extensive delay at STIA, primarily in poor weather conditions, as a result of the close spacing of the two existing runways. In 1995, the FAA conducted a Capacity Enhancement Update Study, which confirmed the results of the earlier capacity study.

4. In 1989, the Port and the Puget Sound Regional Council of Governments initiated the Flight Plan Project to study alternatives and recommend solutions for meeting the region's long-term air transportation needs. As part of the Flight Plan Project, the Flight Plan programmatic EIS was

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prepared and issued in October 1992. The Flight Plan EIS analyzed 34 alternative strategies for meeting the region's air transportation needs. At the conclusion of the Flight Plan studies and public process in 1992, the Flight Plan Report recommended implementation of a multiple airport system, including the addition of a new air carrier runway at STIA.

5. In April 1993, the PSRC General Assembly adopted Resolution A-93-03, amending the Regional Transportation Plan ("RTP") to authorize development of a third runway at STIA: (1) unless a supplemental airport site was proven to be feasible to eliminate the need for a new runway at STIA, (2) after demand management and system management programs are achieved or proven not to be feasible, and (3) when noise reduction performance objectives were scheduled, pursued, and achieved based on independent evaluation and measurement of noise impacts. PSRC established a detailed process to implement Resolution A-93-03, including studies of supplemental airport sites, demand/system management, and existing noise management measures at STIA.

6. After these studies, PSRC concluded that there are no feasible sites for a major supplemental airport within the four-county region.

7. An independent panel reviewed demand/system management programs and noise reduction performance at STIA. That panel concluded that demand/system management would not eliminate the need for a third runway. The panel determined that the noise reduction standards of Resolution A-93-03 had not been met, however, and suggested additional noise reduction measures. The panel noted that the Port has been a national leader in efforts to reduce noise impacts on residents surrounding STIA. The Port's SeaTac Communities Plan, the Part 150 Noise Compatibility Plans, and the innovative Noise Mediation Project have collectively resulted in a series of measures expected to significantly reduce aircraft noise by the year 2001.

8. On July 11, 1996, the PSRC General Assembly passed Resolution A-96-02, which amended Resolution A-93-03 and included a third runway at STIA, with additional noise reduction measures, in the region's RTP.

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9. On January 23, 1998, this Court dismissed with prejudice the Petitioners' claims challenging PSRC Resolution A-96-02 and the SEPA review for that resolution.

The Port of Seattle's Master Plan Update for STIA and Preparation of the Master Plan Update Environmental Impact Statement.

10. In 1993, the Port initiated an Airport Master Plan Update for STIA, which identified and studied alternative means of meeting the following needs at the Airport: (1) improve the poor weather airfield operating capacity to an acceptable level of delay, (2) provide sufficient runway length to accommodate warm weather operations without restricting passenger load factors or payloads, (3) provide Runway Safety Areas that meet current FAA standards, and (4) provide efficient and flexible landside facilities to accommodate future aviation demand.

11. Also in 1993, pursuant to the National Environmental Policy Act ("NEPA") and the State Environmental Policy Act ("SEPA"), the FAA and the Port initiated preparation of a joint Master Plan Update EIS to analyze the alternatives to, environmental impacts of, and possible mitigating measures for the Master Plan Update improvements at STIA.

12. In 1995, the FAA and Port issued the Master Plan Update Draft EIS, conducted two public hearings, accepted and responded to voluminous written and oral comments, conducted additional studies, and prepared project revisions in response to public comments. The Coalition cities submitted detailed comments on the Draft EIS. Throughout the preparation of the Master Plan Update Final EIS, the Port coordinated with numerous agencies with technical expertise to ensure that the most appropriate methodologies for measuring impacts was followed. In particular, the issue of aviation demand forecasting was coordinated on an ongoing basis with the FAA.

13. On February 9, 1996, the Port issued the Master Plan Update Final EIS, which included all comments on the DEIS and the Port/FAA responses to each comment. Among other impact areas, the EIS identifies the quantity of fill needed for construction of the third runway and the various locations where the fill might be obtained. The EIS identifies numerous haul routes that could be used for transportation of fill. While there may be some flexibility in where the dirt is

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obtained and how it is transported to the Airport, the EIS recognizes that securing dirt and transporting it to the Airport is a necessary support activity for the expansion of STIA.

Port Adoption of Resolution 3212.

14. On August 1, 1996, the Port Commission adopted Resolution No. 3212, which attached and adopted the Airport Master Plan Update for STIA and granted approval to develop the third runway at STIA. Included with Resolution 3212 was a commitment to mitigate the impacts of the improvements at STIA based on the impacts identified in the Master Plan Update EIS. This list of mitigation measures was in addition to the noise reduction measures called for by the PSRC in its Regional Transportation Plan, which the Port also committed to in Resolution 3212. The mitigating measures are found at Attachment D to Resolution 3212. The PSRC noise mitigation measures are included as Attachment E to Resolution 3212. The mitigation measures included in Resolution 3212 addressed noise, land use, water quality, wetlands, plants and animals, earth, and construction impacts.

The Port's Preparation of the Master Plan Update Supplemental EIS.

15. After publication of the FEIS, the FAA Office of Aviation Policy and Plans in Washington, D.C., issued its fiscal year 1996 Terminal Area Forecast ("TAF") for the nation's airports, including STIA. The fiscal year 1996 FAA TAF predicted levels of aircraft operations and passenger enplanements at STIA that exceeded the numbers of operations and enplanements in the Master Plan Update Final EIS.

16. When the FAA's 1996 TAF was released, a review of the aviation forecasts at STIA was initiated to identify why the forecast was higher and how it would affect the Master Plan Update. P&D Aviation, the Port's Master Plan Update contractor, evaluated the FAA 1996 TAF and supported its general conclusions that activity could grow faster than identified by the Master Plan Update aviation forecasts. This evaluation led to the development of new Port aviation forecasts that showed aircraft operations and passengers estimated to be approximately 17 percent greater (for

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planning year 2010) than the primary Master Plan Update FEIS forecast. To fully evaluate the possible project-level impacts (and potential mitigation measures) based on the new Port forecasts, the FAA and the Port commissioned a Supplemental EIS ("SEIS").

17. The Draft SEIS (containing a draft Clean Air Act Conformity Analysis) was released in February 1997. In the SEIS, the horizon for the project-specific impact analysis was revised from the year 2020 to 2010 for a number of reasons, including the following: aviation demand had become impossible to forecast with substantial accuracy beyond 2010, airline ticket prices (the primary prediction of aviation demand) had become impossible to reasonably forecast beyond 2010, airline fleet mix and engine mix were not reasonably predictable beyond 2010, new aviation engine technology was not predictable beyond 2010, and background surface traffic was not reasonably predictable beyond 2010 because major transportation projects in the STIA vicinity had been recently and drastically revised.

18. Although the SEIS concluded that detailed impacts could not be meaningfully predicted and analyzed beyond 2010, in order to aid the decision makers using the SEIS, the SEIS contained at Appendix D projections of impacts (based on assumed steady growth rates) to the year 2020, as well as a higher growth rate scenario. Appendix D also contained a projection of impacts based on a higher assumed growth rate.

19. The Coalition cities commented extensively during the comment period following issuance of the Draft SEIS. After reviewing and responding to the Coalition cities' comments and extensive agency and public comments, the Final SEIS (and final Clean Air Act Conformity Analysis) was published on May 13, 1997. The Coalition cities appealed the adequacy of the EIS/SEIS under SEPA to the Port's Hearing Examiner, but have not challenged it under NEPA.

The Master Plan EIS/SEIS Shows the Unique Situation at the Seattle-Tacoma International Airport.

20. The Master Plan EIS/SEIS shows the special circumstances at STIA, which do not affect most U.S. airports. First, STIA is the only commercial airport in the region and is the primary

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air transportation hub of Washington state and the northwestern United States. As measured by total passengers, STIA is the 21st busiest airport in the country. It is the 18th busiest cargo airport. Because of the central Puget Sound's relative isolation from other parts of the country, there are no other commercial airports within a reasonable driving distance from STIA. Second, the primary problem affecting air transportation at STIA is delay. Although delay is currently a problem during bad weather conditions, those conditions occur 44 percent of the time at STIA. It is not unreasonable to conclude that STIA currently operates at an unacceptable level of delay during bad weather conditions, and that, if the Port does nothing, such delay will dramatically increase in the upcoming decade.

21. Regional planning studies document a critical need to improve the central Puget Sound region's ability to meet the increasing demand for air transportation services. The regional planning body has decided that "there are no feasible sites for a major supplemental airport within the four-county region." Thus, after 10 years of planning, it is not unreasonable to conclude that improvements at STIA are the region's only feasible solution for its air transportation needs.

Port Adoption of Resolution 3245.

22. On May 27, 1997, the Port Commission reaffirmed the approvals and commitments made in Resolution 3212, including the adoption of the revised STIA Master Plan Update and the commitment to undertake the noise reduction measures called for in PSRC Resolution A-96-02. Resolution 3245 included both a summary of the Commissioners' decision-making process (Attach. A) and an updated and expanded list of mitigating measures (Attach. D to Resolution 3245). The Resolution noted that the Final EIS and SEIS included a more complete list of possible mitigating measures. The list of mitigation measures included in Resolution 3245 was subject to further refinement and revision as plans were finalized and permitting processes were completed.

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The FAA's Record of Decision.

23. On July 3, 1997, the regional administrator for the FAA's Northwest Mountain Region issued a Record of Decision ("ROD") approving the Master Plan Update at STIA. In accordance with the requirements of the Airport and Airways Improvements Act, the ROD provides comprehensive mitigation for the impacts of the third runway project. The ROD includes at Appendix B a June 30, 1997 letter from Washington State Governor Gary Locke on behalf of the Washington State Department of Ecology to the Secretary of the U.S. Department of Transportation which provides "reasonable assurance that the proposed airport development project involving the SeaTac Airport third runway will be located, designed, constructed and operated so as to comply with applicable air and water quality standards." The ROD concluded that "all practical means to avoid or minimize environmental harm have been adopted through appropriate mitigation planning."

24. The ROD also contains an analysis of the impacts of the project and a list of mitigation measures required by the FAA. There are comprehensive federal mitigation requirements under the Airport and Airway Improvement Act ("AAIA") and the Clean Air Act. The ROD mitigation measures include noise, land use, archeological, cultural and historic resources, social and induced socio-economic impacts, air quality, water quality, construction, erosion and sedimentation control, wetlands, flood plains, surface transportation, plants and animals, services/utilities, earth, hazardous substances, and construction impacts.

Port/SeaTac Interlocal Agreement.

25. Before the adoption of the Port resolutions, the City of SeaTac ("SeaTac") and the Port were pursuing discussions concerning the regulatory authority of the two jurisdictions on airport and airport-related projects. These negotiations culminated in an Interlocal Agreement dated September 4, 1997 ("ILA"), which resolved the outstanding jurisdictional issues. Because SeaTac is the host jurisdiction for the STIA expansion, the ILA contains proposed land use policies to ensure

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the consistency of the SeaTac Comprehensive Plan with the STIA expansion. The ILA also included additional mitigation measures committed to by the Port to address the impacts of STIA expansion.

The Port's Commitment to Comprehensive Mitigation of the Impacts of the Master Plan Update Development Actions.

26. The Port of Seattle, in Resolution 3245, committed to comprehensive mitigation for the impacts of the Master Plan Update development actions, as disclosed in the EIS and SEIS. Those mitigation measures are set forth in Appendix D to Resolution 3245. Most of the Port's mitigation measures are also required by the FAA, pursuant to the Airport and Airways Improvement Act, and outlined at Appendix F to the FAA's ROD.

27. With respect to noise impacts, mitigating measures include:

- acoustical insulation of noise sensitive facilities such as schools, multi-family residences. and institutional uses;
- acoustical insulation of nine significantly impacted buildings;
- acoustical insulation of all eligible single family residences on the Port's waiting list prior to operation of the new runway;
- acoustical insulation of all single family residences that become eligible, based on the Master Plan Update development actions, prior to the operation of the new runway;
- directional soundproofing for homes already insulated;
- acquisition of residences in the Approach Transition Area;
- continuation of the existing noise abatement and noise remedy program at STIA;
- updates of the FAA Part 150 noise studies;
- continued work with local communities in locating compatible land uses near the airport; upgrading the noise monitoring equipment at STIA;
- work with the FAA to reduce reverse thruster use, to voluntarily reduce night flights, and to minimize the number of variances to the noise limitations program;
- work with foreign airlines to ensure the use of Stage 3 aircraft;

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- work with operators to reduce the number of Stage 2 aircraft and to minimize night engine testing;
- design and implement a noise compatible land use plan for properties in the acquisition zone;
- complete the public buildings insulation pilot studies; and
- seek FAA commitment to preventing violations of north flow nighttime departure procedures.

28. With respect to mitigation of air quality impacts, the air quality agencies have determined that the Master Plan Update development actions will be in conformance with the State Implementation Plan (SIP) and will meet National Ambient Air Quality Standards (NAAQS). Thus, no mitigation is required. Nevertheless, to ensure conformity, the Port, pursuant to a Memorandum of Agreement with the air quality agencies, has committed to fund air measurement studies by DOE in the vicinity of STIA. The Port has also committed to detailed Best Management Practices during construction to ensure that significant air pollution levels do not occur during construction. In addition, the number of annual heavy-duty diesel trips during construction has been limited by the FAA in its ROD.

29. With respect to mitigation of impacts to wetlands, the Port has committed to avoiding and minimizing fill of wetlands whenever possible. For required wetland fill and creek relocation, the Port has committed to no net loss of wetlands and wetland functions. The EIS and SEIS propose replacement of the wetland functions and values in the vicinity of STIA, to the extent such replacement is compatible with safe aircraft operations. The Port has proposed to replace all wildlife attractant values by constructing compensatory wetlands in Auburn. Compensatory mitigation for creek relocation is also proposed.

30. With respect to mitigation of water quality impacts, the Port has proposed a stormwater management plan for the new runway that includes the following:

- detention criteria based on DOE standards;

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- stormwater outlets designed to reduce channel scouring, sedimentation and erosion, and to improve water quality;
- stormwater outlets with flow dispersion compatible with stream mitigation;
- an ongoing maintenance plan for existing and proposed new stormwater facilities.

Water quality mitigation also includes compliance with the mitigating conditions in the Port's National Pollution Discharge Elimination System (NPDES) permit, which is re-examined and revised from time to time by the Department of Ecology. In addition, a construction erosion and sedimentation control plan will be prepared for the construction of the Master Plan Update improvements, which will incorporate Best Management Practices, including:

- erosion control measures such as mulching, silt fencing, sediment basins and check dams;
- spill containment areas to capture and contain any spills at construction sites and prevent their entry into surface or ground water;
- installation of temporary fuel storage and maintenance areas to reduce the potential for spills and contamination;
- phasing of construction activities to minimize the amount of area that is disturbed at any one time;
- use of temporary and permanent terraces for fill slopes and cut slopes to reduce erosion and to reduce transport of eroded materials; and
- installation of gravel and wheel wash facilities on construction equipment access roads to minimize transport of sediment onto nearby roadways.

31. With respect to mitigation of construction impacts, the Port has committed to prepare a construction and earthwork management plan to govern acquisition and placement of fill material for the Master Plan Update development actions. The plan will address the methods for acquiring and transporting fill material, including designation of haul routes, hours of operation, traffic control and route mitigation. The final content of the plan will depend on the methods of transport

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ultimately selected. The Port has also committed to a construction acquisition plan in order to mitigate the disruption that could occur in the general vicinity of the proposed new runway construction. The Port has also committed to the extensive Construction Best Management Practices identified in the Final SEIS at Table 5-4-8 (SEIS at pp. 5-4-37 through 5-4-41).

32. With respect to mitigation of land use impacts, the Port has committed to the mitigating conditions for noise discussed above. In addition, the Port has committed to work with surrounding communities to develop compatible land use plans with the airport uses, to prepare a compatible land use plan for the acquisition areas acquired by the Port for noise mitigation, and to evaluate the acquisition of properties in the approach transition areas.

33. With respect to mitigation of transportation impacts, many of the transportation improvements and parking improvements are included in the Master Plan Update proposal itself. In addition, the Port has agreed to support and share in the costs of developing the 28th/24th Avenue South arterial and airport link roadway, to support the planned development of SR-509 by the State of Washington, to develop the south airport access solution if SR-509 does not proceed for any reason, to plan jointly with the City of SeaTac on transportation issues, and to construct roadway improvements at the intersections of 24th Ave. S./S. 154th St. and at SR-99/S.160th St.

Growth Management Hearings Board Decision on City of Des Moines' Plan.

34. In February 1997, the Port filed a petition with the Central Puget Sound Growth Management Hearings Board ("Board") challenging numerous policies in the Comprehensive Plan of the City of Des Moines ("Des Moines Plan") as violative of the GMA. CPSGMHB Case No. 97-3-0014.

35. On August 13, 1997, the Board entered a Final Decision and Order ("Board FDO"), unanimously ruling that the Des Moines Plan did not comply with the GMA and invalidating two plan policies. The Board ruled that STIA was an essential public facility ("EPF"), protected by RCW 36.70A.200. The Board also held that the expansion of an existing EPF, including necessary

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support activities associated with that expansion, was protected by RCW 36.70A.200. The Board determined that the Des Moines Plan unlawfully precluded, by making impossible or impracticable, expansion of STIA.

36. The Board ruled that the Des Moines Plan violated the GMA because the Plan expressed the City's clear intent to exercise its municipal authority to prevent expansion of STIA, not to mitigate its impacts. The policies at issue in the Des Moines Plan did not require mitigation, but instead directed the City to oppose any new facilities at STIA that increased the impacts to the City of Des Moines. The Board did not rule that the Port could avoid reasonable mitigation of adverse impacts associated with the expansion of STIA.

37. Two members of the Board decided that it was unnecessary to reach the issue of whether the Des Moines Plan also violated the interjurisdictional plan consistency and countywide planning policy consistency requirements of RCW 36.70A.100 and .210. One Board member decided that the Plan violated these provisions as well and wrote a concurring opinion to that effect.

38. In addition to finding the Des Moines Plan not in compliance with GMA, the Board invalidated two Des Moines Plan policies because those policies substantially interfered with GMA's transportation goal which requires local governments planning under GMA to "[e]ncourage multimodal transportation systems that are based on regional priorities and coordinated with county and city comprehensive plans." Those invalidated policies are strategy 1-04-05 and strategy 5-04-04:

- Strategy 1-04-05: Intergovernmental Cooperation/Annexation: (1) When decisions are made by state, county, regional agencies, tribes , or special purpose districts, and those decisions are clearly in the best interests of the state, county or region, take appropriate measures to implement those decisions within Des Moines and the Planning Area, unless the decisions unfairly or negatively affect the residences or businesses in the Des Moines area. (Emphasis added.)

- Strategy 5-04-04: Adopt development regulations as needed that provide a process for the identification and possible siting of essential public facilities. Cooperatively work with surrounding municipalities and King County during the siting and development of facilities

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of regional significance. Oppose new facilities associated with Sea-Tac International Airport that increase adverse impacts to the City of Des Moines. (Emphasis added.)

39. The record before the Board shows that in order to construct the STIA improvements planned for in the Port's Master Plan Update, it is necessary for trucks hauling fill dirt to travel through the streets of one or more of the cities of SeaTac, Des Moines, Burien, Tukwila and Normandy Park.

40. The record before the Board shows that the City of Des Moines developed and adopted certain comprehensive plan policies and development regulations which would permit it to stop trucks moving fill, and thereby to directly or indirectly prevent STIA expansion.

41. Since 1993, the Coalition cities have entered into a series of interlocal agreements with the primary stated purpose being to "stop the construction of any additional runways" at STIA.

42. Under the GMA, airports such as STIA are expressly included in the definition of essential public facilities.

The Decision of the Port of Seattle Hearing Examiner Finding the EIS and SEIS to be Legally Adequate.

43. The Master Plan Update Final EIS was issued in February 1996. In Port Resolution 3212, the Port determined that EIS was legally adequate for its decision to approve the Master Plan Update development actions. Because of the changed forecasts of aviation activity at STIA, the Port and FAA prepared the Master Plan Update SEIS. The Master Plan Update Final SEIS was issued on May 13, 1997. In Port Resolution 3245, the Port determined that the SEIS was legally adequate for its decision to approve the Master Plan Update development actions as amended. Both EISs were administratively appealed by the Coalition cities to the independent Hearing Examiner of the Port of Seattle.

44. The Hearing Examiner reviewed the extensive record on the EISs, reviewed written testimony submitted by all parties, and heard five days of testimony and legal argument on December 1 through 5, 1997. On January 30, 1998, the Examiner issued a detailed Findings,

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Conclusions And Decision ("Examiner's Decision"), which held that the EIS and SEIS are legally adequate.

Findings Relating to the EIS Forecast Methodology and Analysis.

45. The Coalition argues that the EIS is inadequate because the forecasts on which it is based show the same number of enplanements (passengers) under both the With Project and No Action alternatives.

46. When the Port and the FAA began preparation of the Master Plan Update EIS, they retained P&D Aviation to prepare the forecast that served as the basis for the Master Plan Update EIS (the "1994 forecast"). Later, in 1996, when a decision was made to update the forecast, the Port again retained P&D Aviation to prepare the updated forecast (the "1996 forecast"). P&D Aviation had experience in preparing aviation forecasts for the Puget Sound region, having prepared the forecast that served as the basis for the Flight Plan EIS issued by the Port and the PSRC in 1992.

47. The forecasting expert at P&D Aviation primarily responsible for the preparation of the STIA forecasts was Stephen L. Allison, Senior Aviation Planner. Mr. Allison has 30 years experience in the aviation planning and consulting field, having served as project manager or lead aviation planner on the development of over 30 airport master plans and regional aviation system plans. While he functions as project manager or lead aviation planner on a variety of airport planning assignments, his specialty is the preparation of forecasts of aviation activity for individual airports and multiple-airport regions.

48. The approach used in preparing the STIA forecasts is widely accepted and used throughout the aviation industry. Mr. Allison generally described the process utilized as consisting of the following steps:

- Analyze historic airport activity data and trends (such as passengers, air cargo, and aircraft operations).

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- Assess the conditions and factors which influence the demand for aviation activity, including the local and national economies, air fares, changes in airline service, competing airports, technological advances in telecommunications, and international economic growth and bilateral agreements.
- Obtain input from the aviation community, particularly the airlines serving STIA, to obtain their opinions regarding the future of aviation demand in general and at STIA.
- Develop a mathematical relationship between a component of airport activity (e.g., domestic passengers) and the factors (explanatory variables) which are historically shown to strongly affect it. Evaluate this mathematical relationship, or "model," to ensure that it is logical for forecasting aviation demand and passes key statistical tests.
- Obtain projections of the factors in the model affecting airport activity, then use the model with the projected factors to derive a forecast of the airport activity.
- Evaluate the probable effects on the forecast of factors not explicitly accounted for in the model, such as telecommunications, demand management techniques, and high speed rail.
- Develop alternative forecast approaches as a check against the results of the model.
- Prepare upper-range and lower-range forecasts based on the alternative approaches to illustrate the potential range of outcomes.
- Compare the master plan forecast with forecasts prepared in other studies (such as flight plan) and by the FAA and evaluate differences in the purpose for the forecast, the forecast approach, and assumptions.

49. The evidence showed that three factors stand out as having the greatest correlation with aviation demand at STIA and the greatest predictive value for estimating future aviation demand at STIA. These three factors are (a) the population of the airport's service area, (b) personal

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income in the service area, and (c) average air fares. Higher population and personal income have a positive effect on demand for air travel, and higher air fares influence demand negatively.

50. The models used by P&D Aviation for the 1994 and 1996 forecasts were tested against actual aviation activity at STIA from 1973 through 1993. The 1994 model showed a 99.6% correlation with domestic passenger variation, and the 1996 model showed 99% correlation. These statistics indicate that the factors used in the P&D forecasting models are excellent in explaining past variations in numbers of passengers at STIA.

51. The forecasts prepared by P&D Aviation were reviewed by the FAA's Northwest Mountain Region. The FAA reviewed the forecasts in terms of the methodology, forecast variables used, statistical measures, and reasonableness of the overall results. The FAA accepted the P&D forecasts and approved their use for the preparation of the EISs.

52. The forecasts were also reviewed by Landrum & Brown, Inc., the prime consultant selected by the Port and the FAA to prepare the Master Plan Update EIS and SEIS. The individual at Landrum & Brown primarily responsible for the review of the forecasts was Douglas F. Goldberg, Vice President and Leader of the firm's Facilities and Operations Practice. Mr. Goldberg has 14 years of experience in aviation and airport planning, has been involved in the planning of over 30 airports in the U.S. and abroad, and has participated in demand forecasts at a variety of major U. S. airports.

53. Mr. Goldberg reviewed the forecasts prepared by P&D Aviation and found them consistent with the industry standard accepted methodology and properly prepared. He testified that the methodology used by P&D Aviation has been used to provide the basis for implementing improvements at most of the major airports throughout the U.S. Landrum & Brown has applied this technique to develop aviation forecasts for many airport clients around the world, including the City of Chicago Department of Aviation and its two primary airports O'Hare and Midway.

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54. The ACC presented the testimony of economist Dr. Clifford Winston, in support of its challenge to the aviation forecasts. Dr. Winston stated that expanded airport facilities, including a third runway, would themselves cause a growth in demand for air travel. It was his position that, by not taking this factor into account, the STIA forecasts understated the actual demand that will occur once the improvements are constructed.

55. In response to Dr. Winston, the Port presented the testimony of expert Mr. Allison, Mr. Goldberg and Ms. Mary Vigilante, all of whom disagreed with Dr. Winston's positions. The Examiner found the testimony of the Port's witnesses to be credible that aviation demand at STIA is not caused by expanded airport facilities and not constrained by the delay characteristics as STIA, so long as there is sufficient airport capacity to serve the passengers who wish to fly. Thus, aviation demand at STIA can be adequately predicted by using population and income characteristics of the market area, along with air fares. This is particularly true for STIA, because there are no other airports in the region that can meet the demand and because the delays occur during poor weather conditions which are not predictable.

56. Mr. Allison and Mr. Goldberg disagreed with Dr. Winston's position. The Hearing Examiner found the testimony of Mr. Allison and Mr. Goldberg credible that delay at STIA occurs in poor weather conditions and poor weather primarily affects arrivals rather than departures. Because poor weather, particularly on arrivals, is not predictable, the delay is not likely to have a significant impact on travelers' decisions. Moreover, airlines can incorporate delay into their flight schedules and incorporate sophisticated flight consolidation procedures. There are no other airports in the Puget Sound Region that provide an alternative to STIA. Moreover, even with the average delays projected for STIA during the planning horizon, alternative modes of travel (such as automobile travel) will still be considerably longer than air travel. For all these reasons, it is unlikely that reductions in delay at STIA caused by the Master Plan Update will result in substantial additional demand for air travel.

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57. In response to the ACC's argument that increasing delay at STIA without the project will reduce demand, the Examiner found the testimony of Mr. Goldberg and Mr. Allison to be credible that there will be sufficient capacity at STIA to accommodate passenger demand through the Master Plan Update's planning horizon (beyond the year 2010). That is, through modest adjustments in the number of passengers per airplane and the size of aircraft, as well as the hours of operation, STIA has the capacity to accommodate all the projected passenger demand through the planning horizon. This available capacity at STIA would likely accommodate the demand even as average delays increased, because that has been the experience at other congested airports. Other airports in the U.S. currently operate with levels of delay at or greater than the delay levels projected for STIA beyond 2010. At some of these airports, such as O'Hare, the level of activity is such that the FAA has imposed limits on the number of operations during most of the day. Despite the high levels of delay and the limits on operations, the activity levels at these airports have continued to increase in response to the demand. Therefore, it is not likely that increasing delays at STIA will significantly constrain demand between now and 2010.

58. Dr. Winston hypothesized that an increase of runway capacity and an expansion of terminal and ground transportation facilities would enable the airport to expand the number of aircraft operations. However, as testified to by Mr. Goldberg and as found by the Examiner, the addition of the proposed third runway will not add significant new capacity at STIA during good weather conditions, which occur approximately 56% of the time. The purpose of the new runway is to improve efficiency in poor weather conditions, i.e., to provide two streams of aircraft traffic during poor weather conditions, the same as occurs now in good weather conditions. Because poor weather is not predictable, the addition of capacity in poor weather conditions should not have a significant effect on the demand for air travel.

59. Based on Dr. Winston's testimony, the ACC also argued that expansion of the airport facilities will lead to greater airline competition and reduced operating costs, thereby reducing air

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fares and inducing more air travel. Again the Examiner found the testimony of the Port's witnesses more credible that the improvements at STIA will not result in greater airline competition because airlines add flights in response to increasing demand not in response to increased airport capacity. STIA already enjoys a high level of airline competition and comparatively lower air fares than the rest of the country. In addition, reduced airline delay costs will not likely result in lower air fares. Savings from delay costs will be partially offset by the airlines' share of the capital improvement expenses. Also, the savings from reduced delay costs, when spread among all airline passengers, represents a small percentage of air fares and will not likely have a major impact on travel demand.

60. Dr. Winston also argued that more efficient and reliable air service would be a stimulant to regional economic growth which, in turn, would generate increased demand for air travel. As the testimony of the Port's witnesses showed, however, for economic growth in a region to be affected by airport improvements, there would have to be a major change from extremely inadequate service to adequate or better service. STIA already provides adequate or better air service, so the STIA improvements will not result in significant new economic growth in the region. In addition, as Mr. Goldberg testified, the EIS aviation forecasts did not assume any constraints in airport capacity, so it would be illogical to include in the forecasts a factor for increased aviation activity resulting from the airport improvements. Also, Mr. Goldberg testified that Denver, which recently constructed a new five-runway modern airport, actually has experienced a decline in the number of passengers and operations following completion of the new airport.

61. Finally, Dr. Winston testified that he developed a model to test whether the addition of a runway fuels growth in aviation demand. Applying his model to the top 150 airports in the country, he concluded that there is a statistical correlation between the number of runways and the amount of aviation activity at an airport. This, he argued, is evidence that an additional runway at STIA would cause additional growth. Again, the Examiner found the testimony of Mr. Allison and Mr. Goldberg more credible on this point. As they testified, Dr. Winston's analysis did not test for a

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cause and effect relationship and can only show that a correlation exists between airports with high demand and airports with multiple runways. That is, the Winston analysis demonstrated that airports with greater aviation activity generally have more runways than airports with less activity. This does not demonstrate that the additional runways were the cause of greater activity levels, and it could demonstrate nothing more than that busy airports build runways. In addition, the statistical correlation found by Dr. Winston was weak.

62. As Mr. Allison testified, the addition of the second runway at STIA did not result in increased aviation demand. The second runway was built after a period of rapid growth at the airport, but this growth was not sustained after the construction of the runway. The number of passengers grew at an annual average rate of 14.8 percent in the five years before the runway was completed and at an average rate of 3.8 percent in the three years after the runway was completed. A similar pattern occurred with regard to the number of operations. The Examiner found Mr. Allison testimony credible that this is not an unusual occurrence. Airport activity is typically cyclical (reflecting economic cycles), with activity growing rapidly for several years then growing more slowly for several years, and is not dependent on the construction of new runways.

63. The Final EIS included at Appendix R, and the Final SEIS included at Appendix D, analyses of certain "what if" scenarios that respond to the comments that growth in aviation activity might be higher than forecast. In these appendices, the Port considered the possible impacts if added airport capacity results in higher aviation activity. In Appendix D of the SEIS, the Port even considered the potential differences in impacts between (a) a With Project scenario in which operations and enplanements grew at a 10% faster rate than forecasted and (b) a Do Nothing scenario in which it was assumed that the number of operations and enplanements would be limited to their 2010 levels.

64. The ACC asserted that if Dr. Winston's theory is correct, that air pollution and noise would increase with the number of operations. However, increased number of operations under the

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With Project scenario does not necessarily translate to a comparable increase in air pollution. Eugene R. Peters is a Director with Landrum & Brown. He has over 10 years of environmental planning experience and has conducted the analysis of airport-related activity on regional air quality on airports throughout the country. Mr. Peters provided a detailed analysis in his written testimony that was consistent with the SEIS conclusion that NOx will decrease even as the number of operations increases out to 2010, due to the impact of the reductions in delay which accompany the construction of the 3rd Runway.

65. With respect to noise, the Port presented credible testimony from Mr. Jon Woodward. Mr. Woodward has more than 25 years experience in program design and noise assessment and land use analysis. He has prepared over 1500 noise contour studies in his career. He has worked on noise studies at major airports throughout the country, including Dallas-Ft. Worth, Los Angeles International, Cincinnati, St. Louis, Chicago O'Hare and Toledo. Mr. Woodward was in charge of preparing the noise contours for the EIS. Mr. Woodward corroborated analysis in the EIS which demonstrated the declining size of the 65 DNL noise contours under a do-nothing scenario between 1994 and the year 2010. Despite the anticipated increase in operations at STIA, noise impacts are expected to decline in the future relative to existing conditions. As Mr. Woodward testified, even if the operations forecast projected by Dr. Winston were to occur, the resulting effect would be an expected increase of 7/10 of one decibel (0.7 dBA) on average noise levels. Based on the FAA threshold of significant impact of 1.5 DNL, the 0.7 dBA would not be significant. If any of the current technological initiatives now under way by NASA achieve even 10% of their goals (i.e., one decibel reduction), this would more than offset the increased noise levels associated with the difference in forecasted operations alleged by Dr. Winston.

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Findings of Fact on the Port and FAA's of Decision To Limit Detailed Analysis in the SEIS to 13 Years (to the Year 2010).

66. At the time the Master Plan Update EIS was prepared in 1994, the airfares nationally and at STIA were relatively stable. Thus, those charged with preparing long-term airport forecasts believed they could consider larger planning horizons than normal.

67. Several factors came together in the time period between the MPU EIS in 1994 and the SEIS in 1996, each of which added significant uncertainty to the planning efforts of those professionals charged with attempting to meaningfully evaluate long-term impacts under SEPA and NEPA. The EIS consultants agreed with the EIS Project Manager Mary Vigilante that these factors made it very difficult to meaningfully evaluate the environmental impacts of the Master Plan Update beyond the year 2010.

68. The testimony of the professionals participating in the SEIS establishes that in various key areas, the SEIS- period of analysis of 13 years falls squarely within the typical range for studies of this type throughout the country. Mr. Peters testified that the air quality studies varied the study period from 5-15 years in the future. In the noise area, Mr. Woodward testified that noise contour studies for new runways typically run on a 10-12 year planning horizon.

69. While the Coalition emphasizes the relationship of the planning period to the anticipated construction date, the runway in the year 2004, a more proper context is to review the length of the planning period from the date of the SEIS in 1996. The planning period evaluated by the Port and FAA was 13 years.

70. One of the principal decision makers in the determination of the planning horizon in SEIS was the EIS Project Manager Mary Vigilante. In addition to extensive airport project management experience, Ms. Vigilante has specialized experience in both air quality and noise analysis fields. She conducted much of the original analysis, as well as the response to comments in

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all of the project level environmental documents. In addition to the reasons set forth in Appendix D of the SEIS, she testified credibly that there were rapid changes in aviation activity during the mid-1990s at STIA, which made forecasting aviation activity very difficult. Ms. Vigilante and all the experts on the SEIS team concluded that detailed analysis of the years beyond 2010 in the EIS would be speculative and could lead to a substantially inaccurate evaluation of environmental effects. The quantification of project-level environmental impacts is dependent on factors such as total aviation activity, the time of day the activity occurs, the aircraft types, and the engines on the aircraft. Even slight changes in aircraft types and their associated engine types, for instance, can result in substantially different impact analysis. Due to the various volatile factors identified and because aircraft fleet mix and air fares are could not be reasonably predicted beyond 2010, the SEIS concluded that impacts could not be reasonably evaluated beyond this time period, 13 years into the future. Ms. Vigilante also described in detail the different forms of future environmental review, both state and federal, which will analyze possible adverse environmental impacts of the Master Plan Update during the period after 2010.

71. One of the greatest changes following issuance of the Master Plan EIS was the 1996 change in projected airfares announced by the FAA. With respect to the Port's updated aviation demand forecast prepared for the SEIS, after calibrating for local data, this resulted in an 17% increase in the number of operations anticipated at STIA for the year 2010 over the number of operations anticipated under the 1994 Master Plan forecasts. The volatility in projected airfares represented by the FAA's changed airfare projections makes it more difficult to reasonably estimate long-term trends in number of aircraft operations, fleet mix, or day/night operations. Moreover, when the SEIS was prepared, the FAA only estimated airfares to the year 2010 and not beyond.

72. The forecasting uncertainty that surfaced in 1996 significantly changed the ability to analyze long-term forecasts, fleet mix, day/night operations, and created a corresponding uncertainty for the professionals charged with evaluating long-term air quality and noise impacts. This level of

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uncertainty did not exist two and one-half years earlier, when the Master Plan EIS was being prepared.

73. The preparation of the air quality analysis in the SEIS was the product of collaboration among the three agencies with regulatory authority in this area, the Puget Sound Air Pollution Control Agency ("PSAPCA"), the Washington State Department of Ecology ("DOE") and the U.S. Environmental Protection Agency ("EPA"). DOE retained an independent consultant to assist in detailed review and preparation of comments in its review of the SEIS. All three agencies participated in the air quality analysis which found that the year 2010 was the logical planning horizon for air quality impacts. Although the three agencies had many questions during the process and in their comments on the draft SEIS, all three approved the final air quality analysis contained in the final SEIS.

74. As Mr. Gene Peters testified, the volatility in airfares, forecasts, fleet mix, and other areas in the period following 1994 made it difficult in 1996 to predict with substantial accuracy or to reasonably foresee air quality impacts beyond the year 2010.

75. The uncertainty of long-term airfare projections and the resulting fluctuation in aircraft operation forecasts at STIA added a significant element of uncertainty in the ability of the noise measurement professionals to prepare reliable long-term noise contours in the SEIS. While it is theoretically possible to run noise contours, as testified by the experienced noise professionals Paul Dunholter and Jon Woodward, the reliability of this modeling diminishes significantly as one goes further out in time. Their unrebutted expert testimony was that, while a range of assumptions or alternatives is theoretically possible, the usefulness of such an exercise is questionable because it is not likely to lead to meaningful evaluation.

76. Because of the lack of reliable data beyond the year 2010 to input into the standard noise model (the INM model), the noise professionals in the SEIS limited detailed analysis to thirteen years, because noise impacts analysis beyond that time would be speculative and not likely

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to lead to meaningful evaluation. In the future, there will be several additional steps of environmental review which will be completed when those impacts are more capable of being meaningfully evaluated. These include Part 150 Noise Compatibility Program, future chapters of the Port's Master Plan Update process, and any future planning and environmental review required under the terms of the FAA Record of Decision

77. The advent of Southwest Airlines to STIA has since 1994 had a significant impact on the fleet mix at the Airport by Southwest and its airline competitors. There has been a significant change from three and four-engine aircraft to medium-sized two-engine jet aircraft. The change in fleet mix translates directly into significant changes in the resulting air pollution emissions. This recent volatility made long term analysis of air quality impacts more difficult in 1996 than in 1994

78. The inability to reasonably forecast aviation demand beyond 2010 made it impossible to reasonably model intersection-by-intersection traffic impacts beyond 2010. In addition, there were also independent changes following issuance of the Master Plan EIS which made meaningful evaluation of surface transportation impacts speculative in and around STIA beyond 2010. The long-term analysis of background surface traffic depends to a large extent of the PSRC's regional model, which was used by traffic expert Jim Edwards and INCA Engineers as the foundation for its analysis of background traffic in the Master Plan EIS and the SEIS. When the SEIS was getting underway, there were three major changes affecting arterials and intersections in the vicinity of STIA, none of which was included in the PSRC model.

79. First, the state's largest public infrastructure project, the Regional Transportation Authority ("RTA") dramatically changed in scope following issuance of the EIS, from a $13 billion project to a $3-4 billion project. This change would radically alter the impact at intersections and arterials in and around STIA after 2010 in ways that could not be fully understood in 1996, because the impacts of this change were not yet known or included in the PSRC model.

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80. Second, the state highway adjacent to STIA, SR 509, also experienced major planning changes following issuance of the Master Plan EIS. The route and connections for the proposed extension of SR 509 to Interstate 5 was changed. Given its proximity to the Airport, this change would also have very significant impacts on the analysis of traffic intersections in the area after the year 2010. As explained by Mr. Edwards, the specifics of this new proposal was not known in 1996 and was not included in the PSRC traffic model on which INCA relied to conduct its analysis.

81. Third, the City of SeaTac's proposed Personal Rapid Transit system, which was very conceptual in 1994 when the EIS was issued, was two years further into the planning process by 1996. As this was proposed in the jurisdiction surrounding STIA, if constructed it too would have significant impacts on traffic in the area, which impacts were able to be evaluated and not included in the PSRC model.

82. In addition to showing the uncertainties of forecasting project-specific, intersection-by-intersection impacts in 1996 for longer than 13 years, the record reflects numerous examples of ongoing environmental review, to be conducted by the Port and other agencies, of the impacts of the Master Plan Update improvements after the year 2010, at a time when those impacts can be meaningfully analyzed. Those future reviews include:

- <u>Additional Master Plan-related SEPA review by the Port</u>. The Port Director of STIA, Gina Marie Lindsay, testified this process would likely get underway in the next several years,
- <u>The Port's portion of the Part 150 Noise Compatibility Program</u>. While this is a FAA-authorized activity, the testimony outlined the Port's role in approving a plan for FAA consideration. The Port decisions will be subject to SEPA requirements. The scope of this review includes consideration of noise impacts on affected schools. The Port has a well-established track record of conducting Part 150 review at regular intervals, and is currently collecting data for the Part 150 process now underway.

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- Port Review and Action Mandated bv the FAA in its Record of Decision. This will be required prior to 2010 and must include a review of the "adequacy, accuracy, and validity of the final statement." Under the terms of the ROD, "if this review identifies additional significant adverse environmental impacts, the Port will be required to adopt further noise and land use measures designed to minimize any significant adverse effects found in that evaluation."
- Supplemental Environmental Review for Projects Not Underwav bv June 2000. Because many of the Master Plan Update improvements will not be initiated until after the year 2000, it is likely that a new or updated environmental analysis will occur to cover these projects.
- Air Qualitv Conformitv Review. Air quality conformity is required under state law (although the state is applying the duties of the federal Clean Air Act, which have been delegated to the state and regional agencies.) Under federal law, any action in the Port's Master Plan Update which is not commenced within five years must undergo environmental review again.
- NPDES Permit Renewal Process. Although not directly included in the ACC appeal, the future SEPA review will include consideration of stormwater and water quality impacts associated with the Master Plan Update, as the Port must every five years submit a detailed application for renewal. WAC 173-220-180 (1), (2).

II. CONCLUSIONS OF LAW

Conclusions Relating to the Appeal of the Port Commissioners' Decisions.

1. In Case Nos. 96-2-20357-2KNT and 97-2-13908-2KNT, the Coalition is challenging the legislative decisions of the Port Commissioners adopting Port Resolution 3212 and Port Resolution 3245. The adoption of these two resolutions were legislative decisions reviewable only under a constitutional writ of review.

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2. Under a constitutional writ, the Court's review is limited to a determination of whether the Port Commissioners' legislative actions were arbitrary and capricious or illegal. Under the arbitrary and capricious standard of review, the Coalition must show that the Port's action was willful and unreasoning, taken without regard to or consideration of the facts and circumstances surrounding the action. An action by an agency is not arbitrary and capricious when there is room for two opinions, even though a reviewing court may believe it to be erroneous, if taken after due consideration.

3. The Coalition claims that the Port has a legal duty under the GMA to comply with each individual comprehensive plan of the Coalition cities. The Coalition relies exclusively on the procedural criteria enacted by the state Department of Community Trade and Economic Development ("CTED") at WAC ch. 365-195 in making this argument. Chapter 36.70A RCW sets forth the planning requirements for cities and counties subject to GMA. The GMA statute does not contain any requirement that port districts comply with local comprehensive plans, and there are no planning or compliance requirements in Chapter 36.70A RCW for special districts, including port districts.

4. For reasons set forth in a separate Memorandum Ruling entered this day, the Court has concluded that even if WAC Ch. 365-195 were read to apply to the Port, its provisions in fact undercut the challenges by the ACC to the Port's actions.

5. In the 1990 legislative session, the Washington Legislature passed a provision for inclusion in Chapter 36.70A RCW that would apply GMA plan consistency requirements to special districts. 1990 Wash. Laws, 1990 1st Ex. Sess. Ch. 17, § 18. This provision explicitly exempted port districts from its requirements. The Governor vetoed this provision, in part because it did not apply GMA plan consistency requirements to port districts. The Legislature had intended that the GMA's requirements not extend to port districts. The Governor's veto does not and cannot act as an affirmative enactment of the philosophy or rationale behind his veto. The Court's decision in this case is therefore based on its reading of the law apart from this legislation and veto.

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6. Petitioners suggest that the legally binding nature of the CTED procedural criteria is demonstrated by their use by the Growth Management Hearings Board. However, the Board decisions show that the Board has consistently held that the procedural criteria are "purely advisory" and have no regulatory effect. See, West Seattle Defense Fund v. Seattle, CPSGMHB Case No. 96-3-0003 (Final Decision and Order March 24, 1997); Children's Alliance v. Bellevue, CPSGMHB Case No. 95-3-0011 (Order Granting Dispositive Motion); Pilchuck v. Snohomish County, CPSGMHB Case No. 95-3-0047 (Final Decision and Order December 6, 1995).

Conclusions of Law Regarding 47.80.030(3).

7. While the GMA does not contain any legally binding provisions governing port districts as port districts, a portion of the GMA does apply to major transportation projects, irrespective of what type of agency is the project sponsor. In particular, RCW 47.80.030(3) provides that:

> (3) All transportation projects, programs and transportation management measures within the region that have an impact upon regional facilities or services must be consistent with the plan and with the adopted regional growth and transportation strategies.

The "plan" referred to in this case is the Regional Transportation Plan ("RTP") adopted by PSRC. The "adopted regional growth and transportation strategies" in this case refers to the general policies in VISION 2020, also adopted by the PSRC, of which the RTP is a part. Therefore, RCW 47.80.030(3) requires that a project such as the STIA expansion, which is a transportation project with impacts upon regional facilities or services, must be consistent with the RTP and with VISION 2020.

8. The Port's Master Plan Update development actions are consistent with the RTP. Plans for a third runway at STIA are expressly incorporated into the RTP, if the Port agrees to the additional mitigation measures specified by the PSRC. In Resolution 3212, and again in Resolution 3245, the Port committed to those mitigation measures.

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9. The Court has reviewed the broad, general planning policies of VISION 2020, including the policies regarding the siting of essential public facilities (RF-3 and RF-3.3) although the Court recognizes that these policies are not to be read in isolation from all other applicable policies in VISION 2020. The Court has also thoroughly reviewed the Port decisions in Resolution 3212 and Resolution 3245, including the mitigation committed to by the Port in those resolutions and elsewhere, and the mitigation required under federal law. The Port decisions appropriately considered the range of additional local, state and federal permitting requirements, as authorized by RCW 36.70A.420. The Coalition has not shown that the Port Commissioners' decision violates RCW 47.80.030(3) or is inconsistent with either the RTP or VISION 2020.

10. Based on the record before the Court and the mitigation to which the Port has committed, the Coalition has not met its burden of proving that the Port Commissioners adoption of Resolutions 3212 and 3245 was either arbitrary and capricious or illegal.

Conclusions Regarding the Growth Management Hearings Board Decision.

11. The Court also is reviewing a final decision and order of the Central Puget Sound Growth Management Hearings Board under the Washington Administrative Procedures Act ("APA"). That case is King County Case No. 97-2-22276-1KNT.

12. Under the APA, the Coalition has the burden of proving that (1) the Board erroneously interpreted or applied the law, (2) the GMA Board's FDO is not supported by substantial evidence, or (3) the GMA Board's FDO is arbitrary or capricious. RCW 34.05.570(3).

13. The substantial evidence standard is a deferential standard of review that requires the Court to view the evidence in the light most favorable to the party prevailing in the highest forum that has fact-finding authority. Freeburg v. Seattle, 71 Wn. App. 367, 371, 859 P.2d 610 (1993). The substantial evidence test requires that the Court accept the fact

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finder's views regarding the weight to be given competing inferences from the evidence. Department of Corrections v. Kennewick, 86 Wn. App. 521, 529-30, 937 P.2d 1119 (1997).

14. On purely legal matters, the Court should give considerable deference to the Board's interpretation of the law, if it is an area in which the Board has special expertise. Northwest Steelhead & Salmon Council v. Department of Fisheries, 78 Wn. App. 778, 786-87, 896 P.2d 1292 (1995); Peter Schroeder Architects v. Bellevue, 83 Wn. App. 188, 191, 920 P.2d 1216 (1996). Because the Board is the expert agency created by the Legislature to determine issues of GMA compliance, the Board's legal interpretation of any ambiguous GMA provisions should be given substantial deference by the Court. King County v. Central Puget Sound Growth Management Hearings Board, ___ Wn. App. ___, 951 P.2d 1151, 1157 (March 2, 1998).

15. Under the arbitrary and capricious standard, the Coalition must show that the challenged agency action was willful and unreasoning, taken without regard to or consideration of the facts and circumstances surrounding the action. Saldin Securities, Inc. v. Snohomish County, 134 Wn.2d 288, 296, 949 P.2d 370 (1998). An action by an agency is not arbitrary and capricious where there is room for two opinions, even if a reviewing court believes it to be erroneous. Abbenhaus v. Yakima, 89 Wn.2d 855, 858-59, 576 P.2d 888 (1978).

16. The Board correctly ruled that the requirements of RCW 36.70A.200(2) apply to all essential public facilities (EPFs), whether or not the EPF was in existence prior to the GMA. The Board also correctly determined that STIA was an EPF subject to the protections granted by RCW 36.70A.200. The GMA refers simply to essential public facilities, which include airports, not to "proposed" or "future" or "new" essential public facilities. This plain language employed in RCW 36.70A.200 provided the GMA Board with no basis for distinguishing between existing and future EPFs

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17. The Board did not deviate from, or violate, any statutory rule of construction when it decided that RCW 36.70A.200 protects all EPFs, including those existing prior to the enactment of the GMA.

18. The Board's classification of STIA, and its proposed expansion as an EPF, did not require retroactive application of the GMA. Bayless v. Community College Dist. No. XIX, 84 Wn. App. 309, 315, 927 P.2d 254 (1996). The key time for application of RCW 36.70A.300 was not when STIA first came into existence, but when the City of Des Moines amended its GMA plan.

19. The Board properly construed RCW 36.70A.200(2) to prohibit local preclusion of activities necessary to construct and operate an EPF. The legislative purpose of RCW 36.70.200(2) would be defeated if local governments could prevent the siting of an EPF by preventing an activity essential to the EPFs construction or operation.

20. Substantial evidence in the record supports the Board's determinations that (1) fill dirt hauling is essential to the construction of the third runway and (2) trucks hauling fill dirt will have to travel through Des Moines or other adjacent cities to reach the construction site of the third runway.

21. The Board's jurisdiction is limited to deciding whether city and county comprehensive plans and development regulations, as adopted in the abstract, comply with the requirements of the GMA codified in RCW Ch. 36.70A. When comprehensive plan provisions are appealed to the Board, review never relates to any specific project because comprehensive plans have no regulatory effect. Citizens for Mount Vernon v. City of Mount Vernon, 133 Wn.2d 861, 873, 947 P.2d 1208 (1997). In deciding whether comprehensive plan policies and development regulations comply with GMA requirements, the Board necessarily must consider potential consequences based upon the terms and scope of the challenged local enactment.

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22. The Board's discussion of and findings related to specific activities which are reasonably likely to occur. The Board properly decided that the Des Moines Plan violated RCW 36.70A.200(2). The exact amount of cost or delay did not have to be conclusively established for the GMA Board to determine that the Des Moines Plan policies in question would as drafted be capable of precluding necessary support activities, such as fill dirt hauling, and directly or indirectly stopping construction of the third runway, because the policies at issue in the Des Moines plan unequivocally committed the City to opposing any activity supporting the expansion of STIA. The Board's holding is consistent with the purpose and intent of RCW 36.70A.200, and is not arbitrary or capricious. The Board did not have to wait for that plan to be so applied.

23. The Board properly ruled that because the Des Moines Plan had the effect of making STIA expansion incapable of being accomplished by means at the Port's command, it violated RCW 36.70A.200(2). Under RCW 36.70A.200(2), a city or county is not permitted to "preclude" the siting of an essential public facility. The verb "preclude" means to "render impossible or impracticable." Children's Alliance v. Bellevue, supra. Impracticable is defined as that which cannot be accomplished by the means at the party's command. Merriam Webster's Collegiate Dictionary. The Board properly determined that the Port would be precluded from constructing the third runway because, under numerous Des Moines Plan policies, the Port could not proceed with construction by the means at the Port's command. The Board's holding is consistent with the purpose and intent of RCW 36.70A.200, and is not arbitrary or capricious.

24. Based on the record before the Board, the Board's decision in CPSGMHB case 97-3-0014 was not an error of law, was supported by substantial evidence, and was not arbitrary and capricious.

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Conclusions Related to the Hearing Examiner Decision that the Master Plan Update EIS and the Master Plan Update SEIS Are Legally Adequate.

General Conclusions Of Law.

25. In Case No. 98-2-04911-1KNT, the Coalition has appealed the Hearing Examiner's decision that the EIS and SEIS are legally adequate. EIS adequacy has been characterized as a question of law. Questions of law generally are subject to a de novo standard of judicial review. Leschi Improvement Council v. Washington State Highway Commission, 84 Wn.2d 271, 280-87, 525 P.2d 774 (1974). However, the de novo standard of review is specifically qualified by SEPA's statutory requirement that agency determinations of EIS adequacy are entitled to substantial weight in administrative and judicial appeals. RCW 43.21C.090. OPAL v. Adams County, 128 Wn. 2d 869, 913 P.2d 793 (1995).

26. The legal standard by which EIS adequacy must be determined is the "rule of reason."

27. Washington courts consistently have articulated the "rule of reason" as a "broad, flexible cost-effectiveness standard." Citizens Alliance v. Auburn, 126 Wn.2d 356, 362, 894 P.2d 1300 (1995). Under this standard, an EIS is not to be a "compendium of every conceivable effect or alternative to a proposed project." Toandos Peninsula Ass'n v. Jefferson County, 32 Wn. App. 473, 483, 648 P.2d 448 (1982). Rather , an EIS is required to include only a "reasonably thorough discussion of the significant aspects of the probable environmental consequences" and provide "sufficient information to make a reasoned decision." OPAL v. Adams County, 128 Wash. 2d at 875; Citizens Alliance v. Auburn, 126 Wash. 2d at 362.

28. Under the "rule of reason," an EIS is not required to identify or analyze impacts that are "remote and speculative." Cheney v. Mountlake Terrace, 87 Wash. 2d 338, 344, 552 P.2d 184 (1986).

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29. The lead agency's determination that potential environmental impacts are remote or speculative and need not be addressed in an EIS is entitled to substantial weight in an appeal of EIS adequacy. RCW 43.21C.090. OPAL v. Adams County, supra.

30. Under the rule of reason, an agency has broad discretion in deciding what potential mitigation measures should be included in an EIS. SWAP v. Okanogan County, supra; Robertson v. Methow Valley Citizens Coun., 490 U.S. 332, 359, 109 S.Ct. 1835, 104 L.Ed.2d 351 (1989). Neither SEPA nor NEPA require that an EIS include a complete or detailed mitigation plan. Id., 66 Wn. App. at 447.

31. An agency determination of the nature and extent of potential mitigation to include in an EIS is entitled to substantial weight. RCW 43.21C.090. SWAP v. Okanogan County, supra, 66 Wn. App. at 447-448.

Conclusions Of Law Relating to the Aviation Forecast Issue.

32. Washington courts have followed federal NEPA cases when construing similar provisions of SEPA. Eastlake Community Council v. Roanoke Associates, 82 Wn.2d 475, 488 (fn. 5, 513 P.2d 36 (1973).

33. The Port and the FAA are agencies with expertise in forecasting aviation demand and should be granted deference in choosing the appropriate methodology for forecasting aviation activity. City of Grapevine v. Dept. of Transportation, 17 F.3d 1502, 1507 (D.C. Cir. 1994) (court deferred to the agency's expertise in choosing the appropriate way to measure noise); Seattle Community Council Federation v. Federal Aviation Administration, 961 F.2d 829, 833-34 (9th Cir. 1992) ("[I]t is within an agency's discretion to determine which testing methods are most appropriate."); Citizens Against Burlington, 9308 F.2d at 200-201 (FAA's choice of methodology to measure the impacts of noise on the environment was an informed decision to which the court should defer); Sierra Club v. Dept. of Transportation, 753 F.2d 120, 128 (D.C. Cir. 1985) (it is within the expertise and discretion of the FAA to determine the proper method to measure airport noise);

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Florida Wildlife Federation v. Goldschmidt, 506 F. Supp. 350, 376-77 (1981) (the traffic forecasting methodology used in an EIS was adequate where the modeling was consistent with the state of the art at the time). The United States Supreme Court has agreed that a reviewing court must be its most deferential when examining the decision of an expert agency which is making predictions within its area of special expertise. Baltimore Gas and Electric Co. v. Natural Resources Defense Council, 462 U.S. 87, 103, 76 L.Ed.2d 437, 103 S.Ct. 2246 (1983).

34. When an agency is presented with conflicting expert opinion on an issue, it is the agency's job and not the job of the reviewing appellate body, to resolve those differences. Webb v. Gorsuch, 699 F.2d 157, 160 (4th Cir. 1983).

35. The Port and the FAA used a forecasting methodology for the SEIS that was consistent with industry-accepted standards and proven reliable over time. The Master Plan Update forecasts were reviewed and approved by the FAA's Northwest Mountain Region and the Forecast Branch of the FAA Headquarters in Washington, D.C. The decision to measure aviation demand by the aviation forecast methodology chosen is legally adequate under the rule of reason.

36. Under the rule of reason, the Port and FAA reasonably exercised their discretion in determining that, during the planning horizon for the Master Plan Update, (a) the construction of the proposed improvements, including the third runway, would not cause significant new growth in aviation demand and (b) not constructing the proposed improvements would not cause significant decrease in demand. Therefore, the aviation demand forecasts that served as the basis for the SEIS analysis did not understate aviation activity under the With Project scenario and did not overstate activity under the Do Nothing scenario.

37. The EISs analyzed the potential impacts of a higher aviation forecast and compared these impacts to those of a constrained forecast in Appendix R to the FEIS and Appendix D to the FSEIS. Based on the difficulty to reasonably conduct aviation demand forecasting beyond the year 2010, this analysis was sufficient under the rule of reason.

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38. The difference of opinion between the ACC's expert witness and the Port's expert witnesses was discussed in the EISs, which allowed the decision-makers to be informed on this issue prior to making their decisions. The lead agency's decision of which expert opinion to follow and which forecasting methodology to adopt was legally sufficient under the rule of reason.

Conclusions of Law Relating to the Lead Agency's Decision to Limit Detailed Environmental Impact Analysis to the 2010 Planning Horizon.

39. Under SEPA, the contents of environmental review depend on the lead agency's existing planning and decision-making process, and on the time when alternatives can be most meaningfully evaluated. WAC 197-11-060(2)(a)

40. SEPA's provisions relating to analyzing the long-term impacts of a proposal over the life-time of the project must be viewed and applied in the context of related SEPA provisions such as WAC 197-11-060(4), which require consideration of impacts that are "likely, not merely speculative."

41. SEPA only requires a reasonably thorough discussion of the probable environmental consequences of an agency's decision. OPAL v. Adams County, 128 Wn.2d 869, 875, 913 P.2d 793 (1996).

42. When discussing potential impacts, an EIS is only required to consider impacts that are "likely, not merely speculative" and remote or speculative impacts need not be discussed. WAC 197-11-060(a); Mentor v. Kitsap County, 22 Wn. App. 285, 289, 588 P.2d 1226 (1978); Cheney v. Mountlake Terrace, 87 Wn.2d 338, 346, 552 P.2d 184 (1976).

43. The decision in the SEIS to limit the detailed analysis of impacts to the 13-year planning horizon, or the year 2010, was a reasonable decision and was legally sufficient under the rule of reason.

44. The conclusion in the SEIS that detailed analysis of environmental impacts beyond the year 2010 would not be capable of meaningful evaluation was a reasonable decision and

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sufficient under the rule of reason, particularly given the extent to which subsequent environmental review and additional mitigation, if appropriate, would take place under both state and federal processes.

45. The purpose of SEPA was well served with the SEIS. Even though detailed evaluation beyond the year 2010 was speculative and thus not likely to lead to meaningful evaluation, the drafters of the SEIS included at Appendix D an extrapolated estimate of possible impacts in the year 2020 in order to provide decision-makers with the analysis of possible impacts through the year 2020 prior to their taking action. The confirmation in Port Resolution 3245 by the Port Commissioners of the information in the EIS through the year 2020 indicates that this goal was accomplished. Moreover, the discussion of the information contained in the EIS at Attachment A to Resolution No. 3245 shows that SEPA's goal of providing decision-makers with information to ensure an informed decision was well served in this case.

III. ORDER

Based on the foregoing Findings of Fact and Conclusions of Law, and on the Court's Memorandum Ruling on Application of WAC Ch. 365-195, it is ORDERED, ADJUDGED and DECREED as follows:

1. The plaintiffs' claims brought in King County Case No. 96-2-20357-2KNT, in King County Case No. 97-2-13908-2KNT, in King County Case No. 97-2-22276-1KNT, and in King County Case No. 98-2-04911-1KNT should be, and hereby are, DISMISSED WITH PREJUDICE.

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2. The Port of Seattle and the Central Puget Sound Growth Management Hearings Board are the prevailing parties in this action and are entitled to costs and attorney fees to the extent provided by law. The prevailing parties shall file a Cost Bill and any other appropriate documentation and briefing related thereto within ten days of receipt of this order.

DATED this 9th day of July, 1998.

HON. ROBERT H. ALSDORF
Superior Court Judge

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[No. 43100-5-I. Division One. November 15, 1999.]

THE CITY OF DES MOINES, ET AL., *Appellants*, v. THE PUGET SOUND REGIONAL COUNCIL, ET AL., *Respondents*.
THE CITY OF DES MOINES, ET AL., *Appellants*, v. THE PORT OF SEATTLE, ET AL., *Respondents*.
THE CITY OF DES MOINES, *Appellant*, v. CENTRAL PUGET SOUND GROWTH MANAGEMENT HEARINGS BOARD, ET AL., *Respondents*.
THE AIRPORT COMMUNITIES COALITION, ET AL., *Appellants*, v. THE PORT OF SEATTLE, ET AL., *Respondents*.

[Reporter's Note: The following opinion incorporates the Court of Appeals order amending opinion dated February 23, 2000 and supersedes the report of the opinion at 98 Wn. App. 23.]

[1] **Counties — Land Use Controls — Growth Management Act — Regional Transportation Plan — Local Comprehensive Plans — Special Districts — Compliance — Necessity.** When consistency between a local comprehensive plan and a regional transportation plan is achieved after completion of the coordinated planning process mandated by the Growth Management Act (chapters 36.70A and 47.80 RCW), a specific project proposed by a special district within the local jurisdiction must comply with both plans in accordance with state and federal laws.

[2] **Counties — Land Use Controls — Growth Management Act — Essential Public Facilities — Statutory Protection From Local Plans — Expansion.** RCW 36.70A.200(2), which provides that no local comprehensive plan may preclude the siting of essential public facilities, applies to the expansion or improvement of an essential public facility.

[3] **Counties — Land Use Controls — Growth Management Act — Essential Public Facilities — Statutory Protection From Local Plans — Necessary Support Activities.** RCW 36.70A.200(2), which provides that no local comprehensive plan may preclude the siting of essential public facilities, applies to off-site support activities that are necessary to the construction or expansion of an essential public facility.

[4] **Judgment — Collateral Estoppel — Elements — Injustice — Full and Fair Opportunity To Litigate.** The doctrine of collateral estoppel will not bar relitigation of an issue if the party against whom the doctrine is to be asserted did not have a full and fair opportunity in a prior judicial proceeding to litigate the issue.

[5] **Environment — SEPA — Impact Statement — Adequacy — Judicial Review — Administrative Determination — Substantial Weight.** An appellate court engages in a de novo review of the adequacy of an environmental impact statement, giving substantial weight to the governmental agency's determination that the environmental impact statement is adequate.

[6] **Environment — SEPA — Impact Statement — Adequacy — Determination — Rule of Reason — Test.** The adequacy of an environmental impact statement is evaluated under the rule of reason; the rule of reason requires a reasonably thorough discussion of the significant aspects of the probable environmental consequences of the agency's decision.

[7] **Administrative Law — Judicial Review — Deference — Agency — Conflicting Expert Opinions.** A court reviewing an administrative action will defer to an administrative agency's resolution of conflicting expert testimony presented on an issue.

Nature of Action: Several cities surrounding an international airport sought judicial review of growth management hearings board decisions that involved an amendment to a regional transportation plan to include construction of a new runway at the airport. The board had determined that the new runway was an essential public facility, invalidated several provisions of a local plan, and upheld a conclusion by the port district's examiner that the district's environmental studies were adequate.

Superior Court: The Superior Court for King County, No. 96-2-20375-2, Robert H. Alsdorf, J., on July 9, 1998, entered a judgment upholding the board's decisions.

Court of Appeals: Holding that local comprehensive plans could not prevent the port district from conducting off-site dirt-hauling activities that were necessary to construct the new runway, that the port district would be required to comply with the regional transportation plan and the local plans following completion of the coordinated planning process mandated by the Growth Management Act in regard to specific projects in such areas, and that the environmental impact statements were adequate, the court *affirms* the judgment.

Peter J. Kirsch; *John William Hempelmann* (of *Cairncross & Hempelmann, P.S.*); *Gary Neil McLean, Des Moines City Attorney* (*Thomas D. Roth* and *Perry M. Rosen* of *Cutler & Stanfield L.L.P.*, of counsel); *Michael R. Kenyon* and *Robert Franklin Noe* (of *Kenyon Law Firm*); *Londi K.*

Lindell, Federal Way City Attorney; *Wilton S. Viall III*; and *David Todd Hokit* (of *Curran Mendoza, P.S.*), for appellants.

John Tayloe Washburn and *Roger A. Pearce* (of *Foster Pepper & Shefelman P.L.L.C.*); *Linda J.N. Strout*; *Traci Marie Goodwin*; *Christine O. Gregoire, Attorney General*, and *Marjorie Taylor Smitch, Assistant*; and *David Alan Bricklin* and *Jennifer A. Dold* (of *Bricklin & Gendler*), for respondents.

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1999 Wash. App. LEXIS 1940

[As amended by order of the Court of Appeals February 23, 2000.]

AGID, J. — This is the second of three actions brought by the cities surrounding the Seattle Tacoma International Airport against the Port of Seattle, the Puget Sound Regional Council, and the City of Sea-Tac—the entities responsible for approving and implementing the Sea-Tac expansion project. All three actions essentially allege "that the GMA [Growth Management Act] requires at least one public entity . . . to ensure that the Sea-Tac expansion project is consistent with the comprehensive plans of neighboring jurisdictions . . . all of which call for the reasonable mitigation of impacts from such a massive project."

In this appeal, which deals solely with the Port's obligations under the GMA and the State Environmental Policy Act (SEPA), the Cities contend that the trial court erred by (1) concluding that neither the GMA nor the Department of Community, Trade and Economic Development regulations require the Port Resolutions to comply with local comprehensive plans, regardless of whether they violate the GMA, (2) upholding the Central Puget Sound Growth Management Hearing Board's invalidation of several provisions of the Des Moines city plan based on the conclusion that they preclude the siting of an essential public facility in violation of RCW 36.70A.200(2), and (3) upholding the Port's and the

Federal Aviation Administration's (FAA) SEPA studies, which assume that the expansion will result in no additional passengers or operations and fail to analyze the environmental impacts of the expansion beyond the year 2010. We affirm the trial court.

FACTS

The Port of Seattle is a special district governed by an elected commission and responsible for major marine and air transportation facilities in the Seattle area. In 1993, the Port initiated a Master Plan Update for Sea-Tac, which analyzed alternative means to improve airfield operating capacity in poor weather conditions, one of which was construction of a third runway. In 1995, the Port and the FAA issued a Draft Environmental Impact Statement (DEIS) as required by SEPA, and after public hearings, consultation with numerous agencies, and additional studies, the Port issued a Final EIS which identified the quantity of fill needed for construction of the runway, the various locations where the fill might be obtained, and all routes that might be used to haul the fill. Based on these studies, the Port Commission passed Resolution 3212, which adopted the Master Plan Update and granted approval to develop a third runway at Sea-Tac. Resolution 3212 also contained "a commitment to mitigate the impacts of the improvements at [Sea-Tac] based on the impacts identified in the Master Plan Update EIS."

After publication of the Final EIS (FEIS), the FAA issued its fiscal year 1996 Terminal Area Forecast (TAF) for the nation's airports. The TAF predicted levels of aircraft operations and passengers at Sea-Tac that exceeded the FEIS predictions. In response, the Port and the FAA revised the Sea-Tac aviation demand forecast, concluding that demand could be 17 percent greater than the FEIS forecast. Consequently, the FAA and the Port prepared a Supplemental EIS (SEIS). The draft SEIS, released in February 1997, concluded that detailed impacts could not be meaningfully assessed beyond 2010 for a number of reasons. But the

SEIS did contain a projection of impacts based on assumed steady growth rates to the year 2020, as well as a higher growth rate scenario. Des Moines, Burien, Federal Way, Normandy Park, and Tukwila appealed the adequacy of the EIS/SEIS under SEPA to the Port's Hearings Examiner, who determined that the purposes of SEPA were "well-served" by the Port's studies.

In Port Resolution 3245, the Port Commission reaffirmed Resolution 3212 and included a summary of the Commissioners' decision-making process and an updated and expanded list of mitigation measures. On July 3, 1997, the FAA issued a Record of Decision (ROD) approving the Port's Master Plan Update. The ROD was based on the EIS and SEIS and contained an analysis of the project impacts and a list of FAA-required mitigation. The ROD concluded that " 'all practical means to avoid or minimize environmental harm have been adopted through appropriate mitigation planning.' " On November 24, 1998, the Ninth Circuit upheld that FAA decision, including the aviation demand forecasting and the decision to analyze detailed impacts only through 2010.

Meanwhile, the Port had filed a petition with the Growth Management Hearings Board in February 1997 challenging the Des Moines comprehensive city plan on the theory that it would preclude expansion of Sea-Tac, an essential public facility, in violation of RCW 36.70A.200(2). The Port also asserted that the Des Moines plan was inconsistent with the regional plan, the King County comprehensive plan, and the multicounty planning policies. In an April 20, 1998 order, the Board again stated that the entire Des Moines plan violated RCW 36.70A.200:

> In addition to finding the Plan, as a whole, out of compliance with the requirements of RCW 36.70A.200, the Board found that two policies, 1-04-05 and 5-04-04, substantially interfered with the fulfillment of the GMA's transportation goal, RCW 36.70A.020(3). . . . These policies were invalidated. . . .

The Board remanded the plan and instructed Des Moines to bring the plan into compliance with RCW 36.70A.200 and achieve internal plan consistency. On remand, Des Moines amended only the two invalidated policies. At the hearing after remand, the Board determined that the Des Moines plan was still not in compliance with the GMA, reinstated its invalidity order, and recommended that the Governor impose sanctions on Des Moines if it did not bring its plan into compliance. The Des Moines City Council then amended 15 policy provisions, and the Board found the pl[illegible] complied with GMA.

The Cities appealed the Board's and the Examiner's decisions to the King County Superior Court, which determined that neither the GMA nor the Department of Community, Trade and Economic Development regulations require the Port to comply with the Des Moines city plans, upheld the GMA Board's determination that several Des Moines plan policy provisions violated the GMA, and affirmed the Port's Hearings Examiner's conclusion that the Port's SEPA studies were adequate.

DISCUSSION

1. The Port's Duty to Comply With Local Plans

The Department of Community, Trade and Economic Development (DCTED), the state agency with the princip[illegible] responsibility for implementing the GMA, assists counties and cities in preparing comprehensive plans and development regulations[1] and promulgates administrative procedural criteria in the Washington Administrative Code.[2] In WAC 365-195-770(2), DCTED has directed that "[e]xcept where any specific enactment may state the contrary," special districts, such as the Port district, must "comply with the comprehensive plans and development regulations developed under the [GMA]." The Cities contend that "[c]learly, WAC 365-195-770(2) interprets the GMA as setting forth a legal requirement that port districts comply with local comprehensive plans."

[1] *See* RCW 36.70A.190.

[2] *See* ch. 365-195 WAC.

The trial court noted that DCTED regulations apply by their terms only to cities and counties,[3] and that even if the regulations did apply to the Port, they would "require nothing of it" because they are advisory.[4] The court went on to conclude, however, that:

> If plaintiff-petitioners are correct that the [D]CTED regulations provide persuasive authority concerning the application of the GMA to the current conflict . . . [t]he regulations as a whole cannot reasonably be read to support their position that the Port should defer to their comprehensive plan or plans, except in the very limited situation where it is proven that their own plans have been developed in conformity with the GMA. . . . A planning jurisdiction must demonstrate that it has complied with the act, particularly by developing plans in a cooperative fashion and in reasonable conformity to county-wide and RTPO [Regional Transportation Planning Organization] planning.

The court did not determine, as the Cities argue, that "the Port has absolutely no obligation under the GMA to resolve conflicts with local plans." On the contrary, it concluded that if the cities engage in the cooperative planning process required by the GMA and produce plans which reflect this coordinated approach and do not conflict with the Regional Transportation Plan (RTP), the Port should, according to the DCTED regulations, have an affirmative obligation to comply with the terms of these plans.[5] The DCTED regulations and the GMA itself support this conclusion.

[3] RCW 36.70A.040.

[4] WAC 365-195-030 states that "[t]his chapter makes recommendations . . . but compliance with the requirements of the [GMA] can be achieved without using all of the suggestions made here or by adopting other approaches." But because the GMA itself directed DCTED to develop these regulations, they should receive some deference. *See Green River Cmty. Coll. Dist. No. 10 v. Higher Educ. Pers. Bd.*, 107 Wn.2d 427, 438, 730 P.2d 653 (1986) ("a heightened degree of deference is appropriate where the agency's construction of a statute is within the agency's field of expertise").

[5] At the time of this decision, the court was faced with a Des Moines city plan which actively opposed the runway proposal and would have prevented any proposal which would have had a "negative impact" on its residents or businesses. The trial court noted that the "policies at issue in the Des Moines Plan did not require mitigation, but instead directed the City to oppose any new facilities at [Sea-Tac] that increased the impacts to the City of Des Moines."

[1] WAC 365-195-340(2)(b)(iv) provides that "[w]here essential public facilities may be provided by special districts, . . . cities and counties should adopt provisions for consultation to ensure that such districts exercise their powers in a way that does not conflict with the relevant comprehensive plan." In addition, the regulations direct that the "process should provide for a cooperative interjurisdictional approach to siting of essential public facilities of a county-wide, regional, or state-wide nature, consistent with county-wide planning policies."[6] Also, as a proponent of a regional transportation project, the Port required by RCW 47.80.030(3) to act consistently with the RTP and other regional transportation strategies. As explained in the companion case against the Puget Sound Regional Council, although an RTP may not unilaterally "trump" a city plan, if a conflict between a city plan and an RTP exists after the planning process is completed, the city must revise its plan to comply with the regional plan. *City of Des Moines v. Puget Sound Reg'l Council*, 97 Wn. App. 920, 988 P.2d 993 (1999). After consistency is achieved, the Port will have a duty to comply with both the RTP and the local plans, regardless of whether they require mitigation which the Port finds either difficult or expensive.[7]

2. Application of RCW 36.70A.200(2)

The Cities next contend that RCW 36.70A.200(2), which provides that "[n]o local comprehensive plan or development regulation may preclude the siting of essential public facilities," does not apply to the Sea-Tac expansion. The Cities concede that this provision provides protection from local comprehensive plans that would preclude siting of essential public facilities (EPFs), but they argue that RCW 36.70A.200(2) is inapplicable here because it does not apply to expansions, or to "remote, off-site 'necessary support activities,'" and that the Cities' plan would not have "pre-

[6] WAC 365-195-340(2)(b)(ii).

[7] As urged by the Port in its motion for reconsideration/clarification, we clarify that these duties are limited to Port proposals for specific projects within local jurisdictions in accordance with state and federal law.

cluded" the project. Relying on WAC 365-195-340, which directs that "the broadest view should be taken of what constitutes a public facility," the Board rejected this argument.[8]

Whether RCW 36.70A.200(2) Applies to Improvements or Expansions of EPFs

RCW 36.70A.200(2) states that "[n]o local comprehensive plan or development regulation may preclude the siting of essential public facilities," and RCW 36.70A.200(1) defines essential public facilities as including "those facilities that are typically difficult to site, such as airports." The Cities argue that because this provision makes no mention of "expanding" or "improving" EPFs which have already been sited, neither the Board nor the trial court was authorized to expand the clear terms of the GMA.[9] The Cities also argue that a recent legislative enactment supports its claim that a significant difference exists between construction and expansion. In 1998, seven months after the Board considered this issue, the Legislature enacted House Bill 1487, which added a new section, Section 7, to chapter 47.06 RCW which stated that "[i]mprovements to facilities and services of state-wide significance . . . are essential state public facilities under RCW 36.70A.200." The Cities claim that this amendment supports their argument that prior to this amendment, improvements to airports were *not* considered EPFs.

There are two problems with this argument. First, because of the political controversy generated by the expansion, the bill's co-sponsor explained that the transportation committee had to agree that the amendment would not deal with airports. Thus, the 1998 amendment specifically excludes improvements to airports from the EPF definition,

[8] We accord substantial weight to the Board's findings. *See N.W. Steelhead & Salmon Council of Trout Unlimited v. Dep't of Fisheries*, 78 Wn. App. 778, 786-87, 896 P.2d 1292 (1995).

[9] The Cities point out that the Washington Supreme Court has indicated that the GMA does not "contain the requirement that it be liberally construed." *Skagit Surveyors & Eng'rs v. Friends of Skagit County*, 135 Wn.2d 542, 565, 958 P.2d 962 (1998).

and this amendment has no bearing on the Sea-Tac expansion. Second, the Cities do not acknowledge the likely possibility that the amendment was a clarification, and not an alteration, of the previous law. As the Washington Supreme Court has noted:

> When an amendment clarifies existing law and where that amendment does not contravene previous constructions of the law, the amendment may be deemed curative, remedial and retroactive. This is particularly so where an amendment is enacted during a controversy regarding the meaning of the law.[10]

If this amendment is a clarification, as the controversy surrounding the issue may suggest, then the Port has a valid argument that HB 1487 simply explains that the Legislature had always intended that improvements to EPFs should be protected under RCW 36.70A.200. Nevertheless, the trial court correctly reasoned that because of the conflicting conclusions that can be drawn from this amendment, "neither the rule of 'expression unius est exclusio alterius' nor the argument that the EPF definition has now been legislatively clarified to include airport improvements" is available to either party.

[2] Deprived of its HB 1487 argument, the Cities are left with a claim that the plain language of RCW 36.70A.200(2) says nothing about "expanding" or "improving" EPFs which have already been sited. But the DCTED regulations, to which the Cities urge this court to defer on other points, indicate that in "the identification of essential public facilities, the broadest view should be taken of what constitutes a public facility."[11] Accordingly, the Board determined that the third runway was an essential public facility. We defer to the Board's interpretation of the law and conclude, as the trial court did, that "the requirements of RCW 36.70A.200(2) apply to all essential public facilities (EPFs),

[10] *Tomlinson v. Clarke*, 118 Wn.2d 498, 510-11, 825 P.2d 706 (1992) (footnotes omitted).

[11] WAC 365-195-340(2)(a)(i).

whether or not the EPF was in existence prior to the GMA." This conclusion comports with the fundamental reasoning behind identifying EPFs and giving them special significance under the GMA—the fact that cities are just as likely to oppose the siting of necessary improvements to public facilities as they are the siting of new EPFs.

Whether EPFs Include "Necessary Support Activities"

[3] The Cities argue that even if the EPF provision applies to the Sea-Tac expansion, the "critical issue" before this court is "whether the trial court and the Growth Board erred in determining that this provision is so expansive so as to cover remote, off-site 'necessary support activities.' " The trial court affirmed the Growth Board's ruling that off-site dirt-hauling activities conducted by the Port within Des Moines are protected under RCW 36.70A.200. The Cities claim that because "support activities" do not appear in the GMA, the Board and the trial court cannot add them. But again, the DCTED regulations urge that an expansive view should be taken of essential public facilities. WAC 365-195-340(2)(a)(i) indicates that identification of EPFs should include "the full range of services" provided both by government and by private entities. In addition, section 340(2)(c) states that no comprehensive plan may "directly or indirectly" preclude the siting of an essential public facility. The legislative purpose of RCW 36.70A.200(2) would be defeated if local governments could prevent the construction or operation of an EPF. Thus, if an activity is indeed "necessary" to a construction of an EPF, a local plan may not stop it from occurring. The Port has convincingly demonstrated that the runway cannot be built without constructing a site that is level with the existing airport, and that this construction will require hauling dirt through the cities surrounding Sea-Tac to the site itself. The Port will undoubtedly be required to mitigate the impacts of this construction on the surrounding communities, but because construction is impossible without these support activities, the Cities cannot stop them from occurring.

The Definition of "Preclude"

To determine the precise meaning of the word "preclude" in RCW 36.70A.200, the Board referred to a previous decision which defined it as "render impossible or impracticable." The Board focused on the word "impracticable," because the Legislature would have used the word "prohibit" instead of "preclude" if it had intended to allow the Cities' plans to fall just short of rendering the siting absolutely impossible. Using *Merriam Webster's Collegiate Dictionary*, the Board defined "impracticable" as "incapable of being performed or accomplished by the means employed or at command." The Board therefore interpreted "preclude" to mean "incapable of being accomplished by the means at the Port's command." The Cities claim that under this "expansive definition," an EPF proponent can "unilaterally control what 'precludes' its project, by claiming that contested comprehensive plan provisions simply would be too costly or time-consuming to comply with." This is not a tenable reading of the Board's decision.

At the time the Board and the trial court considered this issue, the Des Moines plan intended to "oppose" construction of the third runway.[12] Now that the plan has been amended to allow construction, but to require mitigation of its adverse effects, the Cities are correct that the Port will have to comply with the Cities' reasonable permitting and mitigation requirements. The fact that these requirements may make the expansion more costly does not relieve the Port of these obligations.

3. Adequacy of SEPA Analysis

Finally, the Cities contend that the Port's 1997 SEIS violates SEPA because it is premised on the assumption that the expansion will not increase the number of people or aircraft operations at the airport, and because it fails to analyze the effects of the project after the year 2010. The Port argues that the Cities are collaterally estopped from

[12] The trial court indicated that the "record before the Board shows that the City of Des Moines developed and adopted certain comprehensive plan policies and development regulations which would permit it to stop trucks moving fill, and thereby to directly or indirectly prevent [Sea-Tac] expansion."

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relitigating this issue because they have already done so in *City of Normandy Park v. Port of Seattle*,[13] an unpublished 1998 Ninth Circuit decision. In that case, the Cities appealed a FAA decision granting final approval to the Port's Master Plan development for the Sea-Tac expansion, arguing that it "improperly relied on a 'no growth' demand model and a limited prediction forecast thereby failing to accurately assess the project's environmental impacts and necessary mitigation measures."[14] The Ninth Circuit analyzed this claim under the federal Airport and Airway Improvement Act (AAIA) and several similar challenges brought against the FAA and concluded that the FAA properly approved the Port's Master Plan.

[4] The collateral estoppel doctrine prevents relitigation of an issue in state court after the party against whom the doctrine is applied has had a full and fair opportunity to litigate his or her case in federal court.[15] But here, the fact that the federal court concluded that the Port's Master Plan satisfied the AAIA has little bearing on the Port's obligations under SEPA because, as the Cities argue, SEPA and the AAIA "have markedly different obligations."[16] The Ninth Circuit analyzed the Cities' claims to determine whether, under the AAIA, "every reasonable step has been taken to minimize the adverse effects"[17] of the expansion and whether the project is consistent with state plans. Although the SEPA inquiry is similar, SEPA requires a

[13] No. 97-70953, 1998 U.S. App. LEXIS 30463, 1998 WL 833628 (9th Cir. Nov. 24, 1998).

[14] 1998 U.S. App. LEXIS 30463, at *3-4, 1998 WL 833628, at *1.

[15] *See Hanson v. City of Snohomish*, 121 Wn.2d 552, 573-74, 852 P.2d 295 (1993) (citing *Standlee v. Smith*, 83 Wn.2d 405, 518 P.2d 721 (1974)).

[16] Substantive differences between two legal schemes do not necessarily preclude application of the collateral estoppel doctrine, *Liberty Bank of Seattle, Inc. v. Henderson*, 75 Wn. App. 546, 548 559-60, 878 P.2d 1259 (1994), *review denied*, 126 Wn.2d 1002 (1995), but when the statutes are sufficiently different that they preclude the full litigation of an issue, applying the doctrine would result in an injustice. *See Southcenter Joint Venture v. Nat'l Democratic Policy Comm.*, 113 Wn.2d 413, 418, 780 P.2d 1282 (1989).

[17] *Normandy Park*, 1998 U.S. App. LEXIS 30463, at *3, 1998 WL 833628, at *1 (quoting 49 U.S.C. § 47106(c)(1)(C)).

more detailed procedural inquiry. The question of the Port's compliance with SEPA therefore requires separate analysis in state court.

SEPA is a procedural statute designed to ensure that local governments consider the environmental and ecological effects of major actions to the fullest extent.[18] SEPA's purpose is to provide decision makers with all relevant information about the potential environmental consequences of their actions and to provide a basis for a reasoned judgment that balances the benefits of a proposed project against its potential adverse effects. An EIS is not to be a "compendium of every conceivable effect or alternative to a proposed project,"[19] but it must include a " ' "reasonably thorough discussion of the significant aspects of the probable environmental consequences" of the agency's decision.' "[20]

[5, 6] The Port and the FAA issued their joint Final EIS for the Airport Master Plan Update in February 1996. Later that year, after determining that additional study was necessary based on new forecasts for the nation's airports conducted by the FAA, they issued a Supplemental EIS (SEIS) in February 1997 and a Final Supplemental EIS in May 1997. The Cities alleged that these studies were inadequate because they assumed that the additional runway would not result in an increase of passengers or airport operations and because they did not evaluate the impacts of the expansion beyond the year 2010. After a five-day hearing before the Hearings Examiner, the Examiner concluded that the "purpose of SEPA was well served with this SEIS." We conduct a de novo review of the Examiner's conclusion,[21] qualified by SEPA's statutory requirement

[18] *See* RCW 43.21C.030.

[19] *Toandos Peninsula Ass'n v. Jefferson County*, 32 Wn. App. 473, 483, 648 P.2d 448 (1982).

[20] *Org. to Preserve Agric. Lands (OPAL) v. Adams County*, 128 Wn.2d 869, 875, 913 P.2d 793 (1996) (quoting *Weyerhaeuser v. Pierce County*, 124 Wn.2d 26, 38, 873 P.2d 498 (1994)).

[21] *Klickitat County Citizens Against Imported Waste v. Klickitat County*, 122 Wn.2d 619, 632-33, 860 P.2d 390, 860 P.2d 1256 (1993).

that agency determinations of EIS adequacy are entitled to substantial weight.[22] The adequacy of an EIS is assessed under the "rule of reason,"[23] which requires a " 'reasonably thorough discussion of the significant aspects of the probable environmental consequences' of the agency's decision."[24]

"No Growth" Assumption

The Final EIS concluded that regardless of whether the Port took "no action" or whether it constructed the airport expansion, the same number of passengers would use the airport. This forecast was prepared by Stephen Allison, a Senior Aviation Planner for P&D Aviation, the company that prepared the Flight Plan EIS issued by the Port and the Puget Sound Regional Council (PSRC) in 1992. Allison has 30 years of experience in the aviation planning and consulting field and has served as project planner or lead aviation planner on the development of over 30 airport master plans and regional aviation system plans. Preparing forecasts of aviation activity for individual airports and multiple-airport regions is his specialty.

At the hearing, Allison explained that when he prepares a forecast, he develops a detailed mathematical model that assesses the relationship between airport activity and the factors that have been shown to strongly affect it, and then evaluates this model to ensure that it accurately forecasts aviation demand and passes statistical tests. He also considers a wide variety of other factors, including input from the aviation community, the local and national economies, airfares, telecommunications, and aviation demand in the region. He then compares the master plan forecast with forecasts prepared in other studies and by the FAA and evaluates differences in the purpose of the forecast, the forecast approach, and assumptions.

[22] RCW 43.21C.090; *OPAL*, 128 Wn.2d at 875.

[23] *Klickitat*, 122 Wn.2d at 633.

[24] *Id.* (quoting *Cheney v. City of Mountlake Terrace*, 87 Wn.2d 338, 344-45, 552 P.2d 184 (1976)).

In this case, Allison determined that three factors at Sea-Tac have the greatest predictive value for estimating future aviation demand: population of the service area, personal income in that area, and average airfares. The models he developed were tested against historical activity at Sea-Tac with a 99 percent correlation and accepted by the FAA for use in preparation of the EIS/SEIS. The forecasts were also reviewed by Landrum & Brown, the consultant selected by the Port and the FAA to prepare the EIS and SEIS. Other expert testimony at the hearing indicated that Allison's methodology has been used at most of the country's major airports.

The Cities presented the testimony of Dr. Clifford Winston, a Senior Fellow at the Brookings Institution, who stated that expanded airport facilities would cause a growth in demand for air travel. The Port's experts responded that aviation demand is not caused by expanded facilities as long as there is sufficient airport capacity to serve the passengers who wish to fly.

The Examiner found the testimony of the Port's experts credible and concluded that the "Port and the FAA used a forecasting methodology for the SEIS that was consistent with industry-accepted standards and was proven reliable over time. . . . The decision to measure aviation demand by the aviation forecast methodology chosen is legally adequate under the rule of reason." In addition, the Examiner noted that the difference of opinion between the Cities' expert witness and the Port's witnesses was discussed in the EIS, which "allowed the decision-makers to be informed on this issue prior to making their decisions."[25] We agree. Although the conclusion that an expansion at Sea-Tac will not create growth initially appears counterintuitive, the purpose of the expansion is not to increase capacity; it is to decrease delays in poor weather. As such, it is entirely plausible that this expansion will simply improve efficiency, not promote growth.

[25] The Final SEIS included an appendix that analyzed environmental impacts if increased airport capacity did indeed result in higher aviation activity.

The Cities cite several federal cases in support of their argument that the Sea-Tac expansion will cause additional aviation demand. In those cases, however, the courts reasonably held that new freeway exchanges and bridges would spur development and increase growth in the area, which would result in increased traffic on the highways themselves. This does not necessarily hold true for Sea-Tac. Although Sea-Tac will become more efficient when it constructs an extra runway to decrease delays in poor weather, it does not necessarily follow that more people from this region will decide to fly, or that people from other areas will be attracted to Sea-Tac for that reason. As the Eleventh Circuit concluded when considering the impacts of an Atlanta airport runway extension, although an increase in capacity would undoubtedly occur given the projected growth of the region, "[t]his increased growth . . . is not attributable to an extended runway. The effect caused by the runway extension will be a higher percentage of safe landings, not a higher number of planes landing."[26] This reasoning applies here.[27]

[7] The Port and the FAA are agencies with expertise in forecasting aviation demand and should receive deference in choosing the appropriate methodology for forecasting aviation activity.[28] When an agency is presented with conflicting expert opinion on an issue, it is the agency's job, and not the job of the reviewing appellate body, to resolve those differences.[29] We commend the Examiner on his

[26] *C.A.R.E. Now, Inc. v. Fed. Aviation Admin.*, 844 F.2d 1569, 1575 (11th Cir. 1988).

[27] The only airport case the Cities cite involves a multiple-airport system in Washington D.C. *See Citizens for Abatement of Aircraft Noise, Inc. v. Metro. Wash. Airports Auth.*, 718 F. Supp. 974 (D.D.C. 1989) (subsequent history omitted). As the Port points out, passengers in that region have an option, so new gates and terminal expansions may indeed lure passengers away from neighboring airports and increase growth.

[28] *Seattle Cmty. Council Fed'n v. Fed. Aviation Admin.*, 961 F.2d 829, 833-34 (9th Cir. 1992).

[29] *Webb v. Gorsuch*, 699 F.2d 157, 160 (4th Cir. 1983). Washington courts have

thorough analysis of this issue and defer to his finding that the Port's "no growth" presumption was a reasonable forecast.

Decision to Limit Analysis of Future Impacts to 2010

The Port explained to the Examiner that at the time the Master Plan Update EIS was prepared in 1994, airfares at Sea-Tac were relatively stable. Thus, the 1996 EIS analyzed effects of the proposal through 2020. But shortl thereafter several factors combined to add "significan uncertainty to the planning efforts of those professionals charged with attempting to meaningfully evaluate long-term impacts under SEPA and NEPA [National Environmental Protection Act]." Some of these factors included a drop in nationwide airfares, Boeing's decision to discontinue production of the MD-80 aircraft, the arrival of Southwest Airlines, one of the nation's lowest airfare airlines, and "investments in noise and air pollution research which are likely to significantly reduce engine noise in new aircraft . . . starting in the year 2005." In light of these events, the EIS consultants agreed with the project manager that they could not "reasonably forecast" the impacts of the runway project beyond the year 2010.[30] The Cities point out that because the runway will not be completed until 2004 or 2005, the Port has evaluated its actu impacts for only five years. The Examiner disagreed with the Cities' views, concluding that "a more proper context is to review the length of the planning period from the date of the EIS in 1996, rather than the year 2004." Thus, the Examiner viewed the Port's planning period as ranging over 13 years.

WAC 197-11-060(4) explains that "SEPA's procedural provisions require the consideration of 'environmental'

followed federal NEPA cases when construing SEPA. *Eastlake Cmty. Council v. Roanoke Assocs.*, 82 Wn.2d 475, 488 n.5, 513 P.2d 36, 76 A.L.R.3d 360 (1973).

[30] The Port did include an appendix, however, that contained "an extrapolated estimate of possible impacts in the year 2020 in order to provide decision-makers with the analysis of possible impacts through the year 2020 prior to their taking action."

impacts . . . , with attention to impacts that are likely, not merely speculative." This subsection further directs that "[a]gencies shall carefully consider the range of probable impacts, including short-term and long-term effects. Impacts shall include those that are likely to arise or exist over the lifetime of a proposal or, depending on the particular proposal, longer." "Probable" is defined in a later section as "likely or reasonably likely to occur, as in 'a reasonable probability of more than a moderate effect on the quality of the environment' . . . . Probable is used to distinguish likely impacts from those that merely have a possibility of occurring, but are remote or speculative."[31]

Mary Vigilante, the EIS Project Manager, testified that because there were rapid changes in aviation activity during the mid-1980s at Sea-Tac, and because quantification of environmental impacts depends on total aviation activity, aircraft types and engines, and the timing of flights, detailed analysis of the years beyond 2010 in the EIS would be speculative and could lead to a substantially inaccurate evaluation of environmental effects. The Examiner found her testimony credible. Gene Peters, a director with Landrum & Brown, similarly testified that the volatility in airfares, forecasts, fleet mix, and other areas in the period following 1994 made it difficult in 1996 to predict with substantial accuracy impacts beyond the year 2010. As for noise impacts, the experts testified that although it was theoretically possible to run noise contours, the reliability of the models diminishes as the length of time is expanded. The Cities did not rebut this testimony.

The Examiner's determination that this analysis satisfied SEPA's procedural requirements is supported by ample evidence in the record. The fact that the Port included an appendix that estimated the effects of the expansion through the year 2020 based on extrapolated data establishes that the Port did what it reasonably could to provide the decision makers with reliable information about the

[31] WAC 197-11-782.

potential environmental consequences of their actions. Anything more would have been too speculative, and thus the EIS was adequate under SEPA.

Affirmed.

Kennedy, C.J., and Coleman, J., concur.

Reconsideration granted and opinion modified February 23, 2000.

Review denied at 140 Wn.2d 1027 (2000).

[Nos. 18743-8-III; 18747-1-III; 18759-4-III; 18776-4-III; 18809-4-III; 19063-3-III. Division Three. July 3, 2001.]

The State of Washington, *Respondent*, v. Armando Mayorga DeSantiago, et al., *Appellants*.

[1] **Criminal Law — Evidence — Hearsay — Former Testimony — Governing Law.** The admissibility in a criminal trial of former testimony by an unavailable witness is governed by ER 804(b)(1), ER 804(a), and the limitations imposed by the Sixth Amendment right to confront adverse witnesses.

[2] **Evidence — Hearsay — Unavailability of Declarant — Attempt To Compel Presence — All Available Means — Necessity.** Before a declarant's hearsay statement may be admitted under ER 804(b) (allowing admission of certain statements or testimony when the declarant is unavailable to testify), the State must use all available means to compel the declarant's presence at trial.

[3] **Criminal Law — Evidence — Hearsay — Unavailability of Declarant — Confrontation Clause — Effect.** Hearsay testimony may not be admitted in a criminal trial under ER 804(b) (allowing admission of certain statements or testimony when the declarant is unavailable to testify) unless the more stringent Confrontation Clause standard for unavailability is satisfied.

[4] **Criminal Law — Evidence — Hearsay — Right of Confrontation — Unavailability of Declarant — Good Faith Effort — What Constitutes.** Under the Confrontation Clause, a

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SEPA ADDENDUM

January 24, 2000

This document is a SEPA Addendum to the *Final Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport* issued May 13, 1997 by the Federal Aviation Administration and the Port of Seattle. This Addendum has been prepared in accordance with Chapter 197-11-625 Washington Administrative Code, and Port of Seattle SEPA Policies and Procedures Resolution No. 3028. The purpose of this document is to describe and analyze the modification to the Master Plan Update Development Actions for the Third Runway Project that was made after the environmental documents were issued. These modifications include the quantity of wetlands affected, the design of the retaining wall for the runway embankment, and the design of the construction only-temporary interchange that is proposed to mitigate construction impacts. These modifications do not substantially change the analysis of significant impacts described in the *Final Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport.*

Project Name: Third Parallel Runway Wetland Fill, and Temporary Construction-Only Interchange at SR 509/South 176th Street POS SEPA No.00-02

Existing Environmental Documents:

Final Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport, FAA and Port of Seattle, February 1996

Final Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport, FAA and Port of Seattle, May 1997

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Project Description

The report *ADDENDUM To Final Environmental Impact Statement and Final Supplemental Environmental Impact Statement For Proposed Master Plan Update Development Actions At Seattle-Tacoma International Airport* prepared pursuant to the Washington State Environmental Policy Act (Ch. 43.21C RCW) provides a detailed explanation of the proposed changes.

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In 1996, the Port of Seattle (Port) and the Federal Aviation Administration (FAA) issued the *Final Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport* (1996 FEIS). In 1997, the Port and the FAA issued the *Final Supplemental Environmental Impact Statement for the Master Plan Update Development Actions* (1997 FSEIS). This Addendum addresses new information that has come to light since the issuance of these EISs relating to: (a) wetlands and other aquatic resources that would be affected by the planned new runway and other improvements at Seattle-Tacoma International Airport; and (b) potential impacts of temporary construction-related interchanges on SR 509 to be used by trucks delivering fill material to the planned new runway site. This Addendum was prepared by the Port to report the Port's assessment of the new information and its determination that the existing environmental analyses under the Washington State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA) remain adequate.

Chapter I of the report contains an introduction and summary.

Wetland Impacts: Chapters II-VI relate to impacts on wetlands and other aquatic resources. They summarize identification of affected wetlands in the 1996 FEIS, the 1997 FSEIS, and the 1996 Joint Aquatics Resources Project Application (JARPA). They contain the refined identification of affected wetlands based on new information. They present a refined wetland impact analysis and recent changes to the project to minimize wetland impacts. They focus on the hydrologic and seismic impacts of the runway embankment and MSE retaining walls. Finally, they describe and explain the planned wetland mitigation measures, on-site and off-site.

The analysis of wetland impacts in the 1996 FEIS and 1997 FSEIS was based on wetland delineations that have been revised recently as the Port has acquired, and gained access to, approximately 390 parcels of land where Master Plan Update improvements will be located. The FSEIS identified a total of 12.33 acres of wetlands that would be affected by Master Plan Update improvements. Of this total, 7.38 acres were identified as affected by the Runway (including embankment and borrow sources), 2.34 acres by the Runway Safety Areas, and 2.51 acres by terminal and landside improvements.

Upon completion of the EIS process, the Port decided to proceed with the Airport improvements and received the approval of the FAA. The Port then initiated acquisition of property. As land was acquired and on-the-ground wetland studies were conducted, the Port found that the Third Runway project would affect more wetlands than previously identified in the 1997 FSEIS. Based on the refined identification of wetlands in the study area, a revised impact analysis was prepared. Under the revised wetland impact analysis, the wetland acreage affected by the project had increased from 12.23 acres to 18.33 acres. Of this revised total, 15.41 acres would be affected by the runway (including embankment borrow sources and off-site mitigation), 0.14 acre by the Runway Safety Areas and 2.78 acres by South Aviation Support Area (SASA) improvements. The refined analysis also identified 2.17 acres of wetlands that would be temporarily affected by construction activities and 16.46 acres of wetlands that would be modified, primarily beneficially, as a result of wetland mitigation measures. Because the value of wetlands is determined more by their environmental function than their acreage, the revised

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wetland impact analysis contained in this report focuses on impacts to wetland functions rather than simply the affected acreage.

Construction-Only Temporary Interchange: Chapter VII relates to the potential impacts of the temporary construction-related interchange on SR 509 to be used by trucks delivering fill material to the planned new runway site. It analyzes potential noise impacts from trucks on the interchange, considers the potential impacts of a temporary noise wall at the interchange on SR 509, and describes potential vibration impacts from the trucks.

The Final Supplemental EIS for the Master Plan Update improvements at Seattle-Tacoma International Airport evaluated the construction and use of temporary construction-only interchanges proposed for the purpose of mitigating traffic-related impacts from hauling fill to construct the Third Runway and Runway Safety Areas. Since the publication of the Final Supplemental EIS in May 1997, the Port has further refined the design for a temporary construction-only interchange facility and conducted additional coordination with the Washington State Department of Transportation. This addendum presents the evaluation of noise and vibration that was conducted based on the design and alignment for the interchange at SR 509 and South 176th Street. No other changes in effect are anticipated.

A vibration analysis was conducted to ensure that significant vibration effects would not occur to residential areas in the vicinity of the temporary construction-only interchange. As this analysis shows, only one home (the home on the north west corner of the SR 509/S.176th Street overpass) could experience vibration effects in excess of the DOT thresholds. As a result, the Port of Seattle proposes to offer to acquire and relocate this homeowner.

The noise analysis was conducted in a manner that considers the possible distribution of traffic haul that could occur. Until a contractor is selected to deliver fill material for the haul, it is not certain as to the location where fill will be obtained. As a result, it is not possible to predict whether or not night haul will be necessary. Consideration was given to four possible scenarios: 1) all haul during daytime hours; 2) 10% haul during nighttime hours; 3) 50% haul during nighttime hours and 4) 100% haul during nighttime hours. At this time the Port is not proposing to haul any portion of fill during nighttime hours. These scenarios were considered for the purpose of ensuring that adequate mitigation is provided. Based on this evaluation, this mitigation item has been refined slightly to include:

- A noise attenuation wall to ensure that the high volume of truck traffic does not create a significant noise effect on adjacent properties;
- Offer to acquire the residence closest to the southbound off-ramp (Home 1) at South 176th Street due to the potential for significant vibration effects if the off-ramp pavement becomes worn.
- Sound insulation of homes that would exceed the Washington State Department of Transportation sound level standard as a result of the proposed haul.

Port of Seattle

SEPA Review

The Port of Seattle has reviewed this proposal and determined that it is a minor revision that is within the scope of the projects described in the Master Plan Update. The proposed revisions do not change the analysis of significant impacts provided in the *Final Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*, Port of Seattle, May 1997.

Date Addendum Prepared: January 24, 2000

SEPA Lead Agency: Port of Seattle (POS File No. 00-02)

SEPA Responsible Official:

Michael Feldman, Director
Airport Facilities

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ADDENDUM

To
Final Environmental Impact Statement and
Final Supplemental Environmental Impact Statement
for
Proposed Master Plan Update Development Actions
at
Seattle-Tacoma International Airport

Prepared pursuant to the Washington State Environmental Policy Act (Ch. 43.21C RCW)

PREPARED BY:
PORT OF SEATTLE

January, 2000

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Chapter I

INTRODUCTION AND SUMMARY

In 1996, the Port of Seattle (Port) and the Federal Aviation Administration (FAA) issued the Final Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport (1996 FEIS). In 1997, the Port and the FAA issued the Final Supplemental Environmental Impact Statement for the Master Plan Update Development Actions (1997 FSEIS). This Addendum addresses new information that has come to light since the issuance of these EISs relating to: (a) wetlands that would be affected by the planned new runway and other improvements at Seattle-Tacoma International Airport; and (b) potential impacts of temporary construction-related interchanges on SR 518 and SR 509 to be used by trucks delivering fill material to the planned new runway site. This Addendum was prepared by the Port to report the Port's assessment of the new information and its determination that the existing environmental analyses under the Washington State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA) remain adequate. As a result of this assessment, the Port, as lead agency under SEPA, has determined that no additional environmental analysis is required. This conclusion was based on the Port's findings that the newly discovered areas of adverse impacts to wetlands, and the potential impacts of the temporary construction interchanges, either were not environmentally significant, in light of project changes and mitigation measures, or were adequately covered by the analyses of wetland impacts in the 1996 FEIS and 1997 FSEIS.

Chapter I of the report contains an introduction and summary.

Chapters II-VI relate to impacts on wetlands. They summarize identification of affected wetlands in the 1996 FEIS, the 1997 FSEIS, and the 1996 Joint Aquatics Resources Project Application (JARPA). They contain the refined identification of affected wetlands based on new information. They present a refined wetland impact analysis and recent changes to the project to minimize wetland impacts. They focus on the hydrologic and seismic impacts of the runway embankment and MSE retaining walls. Finally, they describe and explain the planned wetland mitigation measures, on-site and off-site.

Chapter VII relates to the potential impacts of the temporary construction-related interchanges on SR 518 and SR 509 to be used by trucks delivering fill material to the planned new runway site. It analyzes potential noise impacts from trucks on the interchanges, considers the potential impacts of a temporary noise wall at the interchange on SR 509, and describes potential vibration impacts from the trucks.

Chapter VIII discusses the conclusion that a supplemental EIS is not necessary as a result of this new information.

1. Background

In the late 1980's, the Puget Sound Regional Council (PSRC) and the Port jointly initiated a regional study and decision-making process, known as the Flight Plan Project, to address the growing demand for air travel and impending shortfall in commercial transportation airport capacity in the Puget Sound region. In October 1992, the PSRC and the Port issued a Final Environmental Impact Statement (Flight Plan EIS) for the Flight Plan Project. This EIS was a non-project, programmatic EIS that comparatively analyzed the potential environmental impacts of a wide range of alternative strategies for addressing impending severe constraints on air travel capacity in this region.

The culmination of the Flight Plan Project, after nearly a decade of study, was a regional decision to pursue a new air carrier runway at Seattle-Tacoma International Airport (STIA or Airport), among other strategies. The Port (as operator of STIA), in cooperation with the Federal Aviation Administration (FAA), then initiated a planning process to develop and environmentally analyze a Master Plan Update for the Airport. In February 1996, the FAA and the Port issued the Final Environmental Impact Statement for Proposed Master Plan Update Development Actions (FEIS). The FEIS was a project-level, site-specific EIS that examined the potential environmental impacts of the planned development actions. Shortly thereafter, following review of new information regarding aviation forecasts, the FAA and the Port decided to prepare a supplemental EIS. Accordingly, in May 1997, the FAA and the Port issued the Final Supplemental EIS for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport (FSEIS). The 1996 Master Plan Update FEIS and 1997 FSEIS were prepared in accordance with the requirements of NEPA (42 U.S.C. §§ 4321 *et seq.*) and SEPA (Ch. 43.21C RCW).

In 1997, following the issuance of the FSEIS, the Port approved the Master Plan Update, and the FAA issued a Record of Decision authorizing development of the new runway and other improvements at STIA. The Port then initiated the process of acquiring the property necessary for the development of the Third Runway and other development actions, estimated in the Final EIS to be approximately 388 single family houses, 260 condominiums and apartments, and 105 businesses.

Prior to gaining access to the properties, the Port estimated the location and areas of wetlands and other waters to be affected by the development of the new runway and other Master Plan Update actions. These estimates were made by studying aerial photographs, National Wetland Inventory maps, and local government sensitive area maps, and by making observations from public rights-of-way. However, as documented in the FEIS and FSEIS, lack of access precluded on-the-ground wetland delineations in the acquisition area. The Port, as it acquired properties and conducted on-the-ground wetland delineations, discovered that the quantity of wetlands in the acquisition area potentially affected by the proposed airport improvements was greater than previously estimated. In addition, to avoid wetland impacts and relocation of a greater portion of Miller Creek, the Port has completed additional work regarding the embankment and MSE retaining walls, including new information regarding hydrology and seismic stability. This new information on affected wetlands and other aquatic resources since the 1996 FEIS and 1997 FSEIS were issued is described in detail below.

The FSEIS discussed the planned temporary interchanges on SR 518 and SR 509, to be used by trucks delivering fill material to the planned new runway site. Following issuance of the FSEIS, the Port has prepared more detailed plans on construction of the new runway and other Master Plan Update development actions. During this planning process, the Port has conducted more detailed review of the planned temporary construction-related interchanges, including potential noise and vibration impacts resulting from truck use of these interchanges.

The Port has assessed the new information regarding affected wetlands and the temporary interchanges under the standards of SEPA governing when supplementation of an FEIS for an ongoing proposal is required. The Washington SEPA Rules require a supplemental EIS if there are:

- substantial changes so that the proposal is likely to have significant adverse environmental impacts [not considered in the previous EIS]; or
- new information indicating a proposal's probable significant adverse environmental impacts.[1]

2. Summary of New Information on Affected Wetlands

The analysis of wetland impacts in the 1996 FEIS and 1997 FSEIS was based on wetland delineations that have been revised recently as the Port has acquired, and gained access to, approximately 390 parcels of land where Master Plan Update improvements will be located. The FSEIS identified a total of 12.33 acres of wetlands that would be affected by Master Plan Update improvements. Of this total, 7.38 acres were identified as affected by the Runway (including embankment and borrow sources), 2.34 acres by the Runway Safety Areas, and 2.51 acres by terminal and landside improvements.

Upon completion of the EIS process, the Port decided to proceed with the Airport improvements and received the approval of the FAA. The Port then initiated acquisition of property. As land was acquired and on-the-ground wetland studies were conducted, the Port found that the Third Runway project would affect more wetlands than previously identified in the 1997 FSEIS. Based on the refined identification of wetlands in the study area, a revised impact analysis was prepared. Under the revised wetland impact analysis, the wetland acreage affected by the project had increased from 12.23 acres to 18.33 acres. Of this revised total, 15.41 acres would be affected by the runway (including embankment, borrow sources, and off-site mitigation), 0.14 acre by the Runway Safety Areas and 2.78 acres by South Aviation Support Area (SASA) improvements. The refined analysis also identified 2.17 acres of wetlands that would be temporarily affected by construction activities and 16.46 acres of wetlands that would be modified, primarily beneficially, as a result of wetland mitigation measures. Because the value of wetlands is determined more by their environmental function than their acreage, the revised

[1] WAC 197-11-600(3)(b) and (4)(d).

wetland impact analysis contained in this report focuses on impacts to wetland functions rather than simply the affected acreage.

3. **Summary of New Information on Temporary Highway Interchanges**

The Final Supplemental EIS for the Master Plan Update improvements at Seattle-Tacoma International Airport evaluated the construction and use of temporary construction-only interchanges proposed for the purpose of mitigating traffic-related impacts from hauling fill to construct the Third Runway and Runway Safety Areas. Since the publication of the Final Supplemental EIS in May 1997, the Port has further refined the design for a temporary construction-only interchange facility and conducted additional coordination with the Washington State Department of Transportation. This addendum presents the evaluation of noise and vibration that was conducted based on the design and alignment for the interchange at SR 509 and South 176th Street. No other changes in effect are anticipated.

A vibration analysis was conducted to ensure that significant vibration effects would not occur to residential areas in the vicinity of the temporary construction-only interchange. As this analysis shows, only one home (the home on the north west corner of the SR 509/S.176th Street overpass) could experience vibration effects in excess of the DOT thresholds. As a result, the Port of Seattle proposes to offer to acquire and relocate this homeowner.

The noise analysis was conducted in a manner that considers the possible distribution of traffic haul that could occur. Until a contractor is selected to deliver fill material for the haul, it is not certain as to the location where fill will be obtained. As a result, it is not possible to predict whether or not night haul will be necessary. Consideration was given to four possible scenarios: 1) all haul during daytime hours; 2) 10% haul during nighttime hours; 3) 50% haul during nighttime hours and 4) 100% haul during nighttime hours. At this time the Port is not proposing to haul any portion of fill during nighttime hours. These scenarios were considered for the purpose of ensuring that adequate mitigation is provided. Based on this evaluation, this mitigation item has been refined slightly to include:

- A noise attenuation wall to ensure that the high volume of truck traffic does not create a significant noise effect on adjacent properties;
- Offer to acquire the residence closest to the southbound off-ramp (Home 1) at South 176th Street due to the potential for significant vibration effects if the off-ramp pavement becomes worn.
- Insulation of homes where the sound generated by the construction activity using the temporary interchange would increase noise to sound levels above 67 DNL (the WSDOT land use criteria). It is anticipated that the number of homes to be insulated would depend on use of the interchange at night but would number less than a half dozen homes along South 176th Street west of the interchange.

Chapter VII of this report summarizes the analysis performed.

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Chapter II

ORIGINAL IDENTIFICATION OF AFFECTED WETLANDS AND OTHER AQUATIC RESOURCES

1. Previously Identified Wetland Impacts

In 1996, the Federal Aviation Administration (FAA), as lead NEPA agency, and Port of Seattle (Port), as lead SEPA agency, issued the Final Environmental Impact Statement (FEIS) for the Master Plan Update Development at Seattle-Tacoma International Airport. Prior to issuance of the Record of Decision, the FAA revised its forecast of aviation demand at Sea-Tac. As a result of the revised aviation forecasts, the FAA prepared a Supplemental Environmental Impact Statement to assess the consequences of accelerating the development of terminal and landside improvements and delaying completion of the Third Runway until 2004. In May 1997, the FAA issued the Final Supplemental EIS (FSEIS) and, in July 1997, the Record of Decision.

In December 1996, the Port submitted an application to the Army Corps of Engineers for a permit to fill wetlands for the Master Plan Update improvements in compliance with the Clean Water Act, § 404. The § 404 permit application was submitted as part of a Joint Aquatic Resources Project Application (JARPA) and was accompanied by a report entitled "JARPA Application for Proposed Improvements at Seattle-Tacoma International Airport" dated December 1996. These documents are hereby incorporated by reference. Copies of these and all documents referenced herein are publicly available during regular business hours at the Port of Seattle, Aviation/Project Management Group, Suite 301, Kilroy Building, 17900 International Boulevard, SeaTac, WA 98188.

The purpose of this chapter is to summarize the analysis of wetland impacts contained in the 1996 Final EIS, JARPA, and the 1997 Final Supplemental EIS.

As shown in **Table 2-1**, the 1996 FEIS identified about 10.4 acres of wetlands that would be filled in order to complete the Master Plan Update improvements. Prior to issuance of the Final SEIS, the Port refined its evaluation of the projects affecting wetlands, documented its review of in-basin mitigation options, and further defined plans for development of an off-site wetland mitigation site in Auburn. As a result, the 1997 FSEIS identified 12.23 acres of wetlands that would be filled.

TABLE 2-1

Prior Studies – Wetland Impacts (acres)

Project Element	Final SEIS	Final EIS
Runway impacts		
Embankment	5.46	5.48
Borrow Source impacts	1.92	2.38
Runway Safety Areas 16L/R	2.34	Included above
Runway 34R Extension	0.00	0.00
Terminal/Landside		
N. Employee Parking lot	0.81	0.81
Development in SASA	1.70	1.70
Total	12.23	10.40

Source: *Final Supplemental EIS for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*, FAA, May 1997.

The following sections summarize the wetland impact analysis contained in these previous environmental documents.

The 1996 Final EIS (Chapter IV, Section 16) stated:

> Approximately 40 percent of the detailed study area is occupied by Sea-Tac Airport and is characterized by frequently mowed grassland bisected by service roads and taxiways. This area provides little wildlife habitat value. Wildlife habitat surrounding the airfield consists of fragmented habitat, which is composed of forest, shrub, and grassland with scattered wetlands. These areas are subject to a variety of airport-related disturbances as well as increasing residential, commercial, and industrial development. Each of the "With Project" alternatives would remove approximately the same amounts of vegetation (about 712 acres total). Of that total, the majority is managed grassland (about 303 acres), which provides little wildlife habitat value. In addition, about 269 acres of forest, 78 acres of shrub, 52 acres of unmanaged grassland, *and 10 acres of wetlands would be removed* under each "With Project" alternative. *(Italics added)*
>
> About 3,700 feet of Miller Creek and its tributaries would require realignment and relocation to complete the runway. About 200 feet of Des Moines Creek would require relocation due to the 600 ft extension of Runway 34R. About 2,200 feet of open channel on Des Moines Creek would require relocation due to the South Aviation Support Area. The 200-foot section of Des Moines Creek that would be affected by the extension of Runway 34R is within the area that would be realigned as mitigation for SASA. Proposed mitigation would reduce potential impacts on the hydrology, water quality, and aquatic habitat and biota of Miller and Des Moines Creeks and Puget Sound.

Implementation of the improvements was identified as impacting all or portions of 36 wetlands. The total area of wetland impact was identified in the Final Supplemental EIS at 12.23 acres. Most impacts would occur during the first phase of implementation (then planned to occur before year

2000). Wetland mitigation would compensate for all anticipated wetland impacts attributed to full implementation of the Master Plan Update improvements.

The 1997 Final SEIS stated:

> "Due to similarities in vegetation, many of the affected wetlands serve similar physical and biological functions and have been grouped for ecological assessment. Wetlands within the impact area occur in the Des Moines Creek and Miller Creek drainage basins, where natural habitats (including wetlands) are fragmented by urban development. In addition to substantial fragmentation of habitat, the small size of most impacted wetlands suggests that they function independently rather than as a natural ecological system.
>
> According to the Washington State Natural Heritage Program information system and field studies, no rare plants, high-quality native wetlands, or high-quality native plant communities occur in the study area. Nineteen vegetation communities were identified in the proposed Master Plan Update study area, including nine (9) wetland and ten (10) upland vegetation communities. The wetland vegetation communities include forested wetland, shrub wetland, and emergent wetland."

In the 1997 Final SEIS, the functions and values of the wetlands to be affected were identified.

> "Impacts associated with the Master Plan Update improvements are to small (<0.5 acre) wetlands that are isolated from other significant aquatic or semi-aquatic habitat, and occur in a landscape fragmented by streets, commercial, residential, or airport development. Therefore, for most functions, the wetlands were not considered to provide high function. Emergent wetlands (some with associated shrub habitat) were rated low for the following functions: export of production; baseflow support; and control of floodflow. Forested wetlands (some with associated shrub habitat) received a low functional value for export of production and stormwater runoff storage functions.
>
> The wildlife habitat functions are generally significant to the local vicinity (rather than to a larger landscape or watershed) because urban development isolates the area for many species of wildlife, and the size of many of the wetlands are smaller than the habitat requirements of many mammal and bird species. The biological functions of wetlands are further limited by the lack of permanent open water, the short duration of seasonal ponding or soil saturation, and the high occurrence of non-native plant species in some emergent wetlands. The wildlife habitat value increases where trees and/or shrubs are adjacent to the grass-dominated emergent areas."
>
> Hydrologic functions (such as floodflow storage, groundwater discharge, and storm water detention) are potentially important at the watershed level, because, when present, they may affect hydrologic and habitat conditions in off-site locations, especially fish habitat in Miller and Des Moines Creeks. Forested wetlands, on groundwater seeps adjacent to Miller and Des Moines Creeks, help to support the baseflow of the creeks by providing seasonal or perennial sources of water. Some of the forested wetlands associated with the creeks temporarily store floodwaters, which alleviates the severity of downstream flooding, and streambank erosion. Other wetlands help reduce peak flows by collecting and storing storm runoff, reducing the rate and volume of water that reaches the stream systems during storms. The on-site wetlands have a limited ability to provide these functions, largely due to their small size, the lack of direct connections to the creeks, or topographic conditions that limit seasonal detention of stormwater.
>
> The groundwater recharge function of wetlands appears to be limited throughout much of the site. Many wetlands occur on compact till soils (Alderwood Series) above the Miller Creek and Des Moines Creek ravines. The wetlands have formed in shallow depressions where a perched water table has developed on low permeability till. Due to the low permeability of the till layer, it is unlikely these wetlands contribute significantly to recharge of groundwater."

2. Original JARPA Mitigation Program

In the JARPA and accompanying report, the Port proposed a mitigation program designed to add more wetland functions and values than would be lost as a result of the planned new runway and other Airport improvements. It was not possible to provide all such mitigation "on-site," that is, within the watershed where the affected wetlands were located, for three reasons:

- "Wildlife attractions" within 10,000 ft of the edge of any active runway are not recommended; and wildlife control activities in wetlands near the airport would conflict with wetland habitat mitigation goals.
- Land in the watersheds that is greater than 10,000 feet from the runways is unsuitable for mitigation because of steep topography, lack of water, or presence of forest vegetation (which agencies discourage removing for wetland mitigation).
- Beyond 10,000 feet from the runways, most of the area surrounding the Airport is developed, and not enough available land exists in the watershed to create compensatory mitigation wetlands without relocation of additional business and residences;

The off-site mitigation necessitated by potential wildlife attraction hazards would be provided on land owned by the Port located within the City of Auburn immediately west of the Green River. The undeveloped parcel has been farmed in the recent past and currently supports a mix of upland pasture grasses and forbs that are common to abandoned agricultural land in the Puget Sound basin. Approximately 4.3 acres of emergent wetland was delineated during previous site investigations and is included in the 47-acre portion of the site proposed for mitigation (only 0.27 acres of these wetlands would be affected by the mitigation). The wetland mitigation would be located a minimum of 200 ft west of the ordinary high water mark of the adjacent Green River.

The overall wetland mitigation goal on the Auburn site is to compensate for unavoidable wetland impacts by in-kind replacement of habitat. This would be accomplished by creating a diverse replacement habitat with a net gain in functional value and acreage. Specifically, this offsite mitigation of lost wetland habitat functions would attain the following goals:

1 Create about 21 acres of palustrine forested, scrub/shrub, and emergent wetland at an average replacement ratio of 1.5:1;

2 Consolidate impacts of many lower functioning wetlands into one large wetland ecosystem on a single site with long-term protection. Maximize habitat value of the new wetland by providing habitat connections or corridors to other significant habitat areas;

3 Provide in-kind wildlife habitat replacement while maximizing public safety and minimizing wildlife hazards to aircraft; and

4 Mitigate all adverse impacts on hydrologic functions (water quality, flood storage, and stormwater storage) within the Miller Creek and Des Moines Creek watersheds, with an overall replacement ratio of at least 1:1.

Table 2-2 lists the goals of the mitigation site. The off-site wetland mitigation site is designed to provide in-kind replacement of wetland habitat functions affected by the improvements.

Although not related to impacts of the Master Plan Update improvements, additional Green River floodplain storage capacity would be created as part of the design process.

In 1998, the Port completed a SEPA checklist, and a Determination of Non-Significance for the construction of the wetland mitigation site in Auburn.

3. Relocation of Miller Creek

The new runway embankment would directly affect three areas in the Miller Creek watershed. The Miller Creek basin encompasses about 8 square miles and includes a small portion of the Airport, as well as parts of the cities of SeaTac and Burien. The Airport covers an estimated 5 percent of the entire basin. The Miller Creek watershed consists of drainage channels that originate at Arbor, Burien, and Tub lakes; surface water and seep drainages from the north end of Sea-Tac Airport; and overflows from the Miller Creek Stormwater Detention Facility and Lora Lake. The creek generally flows south and southwest toward Puget Sound. The areas of this basin that would be affected include:

- Area 1: approximately 980 feet of Miller Creek. The affected portions extend approximately 1,000 feet south of Lora Lake.
- Area 2: Class III drainage channels totaling 2,080 feet, that originate as seeps in the Airport Operations Area (AOA) then flow west to Miller Creek.
- Area 3: 200 feet of the Class III headwaters of Walker Creek. These waters, which originate from seepage and storm water runoff at the corner of 12th Avenue South and South 176th Street, flow northwest to SR 509.

The primary mitigation goal is to replace lost values and functions of the three portions of Miller Creek and its associated drainage channels that would be affected by the airport improvements.

The original mitigation plan was designed to ensure that present beneficial uses of Miller Creek will not be reduced and that other beneficial uses will be added or enhanced. Beneficial use criteria provide design standards and require consistency with the overall mitigation plan. The following impact compensation goals were to be attained by the original mitigation program.

Miller Creek Goals

Goal 1:	The creek would continue to provide base flow conveyance.
Goal 2:	The new Miller Creek channel would provide improved fish habitat.
Goal 3:	The mitigation would accommodate peak flows up to the 100-year flow; no net reduction of 100-year floodplain storage or floodway conveyance.
Goal 4:	Minimum flow velocity should minimize fine sediment deposition.
Goal 5:	The channel would replace or increase riparian habitat.

TABLE 2-2

SUMMARY OF WETLAND IMPACTS AND COMPENSATORY DESIGN OBJECTIVES
(Extracted from the 1997 Final Supplemental EIS)

Project Impact	Compensatory Design Objectives	Potential Acreage Provided[1]	Compensation Ratio[1]
Fill of 7.34 acres of forested wetland and loss of associated wildlife habitat.	Provide in-kind replacement of forested wetland vegetation cover and increase overall wildlife habitat value.	14.68 acres of forested wetland	2.0:1
Fill of 2.01 acre of shrub wetland and loss of associated wildlife habitat.	Provide in-kind replacement of shrub wetland vegetation cover and increase overall wildlife habitat value.	2.01 acres of shrub wetland	1.0:1
Fill of 2.88 acres of emergent wetland and loss of associated wildlife habitat.	Provide in-kind replacement of emergent wetland vegetation cover and increase wildlife habitat value.	4.32 acres of emergent wetland	1.5:1
Loss of water quality functions.	On-site replacement of surface water functions would be included in the engineering design of the Master Plan Update improvements. The design features would include 3-celled wetponds (with a maximum 48-hour detention), wet vaults, bioswales, and detention, as necessary to meet or exceed all BMPs.	Best Management Practices for stormwater quality would be followed.	NA
	Additional mitigation to provide flood storage capacity in the Green River drainage basin.	Approximately 30 to 60 acre-ft of flood storage capacity.	NA
Loss of degraded wetland buffers.	In-kind replacement for upland buffer impacts and additional mitigation for wildlife using both wetland and non-wetland habitats.	Approximately 3 acres of forested upland buffer.	NA

[1] Acreages of mitigation and compensation ratios are identified as potential since verification of wetland impacts is in process and because ratios would be subject to negotiation.

NA = Not applicable.

Source: Parametrix, December 1996. As reported in the 1997 Final Supplemental EIS.

Miller Creek Goals (continued)

Goal 6: The channel cannot include expansive, long-standing water pools or wetlands that could potentially attract wildlife.

Goal 7: The proposed Miller Creek corridor should accommodate passive recreational uses, such as walking trails

Drainage Channel Goals

Goal 1: The mitigation drainage channel would continue to provide adequate flow conveyance.

Goal 2: The mitigation drainage channel would collect seepage to maintain base flows.

Goal 3: The new drainage channel would provide an open channel of equivalent length as the existing drainage channels.

The creek relocation site was chosen because it is relatively close to the edge of the third parallel runway embankment, and therefore, requires the shortest stream relocation length. Also, extremely flat site conditions dictate that the proposed channel be as short as possible to provide the maximum possible channel slope. The proposed realigned creek would be located as close to the base of the fill slope of the Third Runway as possible. The downstream end of the channel would connect with the existing Miller Creek channel at the closest possible point to minimize stream relocation impacts. The channel edge would be a minimum of 25 feet from the base of the slope, to accommodate a riparian buffer. However, because of the limited space between Lora Lake and the embankment, narrower buffers might be required in this area. To compensate for the restrictive high flow area, flows in excess of channel capacity will be diverted from the main channel of Miller Creek into Lora Lake and then reintroduced at the lake outlet channel.

The drainage channel mitigation site was selected as the only appropriate option for recreating the equivalent drainage length for the filled drainage channels. The existing channels could not be left undisturbed or reconstructed on the fill slope because of fill stability requirements.

Approximately 9,630 cubic yards of floodplain storage would be lost in the fill area due to the Master Plan Update improvements. Approximately 10,000 cubic yards of floodplain storage and floodway conveyance would be created, not including storage for the proposed stream channel.

* * *

Potential environmental impacts of relocating Miller Creek and its tributaries were discussed in an attachment to the JARPA 404 permit application titled *"Miller Creek Relocation Plan for Proposed Master Plan Update Improvements at Seattle-Tacoma International Airport"* dated December 1996. This document, which included a detailed mitigation plan, was submitted as part of the § 404 permit for the wetland mitigation site and Miller Creek relocation.

Chapter III

REFINED IDENTIFICATION OF AFFECTED WETLANDS AND OTHER AQUATIC RESOURCES

Since the completion of the 1997 Final Supplemental EIS (FSEIS), the Port of Seattle has acquired parcels on which the embankment supporting the new runway will be placed and has conducted more precise on-the-ground delineations. This section summarizes new information on the nature and extent of the wetlands that would be affected by Airport improvements. **Table 3-1** compares the affected wetlands as presently identified with the affected wetlands identified in the 1997 FSEIS.

1. Wetland Identification Process

As is noted in the following description, the primary differences between the wetlands presently identified and those identified in the Final EIS/Final Supplemental EIS relate to access to property for purposes of identifying and delineating wetlands.

(A) Wetland Identification in 1996 Final EIS and 1997 Final Supplemental EIS

As is noted in the 1996 FEIS and 1997 FSEIS, the development of the Third Runway embankment necessitated the Port's acquisition of about 390 parcels of land located directly west of the existing airfield. To avoid public perception of prejudicing the outcome of the environmental review, the Port did not begin acquisition of these properties until after receipt of the FAA Record of Decision approving the proposed Airport improvements. As a consequence, access to the parcels for the purpose of surveying the conditions and delineating wetlands could not be conducted without permission from the property owners. During preparation of the 1996 Final EIS, letters were sent to such landowners seeking access for the purpose of identifying resources, including wetlands. Right-of-entry was not granted by nearly all of the property owners. As a result, no direct access was available at the time of the Final EIS/Final Supplemental EIS to nearly all of the potentially affected parcels. Therefore, the delineation of wetlands was based on interpretation of aerial photography, topographic maps, and visual inspection from public rights-of-way or other parcels owned by the Port.

(B) Refined Wetland Identification After Property Acquisition

In July 1997, the FAA issued the Record of Decision, and the Port initiated the acquisition process immediately thereafter. By mid 1998, the Port had gained possession of about 30 properties and had initiated a wetland delineation and survey process for these parcels. At that time, it became apparent that more or larger wetlands were present. The Port then initiated an accelerated program of gaining access agreements to the remaining parcels that were to be acquired. On-the-ground delineation of wetlands on these parcels was then conducted.

Field investigations for wetlands were completed for properties not previously accessible between March 1998 and February 1999. During these site visits, properties were inspected for wetland characteristics and other related drainage features. Project staff identified and delineated wetlands in the study area using the Routine Determination Method outlined in the *Washington State Wetland Identification and Delineation Manual* and the 1987 *U.S. Army Corps of Engineers Wetland Delineation Manual.* Throughout this document, the refined analysis reflects the delineations completed after access to most of the acquisition area had been obtained.

The U.S Army Corps of Engineers (Corps) has verified the wetland delineations on all properties within the impact area that are either currently owned by the Port, or to which the Port has been granted access. Note that as of December 31, 1999 wetland delineations have not been conducted on two parcels, comprising about 3.5 acres, where access has not been granted (parcels 305, and 177). (USACOE Memorandum for Record: Field Review and Jurisdictional Summary 1999) See **Tables 3-1 and 3-2**. To estimate probable wetland impacts on these parcels, wetland identification was conducted by visual inspection from adjacent properties, review of topography, and review of aerial photography. Wetlands on parcel 177 have been delineated but not surveyed, because access to the site was revoked following identification of wetlands on the parcel. Observations from off-site locations, and other information indicate low probability of wetland occurrence on Parcel 305. The wetland impact analysis assumes the existence of approximately one additional acre of affected wetlands to account for these uncertainties and ensure that wetlands are not underestimated.

2. Wetlands in the Study Area -- Comparison of Original Identification of Affected Wetlands With Refined Identification of Affected Wetlands

The 1997 FSEIS delineated 55 wetlands in the Airport study area totaling about 140 acres and ranging in size from 0.02 acres to 30.3 acres. The refined delineation included more than ninety wetlands, ranging in size from 0.01 to 35.32 acres. Wetlands comprise a total of about 170 acres in the airport vicinity and include palustrine forested, scrub-shrub, emergent, and open-water wetland habitat.

Table 3-1 lists the wetlands identified in the Airport study area. During the refined delineation, the majority of new wetlands identified were small wetlands occuring on undeveloped portions of residential property that appear to have been filled by those residential owners. Wetlands 1 through 55 were identified during the earlier study. Fifty-five additional wetlands were identified by the refined study, ranging is size from 0.01 acres to 4.33 acres – the average being 0.22 acres. Ten of the wetlands identified were farmed wetlands. Eleven (11) of the already identified wetlands were found to be smaller than originally estimated, while twelve wetlands were found to be larger. Three wetlands dominate the increase in acreage in the refined delineation wetlands (Wetlands 18, 28, and 37). Other Waters of the U.S. within the study area include Miller and Des Moines Creeks, as well as several drainage channels that convey natural runoff to these creeks. While many of the wetlands are small, degraded by past and ongoing human disturbance, and isolated from significant habitat, they provide some ecological functions that will be replaced through mitigation.

Exhibits 3-1 and 3-2 show the location of each wetland listed in the table.

TABLE 3-1

COMPARISON OF WETLANDS IN STUDY AREA (Acres)

		Size of Wetland (Acres)		Project Fill	
			Original		Original
Wetland	Classifications	Refined	FSEIS	Refined	FSEIS
	Other Waters of U.S.[a]	0.15	0.00	0.14	0.00
1	Forested	0.07	0.07	0.00	0.07
2	Forested	0.73	0.74	0.00	0.74
3	Forested	0.56	0.56	0.00	0.19
4	Forested	5.00	5.02	0.00	0.46
5	Forested/Scrub-Shrub	4.63	4.58	0.14	1.69
6	Scrub-Shrub	0.86	0.87	0.00	0.00
7	Forested/Open Water/Emergent	6.68	6.70	0.00	0.00
8	Scrub-Shrub/Emergent	4.95	4.95	0.00	0.00
9	Forested/ Emergent (40/60)	2.83	2.85	0.03	0.13
10	Scrub-Shrub	0.31	0.31	0.00	0.00
11	Forested/Emergent (80/20)	0.50	0.50	0.34	0.47
12	Forested/Emergent (20/80)	0.21	0.21	0.21	0.21
13	Emergent	0.05	0.05	0.05	0.05
14	Forested	0.19	0.19	0.19	0.19
15	Emergent	0.28	0.28	0.28	0.28
16	Emergent	0.05	0.06	0.05	0.06
17	Emergent	0.02	0.03	0.02	0.03
18	Forested/Scrub-Shrub/Emergent (50/20/30)	3.56	0.12	2.60	0.12
19	Forested	0.56	0.57	0.56	0.57
20	Scrub-Shrub/Emergent (90/10)	0.57	0.06	0.57	0.06
21	Forested	0.22	0.22	0.22	0.22
22	Scrub-Shrub/Emergent (10/90)	0.06	0.06	0.06	0.06
23	Emergent	0.77	0.78	0.77	0.78
24	Emergent	0.14	0.14	0.14	0.14
25	Forested	0.06	0.06	0.06	0.06
26	Emergent	0.02	0.02	0.02	0.00
28	Scrub-Shrub/Emergent/Open Water (65/15/20)	35.32	18.10	0.07	0.06
29	Forested	0.74	0.74	0.00	0.74

		Size of Wetland (Acres)		Project Fill	
			Original		Original
Wetland	Classifications	Refined	FSEIS	Refined	FSEIS
30	Forested/Scrub-Shrub (80/20)	0.88	0.50	0.00	0.50
31	Emergent	0.05	0.05	0.00	0.00
32	Emergent	0.09	0.05	0.00	0.05
33	Forested/Shrub-Scrub/Emergent/Open Water	17.60	17.60	0.00	0.00
34	Open Water	1.40	1.40	0.00	0.00
35	Forested/Emergent (40/60)	0.67	0.21	0.67	0.18
36	Forested/Emergent	0.30	0.30	0.00	0.00
37	Forested/Emergent (70/30)[b]	5.76	2.41	4.08	1.68
38	Emergent/Shrub Scrub	0.00	0.00	0.00	0.00
39	Forested[c]	0.89	0.07	0.00	0.00
40	Scrub-Shrub	0.03	0.09	0.03	0.09
41a	Emergent/Open Water	0.35	NA	0.35	NA
41b	Emergent	0.09	0.09	0.09	0.08
43	Forested/Scrub-Shrub/Emergent (estimated -50/30/20)	30.30	30.30	0.00	0.00
44	Forested/Scrub-Shrub (70/30)	3.04	0.70	0.26	0.00
45	Emergent	5.00	5.00	0.00	0.00
46	Open Water	0.06	0.06	0.00	0.00
47	Open Water	0.20	0.20	0.00	0.00
48	Forested/Emergent (20/80)	0.46	0.02	0.14	0.00
49 [1]	Emergent	0.00	0.02	0.00	0.03
50 [1]	Shrub-Scrub	0.00	0.03	0.00	0.12
51	Forested	16.00	2.41	0.00	0.48
52	Forested/Scrub-Shrub/Emergent (80/20/20)	4.90	1.00	0.54	1.00
53	Forested	0.60	0.60	0.60	0.60
54	Shrub-Scrub/Open Water	25.70	25.70	0.00	0.00
55 [1]	Shrub-Scrub	0.00	0.04	0.00	0.04
A 1	Forested/Scrub-Shrub/Emergent (15/15/70)	4.51	NA	0.59	NA
A 2	Scrub-Shrub	0.05	NA	0.00	NA
A 3	Scrub-Shrub	0.01	NA	0.00	NA
A 4	Scrub-Shrub	0.03	NA	0.00	NA
A 5	Emergent	0.03	NA	0.03	NA
A 6	Forested	0.27	NA	0.27	NA

		Size of Wetland (Acres)		Project Fill	
Wetland	**Classifications**	**Refined**	**Original FSEIS**	**Refined**	**Original FSEIS**
A 7	Forested	0.30	NA	0.30	NA
A 8	Forested/Scrub-Shrub (30/70)	0.48	NA	0.48	NA
A 9	Scrub-Shrub	0.04	NA	0.00	NA
A 10	Scrub-Shrub	0.01	NA	0.00	NA
A 11	Scrub-Shrub	0.02	NA	0.00	NA
A 12	Scrub-Shrub	0.11	NA	0.02	NA
A 13	Forested	0.12	NA	0.00	NA
B 1	Forested/Scrub-Shrub (30/70)	0.27	NA	0.00	NA
B 10	Forested	0.02	NA	0.00	NA
B 11	Emergent	0.18	NA	0.18	NA
B 12	Scrub-Shrub	0.07	NA	0.07	NA
B 14	Scrub-Shrub/Emergent (70/30)	0.78	NA	0.78	NA
B-15a	Shrub	0.21	NA	0.19	NA
B-15b	Shrub	0.02	NA	0.02	NA
B 4	Scrub-Shrub	0.07	NA	0.00	NA
B 5	Forested/Scrub-Shrub (40/60)	0.08	NA	0.00	NA
B 6	Forested/Scrub-Shrub (30/70)	0.55	NA	0.00	NA
B 7	Forested/Scrub-Shrub (30/70)	0.03	NA	0.00	NA
B 9	Forested	0.05	NA	0.00	NA
E 1	Forested	0.23	NA	0.00	NA
E 2	Forested	0.04	NA	0.04	NA
E 3	Forested	0.06	NA	0.06	NA
FW 1	Farmed Wetland	0.03	NA	0.00	NA
FW 2	Farmed Wetland	0.09	NA	0.00	NA
FW 3	Farmed Wetland	0.59	NA	0.00	NA
FW 5	Farmed Wetland	0.08	NA	0.08	NA
FW 6	Farmed Wetland	0.07	NA	0.07	NA
FW 8	Farmed Wetland	0.03	NA	0.00	NA
FW 9	Farmed Wetland	0.01	NA	0.00	NA
FW 10	Farmed Wetland	0.02	NA	0.00	NA
FW 11	Farmed Wetland	0.11	NA	0.00	NA
G 1	Emergent	0.05	NA	0.05	NA
G 2	Emergent	0.02	NA	0.02	NA
G 3	Emergent	0.06	NA	0.06	NA

		Size of Wetland (Acres)		Project Fill	
Wetland	Classifications	Refined	Original FSEIS	Refined	Original FSEIS
G 4	Emergent	0.04	NA	0.04	NA
G 5	Emergent	0.87	NA	0.87	NA
G 6	Emergent	0.01	NA	0.00	NA
G 7	Forested/Scrub-Shrub (30/70)	0.50	NA	0.50	NA
G 8	Emergent	0.04	NA	0.00	NA
R 1	Emergent	0.17	NA	0.13	NA
R 10	Forested	0.03	NA	0.00	NA
R 2	Scrub-Shrub/Emergent (70/30)	0.12	NA	0.00	NA
R 3	Scrub-Shrub	0.02	NA	0.00	NA
R 4	Emergent	0.11	NA	0.00	NA
R 5	Emergent	0.05	NA	0.00	NA
R 6	Forested/Emergent (25/75)	0.21	NA	0.00	NA
R 7	Forested	0.04	NA	0.00	NA
R 8	Scrub-Shrub/Emergent (40/60)	0.06	NA	0.00	NA
R 9	Forested	0.38	NA	0.00	NA
W 1	Emergent	0.10	NA	0.10	NA
W 2	Forested/Emergent (20/80)	0.22	NA	0.22	NA
Auburn 4	Emergent	5.58	NA	0.02	NA

[a] Subsequent to publishing the functional assessment and natural resource mitigation plan, the Corps requested impacts to other waters of the U.S. be expressed in acres instead of linear ft. Impacts to Waters A, B, and W are reported as 0.13 acre in the Public Notice (September 30, 1999); however, actual impacts [refer to MFR dated June 1999 to September 1999 (ACOE 1999)] are 0.14 acre.

[b] The size of this wetland was reported as 5.74 acres in the 1999 re-evaluation document.

[c] These areas were incorporated into Wetlands B11, B4, and 52, respectively.

Table 3-2. Summary of wetland impacts for Seattle-Tacoma International Airport Master Plan Update improvements by construction project (all values are in acres).

Wetland	Ecology Rating	HGM Class	Classification	Fill Impact	Vegetation Types Impacted		
					Forested	Shrub	Emergent
Runway Safety Area							
5	III	Slope	Shrub	0.14	0.07	0.07	0.00
			Subtotal	**0.14**	**0.07**	**0.07**	**0.00**
New Third Runway							
9	III	Slope	Forested/Emergent	0.03	0.01	0.00	0.02
11	III	Slope	Forested/Emergent	0.34	0.27	0.00	0.07
12	III	Slope	Forested/Emergent	0.21	0.04	0.00	0.17
13	III	Slope	Emergent	0.05	0.00	0.00	0.05
14	III	Slope	Forested	0.19	0.19	0.00	0.00
15	III	Slope	Emergent	0.28	0.00	0.00	0.28
16	III	Depression	Emergent	0.05	0.00	0.00	0.05
17	III	Depression	Emergent	0.02	0.00	0.00	0.02
18	II	Slope	Forested/Shrub/Emergent	2.60	1.30	0.52	0.78
19	III	Slope	Forested	0.56	0.56	0.00	0.00
20	II	Slope	Shrub/Emergent	0.57	0.00	0.51	0.06
21	III	Slope	Forested	0.22	0.22	0.00	0.00
22	III	Slope	Emergent/Shrub	0.06	0.00	0.01	0.05
23	IV	Depression	Emergent	0.77	0.00	0.00	0.77
24	III	Depression	Emergent	0.14	0.00	0.00	0.14
25	III	Depression	Forested	0.06	0.06	0.00	0.00
26	IV	Depression	Emergent	0.02	0.00	0.00	0.02
W1	III	Depression	Forested/Emergent	0.10	0.00	0.00	0.10
W2	III	Depression	Forested/Emergent	0.22	0.04	0.00	0.18
35a-d	III	Slope	Forested/Emergent	0.67	0.27	0.00	0.40
37a-f	II	Slope	Forested/Emergent	4.08	2.86	0.00	1.22
40	III	Depression	Forested	0.03	0.00	0.03	0.00
41a and b	III	Depression	Emergent [a]	0.44	0.00	0.00	0.44
44a and b	II	Slope	Forested	0.26	0.18	0.08	0.00
A1	II	Depression, Riparian	Forested/Shrub/Emergent	0.59	0.09	0.09	0.41
A5	IV	Depression	Emergent	0.03	0.00	0.00	0.03
A6	III	Slope	Forested	0.27	0.27	0.00	0.00
A7	III	Slope	Forested	0.30	0.30	0.00	0.00
A8	III	Slope	Forested/Shrub	0.48	0.14	0.34	0.00
A12	III	Slope	Shrub	0.02	0.00	0.02	0.00

Wetland	Ecology Rating	HGM Class	Classification	Fill Impact	Vegetation Types Impacted		
					Forested	Shrub	Emergent
FW5 and 6	IV	Depression, Riparian	Farmed Wetland	0.15	0.00	0.00	0.15
R1	III	Riparian	Emergent	0.13	0.00	0.00	0.13
			Subtotal	**13.94**	**6.8**	**1.60**	**5.54**
South Aviation Support Area (SASA)							
52	II	Slope	Forest/Shrub/Emergent	0.54	0.54	0.00	0.00
53	III	Depression	Forested	0.60	0.60	0.00	0.00
E2	III	Slope	Shrub	0.04	0.00	0.04	0.00
E3	III	Slope	Shrub	0.06	0.00	0.06	0.00
G1	IV	Slope	Shrub (Slope)	0.05	0.00	0.05	0.00
G2	IV	Slope	Emergent	0.02	0.00	0.00	0.02
G3	IV	Slope	Emergent	0.06	0.00	0.00	0.06
G4	IV	Slope	Emergent	0.04	0.00	0.00	0.04
G5	IV	Slope	Emergent	0.87	0.00	0.00	0.87
G7	III	Slope	Forest/Shrub	0.50	0.13	0.37	0.00
			Subtotal	**2.78**	**1.37**	**0.42**	**0.99**
Borrow Area and Haul Road							
28	II	Depression, Riparian	Emergent	0.07	0.00	0.00	0.07
48[b]	II	Slope	Forest/Emergent	0.14	0.03	0.00	0.11
B11	III	Depression	Emergent	0.18	0.00	0.00	0.18
B12	II	Slope	Forested	0.07	0.00	0.07	0.00
B14	III	Depression	Shrub	0.78	0.00	0.55	0.23
B15a and b[b]	III	Slope	Shrub	0.21	0.00	0.21	0.00
			Subtotal	**1.45**	**0.03**	**0.83**	**0.59**
Mitigation							
Auburn 4	III	Depression	Emergent	0.02	0.00	0.00	0.02
			Subtotal	**0.02**	**0.00**	**0.00**	**0.02**
TOTAL[c]				**18.33**	**8.27**	**2.92**	**7.14**

[a] Includes 0.18 acre of open water habitat

[b] These wetlands extend off-site.

[c] These values represent an increase of 0.05 acre of impacts to Wetland 53 made subsequent to completing the impact assessment and natural resource mitigation plan. The change is reflected in the ACOE public notice for the project.

Table 3-3. Summary of permanent wetland impacts by project and wetland category [a] (in acres).

Project	Category II	Category III	Category IV	Total
RSA	0.00	0.14	0.00	0.14
Third Runway	8.10	4.87	0.97	13.94
Borrow Area 1	0.28	1.17	0.00	1.45
SASA	0.60	1.20[c]	0.98	2.78[c]
Mitigation	0.00	0.02[b]	0.00	0.02
TOTAL	**8.98**	**7.40[c]**	**1.95**	**18.33[c]**

[a] Ecology (1993)
[b] Impacts result from a permanent access road in an emergent wetland at the Auburn mitigation project.
[c] These values represent an increase of 0.05 acre of impacts to Wetland 53 made subsequent to completing the impact assessment and natural resource mitigation plan. The change is reflected in the ACOE public notice for the project.

Table 3-4. Summary of temporary construction impacts to wetlands in the proposed STIA Master Plan Update improvement area.

Wetland	Rating	HGM[a] Class	Vegetation Types	Total	Subtotal Forest	Subtotal Shrub	Subtotal Emergent
Runway Safety Area Extension							
3	II	Slope	Forested	0.05	0.05	0.00	0.00
4	II	Slope	Forested	0.10	0.10	0.00	0.00
5	III	Slope	Shrub	0.10	0.05	0.05	0.00
Third Runway							
9	III	Slope	Forested/Emergent	0.03	0.01	0.00	0.02
11	III	Slope	Forested/Emergent	0.13	0.10	0.00	0.03
18	II	Slope	Forested/Shrub/Emergent	0.36	0.18	0.07	0.11
37	II	Slope	Forested/Emergent/Shrub	0.71	0.50	0.10	0.11
44	II	Slope	Forested	0.30	0.20	0.10	0.00
A1	II	Depression, Riparian	Forested/Shrub/Emergent	0.05	0.01	0.01	0.03
A12	III	Slope	Shrub	0.03	0.00	0.03	0.00
A13	III	Slope	Forested	0.01	0.01	0.00	0.00
Borrow Site 1 Wetlands							
48	II	Slope	Forested	0.10	0.10	0.00	0.00
B15	III	Slope	Shrub	0.10	0.00	0.10	0.00
South Aviation Support Area							
52	II	Slope	Forest/Shrub/Emergent	0.10	0.00	0.05	0.05
TOTAL				**2.17**	**1.31**	**0.51**	**0.35**

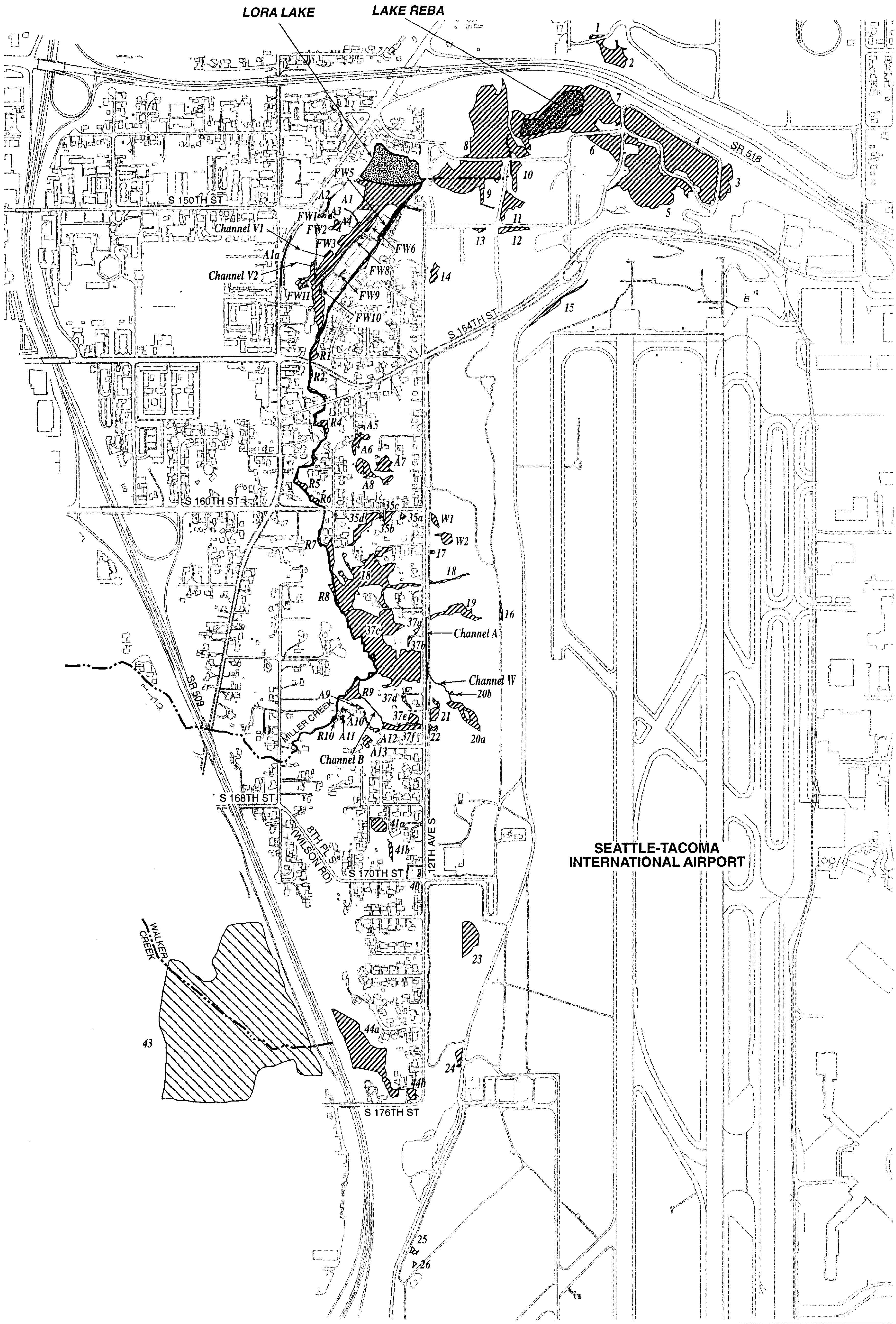
[a] Hydrogeomorphic classification system used to evaluate wetland functions.

Table 3-5. **Summary of wetlands subject to mitigation activities.**

Wetland [a]	Rating	HGM Class	Vegetation Types	Total	Vegetation Type Impacted		
					Forest	Shrub	Emergent
Wetlands subject to temporary impacts associated with mitigation activities including excavation and replanting or restoration of temporary access roads							
A1 [b]	II	Depression, Riparian	Forested/Shrub/Emergent	3.74	0.56	0.56	2.62
A2 [b]	IV	Depression	Shrub	0.05	0.00	0.05	0.00
A3 [b]	IV	Depression	Shrub	0.01	0.00	0.01	0.00
A4 [b]	IV	Depression	Shrub	0.03	0.00	0.03	0.00
FW 1, 2, 3, 5, 6, 8, 10, and 11 [b]	IV	Depression	Farmed Wetlands	1.04	0.00	0.00	1.04
Auburn Area 1 [c]	IV	Depression	Emergent	0.29	0.00	0.00	0.29
Auburn Area 4 [c]	IV	Depression	Emergent	0.14	0.00	0.00	0.14
Auburn Area 5 [d]	IV	Depression	Emergent	0.09	0.00	0.00	0.09
Auburn Area 7 [d]	IV	Depression	Emergent	0.17	0.00	0.00	0.17
Auburn Area 8 [e]	IV	Depression	Emergent	2.20	0.00	0.00	2.20
Auburn Area 9 [d]	IV	Depression	Emergent	0.03	0.00	0.00	0.03
			Subtotal	**7.79**	**0.56**	**0.65**	**6.58**
Wetlands subject to temporary impacts resulting from mitigation enhancement plantings							
18 [f]	II	Slope	Forested/Shrub/Emergent	0.91	0.91	0.00	0.00
37a [f]	II	Slope	Forested/Emergent	1.71	1.71	0.00	0.00
A1 [f]	II	Depression, Riparian	Forested/Shrub/Emergent	0.34	0.34	0.00	0.00
A10 [f]	IV	Depression	Shrub	0.01	0.00	0.01	0.00
A11 [f]	III	Slope	Shrub	0.02	0.00	0.02	0.00
FW 9 [f]	IV	Depression	Farmed Wetland	0.01	0.00	0.00	0.01
R1 [f]	III	Riparian	Emergent	0.17	0.00	0.00	0.17
R2 [f]	III	Riparian	Shrub/Emergent	0.12	0.00	0.00	0.12
R3 [f]	III	Riparian	Shrub	0.02	0.00	0.02	0.00
R4 [f]	III	Riparian	Emergent	0.11	0.00	0.00	0.11
R5 [f]	III	Riparian	Emergent	0.05	0.00	0.00	0.05
R6 [f]	III	Riparian	Forested/Emergent	0.21	0.05	0.00	0.16
R7 [f]	III	Riparian	Forested	0.04	0.04	0.00	0.00
R8 [f]	III	Riparian	Shrub/Emergent	0.06	0.00	0.02	0.04
R9 [f]	III	Riparian	Forested	0.36	0.36	0.00	0.00
R10 [f]	III	Riparian	Forested	0.03	0.03	0.00	0.00
28 [g]	II	Depression, Riparian	Emergent	4.50	0.00	0.00	4.50
			Subtotal	**8.67**	**3.44**	**0.07**	**5.16**
TOTAL [b]				**16.46**	**4.00**	**0.72**	**11.74**

[a] Other Waters of the U.S. V1 and V2 (0.02 acre) not included in this table.
[b] Temporary impacts associated with restoration activities at the Vacca Farm site.
[c] Temporary impact resulting from constructing temporary roads to provide access to, and within the mitigation site in Auburn.
[d] These areas will be converted to shrub and emergent wetlands at the Auburn site.
[e] A maximum of 2.20 acre of existing ditches and farmed wetland at the Auburn site will be converted to a wetland drainage channel that connects the mitigation site to the 100-year floodplain to the north.
[f] Wetlands located within the proposed 100-ft Miller Creek buffer, south of the Vacca Farm site.
[g] Wetland located at the Tyee Valley Golf Course.
b Format of this table has been changed at the request of the ACOE subsequent to issuance of the reevaluation document, impact assessment, and mitigation plan.

[Exhibit 3-2]



POS Natural Resource Mitigation Plan/55-2912-01(03) 8/99

Water Features

Delineated Wetlands Verified by ACOE

Wetlands Not Verified by ACOE

Creek

41a Wetland Number

SCALE IN FEET

0 400 800

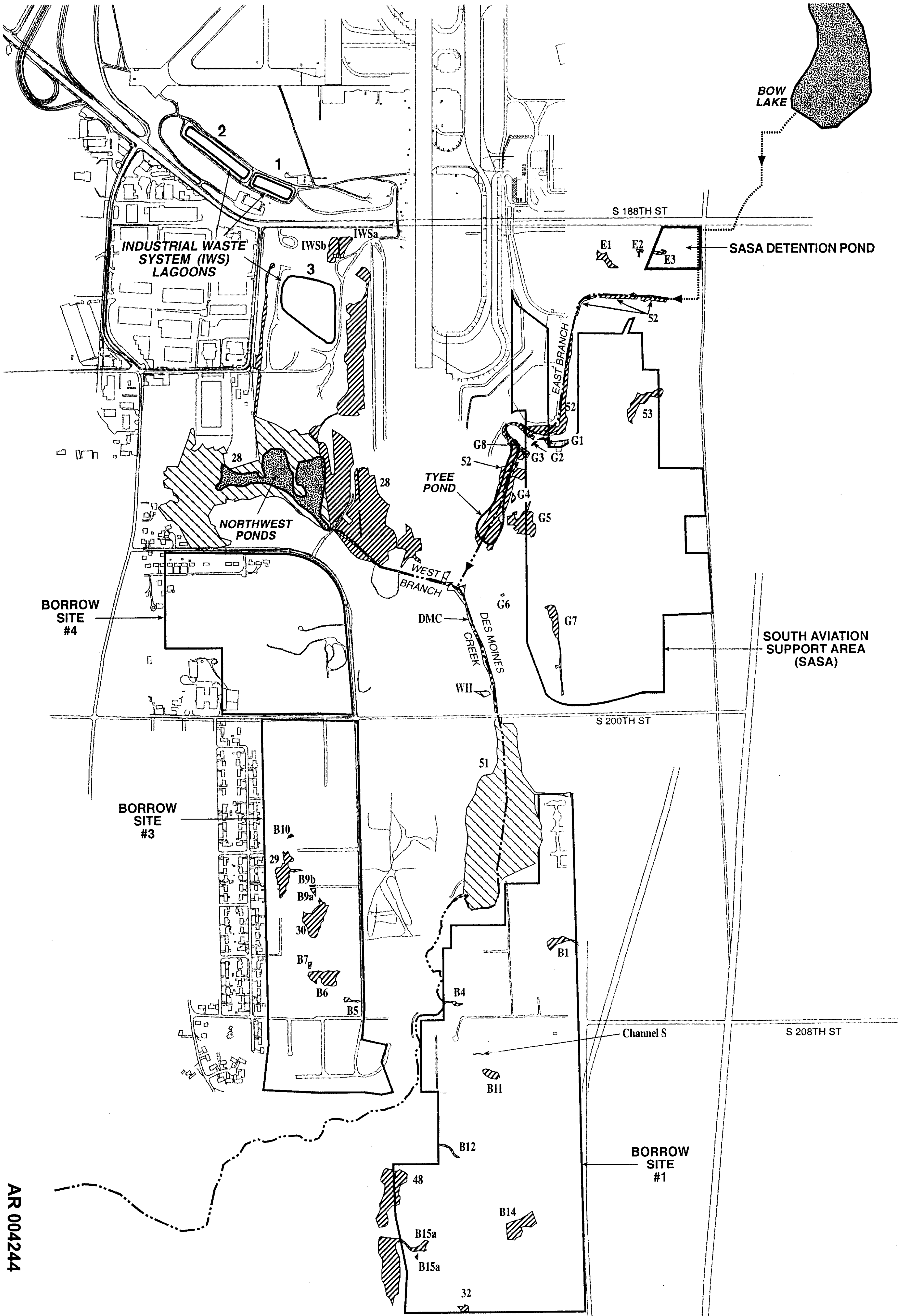
N

Exhibit 3-1
Wetlands in the Miller Creek Basin Near STIA

AR 004242

[Exhibit 3-1]

AR 004243



Water Features

Delineated Wetlands Verified by the ACOE

Creek

B12 Wetland Number

Wetlands not Verified by the ACOE

Piped Creek

SCALE IN FEET

0 400 800

N

Exhibit 3-2
Wetlands in the Des Moines Creek Basin Near STIA

3. Characterization of Wetlands

A variety of wetland conditions are present within the project impact area. These wetlands range from small highly modified wetlands, subject to on-going human disturbance, to less modified wetlands that are gradually recovering from past logging or farming activities and perform a variety of wetland functions. Moderate to high value habitat function occurs in larger wetlands (for example Wetland 37, A-1, and 30) where native vegetation is recovering from past disturbances. Low value habitat functions typically occur in numerous smaller wetlands that are subjected to ongoing disturbance. Hydrologic and water quality functions of wetlands vary depending on their landscape position and numerous site-specific factors. Several wetlands (Wetland 52, Wetland 37, and Wetland 44) appear to provide groundwater discharge functions that enhance baseflow in adjacent creeks. Wetland A-1 and Wetland 28 provide high function for reducing floodflow and for water quality enhancement.

The ecological functions of these wetlands are discussed in more detail below. In general, the functions and values of the affected wetlands remain the same as those identified in the EIS and FSEIS.

Biological Functions

The refined delineation identified additional affected wetlands but did not identify any new or unrecognized biological functions in the area. Wildlife use of the study area and its associated wetlands is largely limited to species tolerant to disturbance. The study area is fragmented by urban development, limiting access to the area for most large mammals. Faunal diversity is frequently limited in wetlands because they are too small to meet habitat requirements for many wildlife populations. The high degree of urbanization within the area may limit the numbers and diversity of amphibians present. No federal or state-listed threatened or endangered wildlife species use the areas planned for Master Plan Update improvements. Coho salmon, a federal candidate species, occurs in Miller Creek and Des Moines Creek.

The forested wetlands within the study area lack true aquatic habitat, and the wildlife function of these wetlands is similar to that of upland areas with comparable vegetation communities. Small passerine birds use forested habitat in the study area for nesting and feeding. Forested areas are also used by small mammals for breeding and cover. Some amphibians may use portions of the wetlands for resting, foraging, and breeding.

Habitat functions of shrub wetlands include nest and cover habitat for songbirds and small mammals. Shallow areas of seasonal ponding in shrub wetlands are uncommon, but, when present, they provide habitat for amphibian breeding. Shrub wetlands lack the woody debris that is desirable to terrestrial amphibians, such as ensatina.

Emergent wetlands in the study area provide habitat for songbird species that use the vegetation for nesting and foraging. Small mammals forage on emergent vegetation. In certain wetlands (Wetland A-1) amphibian species may use emergent vegetation that occurs in standing water for egg mass attachment. Many of the emergent wetlands in the study area are small, isolated, and recently disturbed by human activities. Wetlands located within the current airfield and Tyee Valley Golf Course are mowed several to many times per year. This mowing limits their function as wildlife habitat. Most emergent wetlands have intermittent surface flows or seasonal standing water which also limits the overall value of their habitat function.

The wildlife habitat functions of the affected wetlands are generally significant only to the local vicinity (rather than to a larger landscape or watershed) because urban development isolates the area from other large undeveloped habitat areas. The sizes of most of the wetlands are smaller than the habitat requirements of many native mammal and bird species. The biological functions of wetlands are further limited by the lack of permanent open water, the short duration of seasonal ponding or soil saturation, the high occurrence of non-native plant species in some emergent wetlands, and the fragmented habitats. The wildlife habitat function increases where trees and/or shrubs are adjacent to the grass-dominated emergent areas.

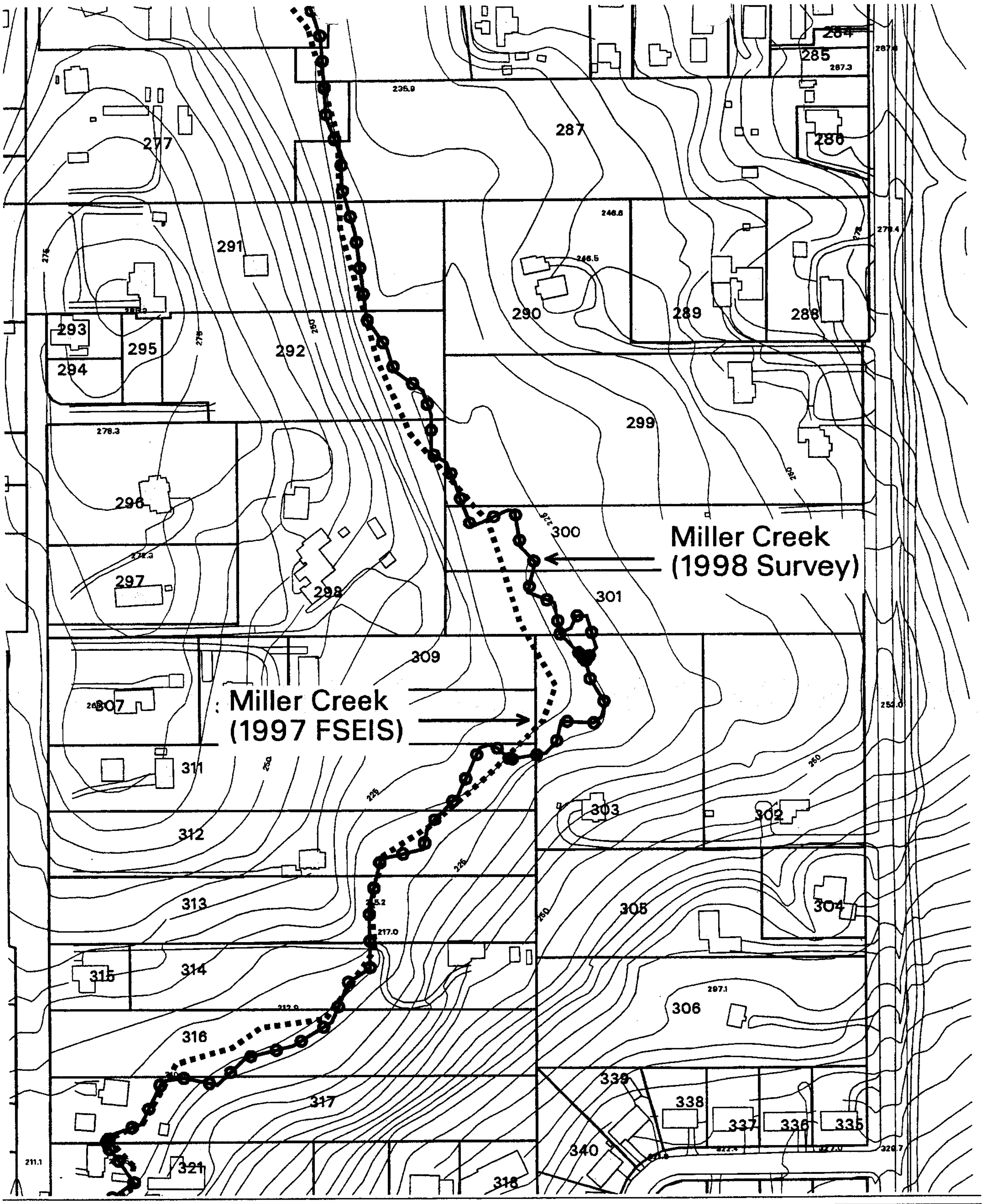
<u>Physical Functions</u>

The physical functions provided by the newly identified affected wetlands are of the same general quality and significance as those identified in the FSEIS. Hydrologic functions (flood storage, groundwater discharge, and storm water detention) affect hydrologic and habitat conditions in both on-site and off-site locations (especially fish habitat in Miller and Des Moines creeks). Riparian wetlands on groundwater seeps adjacent to Miller and Des Moines creeks support stream baseflow by providing seasonal or perennial sources of water and moderate stream temperatures. Wetlands associated with the Miller Creek Regional Detention Facility function by temporarily storing floodwaters, which may reduce downstream flooding and streambank erosion. Other wetlands help reduce peak flows by collecting and storing storm runoff, thereby reducing the rate and volume of water that reaches the stream systems during storms. Many of the isolated on-site wetlands have a limited ability to provide hydrological functions, because of their small size, lack of direct connections to streams, or topographic conditions that limit the amount and duration of seasonally detained stormwater.

The groundwater recharge function of most of the wetlands appears to be limited because many of them occur on low permeability till soils (Alderwood Series). The wetlands have formed in shallow depressions where a perched water table has developed. Due to the low soil permeability, evapo-transpiration, and the short duration of soil saturation, it is unlikely that these small wetlands contribute significantly to recharge of groundwater.

4. Location of Miller Creek

As noted in the 1996 FEIS and 1997 FSEIS, the northern end of the runway embankment requires the relocation of a portion of Miller Creek. Another portion of Miller Creek was identified in close proximity to the near center point of the runway embankment. The FSEIS (Section 5-5), concluded that a retaining wall would avoid relocation of the creek in that area. During the wetland survey for newly delineated wetlands, the location of Miller Creek throughout the acquisition area was also surveyed. The creek was found to be 83 feet closer to the runway embankment than previously indicated. **Exhibit 3-3** shows the original location of the creek relative to the Third Runway, and compares that location with the newly identified location. As a consequence of this new information on the creek's location, the Port undertook a detailed engineering study to examine various options for avoiding relocation of this portion of the creek and impacts to additional riparian wetlands. The following section discusses the changes that were made to the embankment to avoid relocating the creek.



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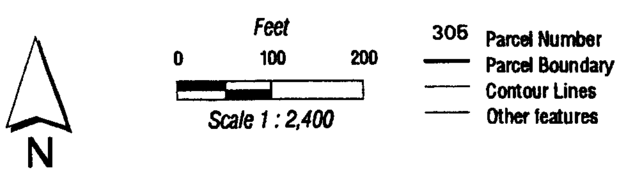

Exhibit 3-3. Surveyed location of Miller Creek (1998) and location identified in the FSEIS (1997).

Chapter IV

REFINED WETLAND IMPACT ANALYSIS

The previous section described the new information on the nature and extent of wetlands and other waters of the United States that would be affected by the Airport improvements. The new information obtained after previously inaccessible properties became accessible was referred to as the "refined" wetland and stream "delineation" or "identification." The refined delineations of affected wetlands and streams were compared qualitatively and quantitatively to the "original" delineation in the 1997 FSEIS and 1996 JARPA. See **Table 3.1**.

This section reports the Port's re-evaluation of the environmental impacts associated with the new information on the nature and extent of wetlands and stream areas that would be affected by the Airport improvements. The re-evaluation analyzed permanent, temporary, indirect, and cumulative impacts on newly discovered wetland and stream areas.

Permanent impacts result from the direct filling of wetlands to transform their use. Temporary impacts result from short-term construction and will be rectified upon program completion. Indirect impacts are largely associated with potential changes to wetland hydrology, increased noise, and increased human disturbance in wetland areas. Cumulative impacts refer to impacts associated with this project in combination with other projects planned in the area.

Each of these categories of impact was analyzed on the basis of key elements of Airport improvements: the third runway, borrow areas, runway safety areas (RSA), south aviation support area (SASA), and mitigation areas. The general categories of impact also are subdivided on the basis of the various wetland and stream functions affected and the State Department of Ecology (Ecology) Wetland Categories.

The re-evaluation of wetland and stream impacts also explicitly takes into account several changes in the proposed project that were made in response to new information on the exact location of Miller Creek and certain wetlands in relation to the proposed third runway embankment. Actual on-the-ground surveys revealed that Miller Creek was closer to the proposed embankment than previously determined and identified additional wetlands near the embankment. As a result of this new information, to avoid relocating that portion of Miller Creek and to avoid wetlands, the Port decided to utilize a retaining wall to reduce the horizontal reach of the embankment. This design change avoided the necessity to relocate a portion of Miller Creek and eliminated impacts on the creek buffer and newly discovered wetlands. Utilizing the retaining wall also reduced the amount of fill needed for the third runway by 250,000 cy. **Table 4-1** compares the quantity of fill for the third runway estimated in the 1997 FSEIS with lower current estimates as a result of the design change incorporating the retaining wall.

Table 4-1

Runway Embankment Fill Quantity

	Current Estimated Quantity(CY)	FSEIS Estimated Quantity(CY)
1. **Project Requirements**		
Total Project Embankment	16,500,000	17,250,000
On Site Common Excavation	2,400,000	2,900,000
Total Project Import Required	14,100,000	14,350,000
2. **Material Imported To Date**		
1997 Stockpile Project	370,000	
1998 Embankment Project	870,000	
Stockpile North of 154th Street	* 200,000	
Total Imported Thu 1999	1,440,000	
Total Import Remaining (as of 1999)	12,660,000	

- Material is currently being placed at this site and therefore the quantity is an approximate estimate only.

Note: The estimated quantities are based on three-dimensional computer modeling and a review of material placed to date. All quantities are in-place and do not account for any material that may be imported from the Port-owned borrow sources.

The runway embankment fill quantity estimate contained in the FSEIS assumed 2:1 fill slopes without retaining walls. Since completion of the FSEIS estimate, the embankment requirements have been recalculated to incorporate current design concepts, including drainage benches along the 2:1 slopes and retaining walls in three locations along the embankment. Incorporation of the current design elements resulted in additions to and subtractions from the estimated fill requirements. However, as shown in the above table, the net result is a modest reduction in the quantity of fill.

In identifying the impacts to wetlands, the following Department of Ecology rating categories were used:

Category I
These wetlands are the "cream of the crop". Generally, these wetlands are not common and would make up a small percentage of the wetlands in the state. These are wetlands that: (1) provide life support function for threatened or endangered species that has been documented, and the wetland is on file in databases maintained by state agencies; (2) represent a high quality example of a rare wetland type; (3) are rare within a given region; or (4) are relatively undisturbed and contain ecological attributes that are impossible to replace within a human lifetime, if at all. We cannot afford the risk of any degradation to these wetlands. Examples of the latter are mature forested wetlands that may take a

century to develop, and bogs and fens with their special plant populations that have taken centuries to develop.

Category II
These wetlands are those that: (1) provide habitat for very sensitive or important wildlife or plants; (2) are either difficult to replace; or (3) provide very high functions, particularly for wildlife habitat. These wetlands occur more commonly than Category I wetlands, but still need a high level of protection.

Category III
These wetlands provide important functions and values. They are important for a variety of wildlife species and occur more commonly throughout the state than either Category I or II wetlands. Generally these wetlands will be smaller, less diverse, and/or more isolated in the landscape than Category II wetlands. They occur more frequently, are difficult to replace, and need a moderate level of protection.

Category IV
These wetlands are the smallest, most isolated, and have the least diverse vegetation. These are wetlands that we should be able to replace and, in some cases, be able to improve from a habitat standpoint. However, experience has shown that replacement cannot be guaranteed in any specific case. These wetlands do provide important functions and values, and should to some degree be protected. In some areas, these wetlands may be providing groundwater recharge and water pollution prevention functions and, therefore, may be more important from a local point of view. Thus, regional differences may call for a more narrow definition of this category.

Washington State Wetlands Rating System, Washington State Department of Ecology Publication 93-74, August, 1993, pp. 3-4.

1. <u>Permanent Impacts</u>

Permanent impacts will occur on about 18.33 acres of wetlands within the project area. Of the wetland subject to permanent impacts, 7.14 acres are emergent, 8.27 acres are forested, and 2.92 acres are scrub-shrub wetland. The permanent impacts are summarized by project elements and Ecology categories in **Table 4-2**:

TABLE 4-2

Summary of permanent wetland impacts by project and wetland category [a] (in acres).

Project	Category II	Category III	Category IV	Total
RSA	0.00	0.14	0.00	0.14
Third Runway	8.10	4.87	0.97	13.94
Borrow Area 1	0.28	1.17	0.00	1.45
SASA	0.60	1.20 [C]	0.98	2.78 [C]
Mitigation	0.00	0.02 [b]	0.00	0.02
TOTAL	**8.98**	**7.40 [C]**	**1.95**	**18.33 [C]**

a Ecology (1993)
b Emergent wetland impacts result from a permanent access road to the Auburn mitigation project.
c These values represent an increase of 0.05 acre of impacts to Wetland 53 made subsequent to completing the impact assessment and natural resource mitigation plan. The change is reflected in the ACOE public Notice for the project.

Taking into account the refined delineation of wetland and stream areas affected by the proposed Airport improvements, the permanent impacts on such areas were re-evaluated, as follows. The re-evaluation separately analyzed the permanent impacts of the various elements of the proposed Airport improvements and the wetland categories and functions affected.

Runway Safety Areas - Permanent wetland impacts associated with extension of the RSAs on existing runways are limited to about 0.14 acres of Wetland 5. This impact will remove forest from a Category III wetland and shrub vegetation that provides habitat for small mammals and songbirds. The affected portion of Wetland 5 is on a moderate slope where groundwater discharge occurs most of the year. Because of the slope of the wetland, this area does not detain or store stormwater. The groundwater discharge supports wetland hydrology in downslope portions of the wetland, and ultimately base flow in Miller Creek.

The design of retaining walls to minimize fill in Wetlands 3, 4, and 5 will incorporate internal drainage systems that allow groundwater to continue to discharge in this area, and this function will not be lost or significantly diminished. The area may provide limited water quality enhancement functions. However, stormwater runoff from upslope areas is channelized limiting the water quality functions this wetland may provide through biofiltration.

Third Runway - The embankment needed to support the Third Runway will have permanent impacts on about 13.94 acres of wetlands. These wetlands vary from lower quality Category IV farmed wetlands to higher quality Category II wetlands.

- Habitat Functions - About 8.98 acres of Category II wetlands will be permanently affected by the runway, including portions of Wetlands 18, 20, 37, 44, and A-1. These wetlands typically contain a mix of early successional forested, blackberry and willow dominated shrub, and non-native emergent wetland plant communities. With the exception of Wetlands 18, 37, and A-1, these wetlands are not riparian to Miller Creek. Portions of Miller Creek will be relocated in conjunction with the filling of a portion of Wetland A-1. The riparian wetlands protect and provide fish habitat in Miller Creek through shade and detrital input that supports invertebrate food production within the stream.

Several Category III wetlands will be permanently affected by the runway embankment. These wetlands are typically dominated by young deciduous forest, blackberry and willow shrubs, or non-native emergent plant species. The wetlands provide habitat to birds and small mammals, but because they are generally small in size, poorly buffered, and subjected to past or on-going disturbance, they represent lower quality habitat than the Category II wetlands. The wildlife habitat functions of these wetlands will be lost but replaced by mitigation measures.

Several Category IV wetlands (Wetlands 23, 26, A-5, FW-5, and FW-6) are dominated by non-native grasses or plowed. These wetlands typically provide habitat for a limited array of wildlife including waterfowl, pigeons, and crows (Wetlands FW-5 and FW-6). Most other Category IV wetlands are mowed lawn, and support fewer wildlife species that are typical of disturbed urban environments (robin, sparrow, starling).

- <u>Hydrologic Functions</u> - Wetlands permanently affected by the Third Runway embankment occur on gentle slopes, shallow depressions, and riparian areas along Miller Creek. These geomorphic positions control, in part, the hydrologic functions the wetlands provide. Some of these functions will be eliminated by the fill for the Third Runway embankment, and replaced by mitigation measures.

  Most slope and depression wetlands are saturated during the winter and spring months when rainwater appears to perch on till soils. These wetlands provide winter baseflow support to Miller Creek, but do not support low summer base flows because they are dry by late summer and early autumn. The wetlands provide some detention functions and desynchronize stormwater runoff by reducing runoff rates. This function is limited by the small storage provided by the shallow depressions or the lack of storage in slope wetlands.

  The wetlands also provide water quality functions in that they receive untreated runoff from adjacent streets and lawns and potentially remove pollutants. Depression wetlands are likely to provide high water quality functions due to longer storage times that promote contaminant removal. Slope wetlands have short retention times and provide fewer water quality benefits.

  Several slope wetlands are areas of groundwater discharge (Wetlands 15, 18, 37) that are saturated throughout the year. These wetlands convey groundwater downslope to Miller Creek. The presence of surface water in the wetlands throughout the summer indicated the wetlands provide base flow support functions to Miller Creek. Wetland impacts from borrow site development are limited to Borrow Area 1, where small areas of Category II and Category III wetlands are altered. These wetlands are dominated by shrub and forest vegetation and provide habitat functions as described in **Table 4-3.** The largest wetland impacted in the borrow area (Wetland B-14) is a shrub dominated wetland that is in an abandoned residential neighborhood. This wetland provides limited habitat for small mammals and songbirds. Since standing water and saturation are of short duration, the wetland does not provide aquatic habitat for amphibians or other organisms.

Wetlands 48 and B-12 and B-15 occur on the west side of the borrow area and extend off-site and downslope to Des Moines Creek. These wetlands convey stormwater and other runoff from the previously developed areas of the borrow site downslope to Des Moines Creek. They provide some biofiltration functions. Due to the shallow depth of the depression, Wetland B-14 provides biofiltration and limited stormwater detention functions.

Table 4-3. Ratings for wetland functions impacted by fill for construction of Master Plan Update improvements at STIA.

Wetland	Resident/ Anadromous Fish	Passerine Birds	Waterfowl	Amphibians	Small Mammals	Exports Organic Carbon	Groundwater Exchange	Flood Storage	Nutrient/ Sediment Trapping
5	Low	Low	Low	Low-Moderate	Moderate-High	Low-Moderate	High	Low	Moderate
9	Low	Moderate-High	Low	Low-Moderate	Moderate-High	Low-Moderate	Low	High	Moderate
11	Low	Moderate-High	Low	Low	Low-Moderate	Low	Low	Low	Moderate
12	Low	Moderate-High	Low	Low	Low	Low	Low	Low	Low
13	Low	Low-Moderate	Low	Low	Low	Low	Low	Low	Low
14	Low	Moderate-High	Low	Low	Low	Low	Moderate	Low	Low
15	Low	Low-Moderate	Low	Low-Moderate	Low	Low	High	Low	Moderate
16	Low	Low-Moderate	Low	Low	Low	Low	Low	Low	Low
17	Low	Low-Moderate	Low	Low	Low-Moderate	Low	Low	Low	Moderate
18	Moderate	High	Low	Moderate	Moderate	High	High	Moderate	Moderate
19	Low	Moderate-High	Low	Moderate	Moderate	Moderate	High	Low	Moderate
20	Low	High	Low	Moderate	Moderate-High	High	High	Low	Low
21	Low	Moderate-High	Low	Low-Moderate	Low-Moderate	Low-Moderate	Low	Low	Low
22	Low	Moderate-High	Low	Low-Moderate	Low-Moderate	Low-Moderate	Low	Low	Low
23	Low	Low-Moderate	Low	Low	Low	Low	Low	Low-Moderate	High
24	Low	Low-Moderate	Low	Low	Low	Low	Low	Low-Moderate	High
25	Low	Moderate-High	Low	Low	Low	Low	Low	Low-Moderate	High
26	Low	Low-Moderate	Low	Low	Low	Low	Low	Low-Moderate	High
28	High	Low-Moderate	High	Moderate	High	Low	High	High	High
35	Low	Low	Low	Low	Low	Low-Moderate	Moderate	Low	High
37	High	High	Low	Moderate	Moderate-High	High	High	Low	Moderate-High
40	Low	Moderate	Low	Low-Moderate	Low	Low	Low	Low-Moderate	High
41	Low	Low-Moderate	Low	Low	Low	Low	Low	Low-Moderate	High
44	Low-Moderate	Moderate-High	Low	Moderate	Moderate-High	High	High	Low	Moderate-High
48	Low	Low-Moderate	Low	Low-Moderate	Low-Moderate	Low-Moderate	Moderate	Low	Low-Moderate

Wetland	Resident/ Anadromous Fish	Passerine Birds	Waterfowl	Amphibians	Small Mammals	Exports Organic Carbon	Groundwater Exchange	Flood Storage	Nutrient/ Sediment Trapping
52	Moderate-High	Low-Moderate	Low	Low-Moderate	Moderate-High	High	High	Moderate	Moderate-High
53	Low	Moderate-High	Low	Low	Moderate	Low	Low	Low-Moderate	High
A1	High	Moderate	Moderate	Low	Moderate-High	High	Low	High	High
A12	Low-Moderate	Low	Low	Low	Moderate	Low- Moderate	Moderate	Low	Low
A5	Low	Low	Low	Low	Low	Low	Low	Low	Low
A6	Low	Moderate-High	Low	Low	Moderate	Low	Moderate	Low	Low-Moderate
A7	Low	Moderate-High	Low	Low	Moderate	Low	Moderate	Low	Low-Moderate
A8	Low	Low-Moderate	Low	Low	Moderate	Low	Moderate	Low	Low-Moderate
B11	Low	Low-Moderate	Low	Low	Low-Moderate	Low	Low	Low-Moderate	High
B12	Low-Moderate	Moderate-High	Low	Moderate	Moderate	Low-Moderate	Moderate	Low	Low-Moderate
B14	Low	Low	Low	Low	Moderate	Low	Low	Low-Moderate	High
B15	Low-Moderate	Low	Low	Low	Moderate	Low-Moderate	Moderate	Low	Low-Moderate
E2	Low	Low	Low	Low	Low	Low	Moderate	Low	Low
E3	Low	Low	Low	Low	Low	Low	Moderate	Low	Low
FW5, 6	Low	Low	Moderate	Low	Low	Low	Low	High	High
G2	Low	Low	Low-Moderate	Low	Low	Low	Moderate	Low	Low-Moderate
G3	Low	Low	Low-Moderate	Low	Low	Low	Moderate	Low	Low-Moderate
G4	Low	Low	Low-Moderate	Low	Low	Low	Moderate	Low	Low-Moderate
G5	Low	Low	Low-Moderate	Low	Low	Low	Moderate	Low	Low-Moderate
G7	Low	Moderate	Low	Low	Low	Low	High	Low	Low-Moderate
R1	Low	Low-Moderate	Low	Low	Moderate	High	Moderate-High	High	Moderate-High
W1	Low	Low	Low	Low	Low	Low	Low	Low-Moderate	High
W2	Low	Moderate	Low	Low	Moderate	Low	Low	Low-Moderate	High

South Aviation Support Area (SASA) - Wetlands in the SASA area are typically dominated by early successional deciduous forests and shrub wetlands, or are emergent wetlands plated as golf course greens. The golf course wetlands (Wetland 52, G-1, G-2, G-3, G-4, G-5, G-6, and G8) provide limited wildlife habitat to foraging waterfowl and songbirds.

Most wetlands affected by SASA are slope and depression wetlands that are seasonally saturated. They likely provide biofiltration to stormwater runoff and limited stormwater detention functions. They provide baseflow support to Des Moines Creek during the winter months, but are dry during the late summer months when low flows occur. An exception to this is Wetland 52 where groundwater discharges throughout the summer. This wetland provides baseflow support to the creek during low flow periods. Project impacts to the wetland are limited to a bridge crossing, and the groundwater discharge functions will not be impacted.

2. Temporary Construction Impacts

The re-evaluation of temporary (construction) impacts to wetlands are reported in this section. Specific construction activities that temporarily affect wetlands are summarized in **Table 4-4** by the wetland affected and the nature of the impact.

Runway Safety Area Extension - Wetlands 3, 4, and 5 are located near the north end of the existing runways where required runway safety area extensions will be constructed. Temporary disturbance to small portions of these wetlands (about 0.25 acres) could result from placement of silt fences and required temporary erosion and sediment control (TESC) actions. Minor siltation could occur within the 0.25-acre disturbance area during construction.[2]

During the relocation of S. 154th St., temporary disturbance to wildlife is likely to occur in Wetlands 3, 4, and 5. Wildlife in these wetlands, are tolerant of aircraft noise from existing runways and roadway noise from SR-518 and the existing S. 154th St. Additional disturbance to wildlife is likely to be minor, and limited to the south edges of the wetlands.

2 TESC BMPs are implemented prior to construction of all Master Plan projects and their effectiveness is strictly monitored. The adequacy of these BMPs is monitored under the reviewed and approved provisions of site-specific monitoring plans as are described in this report. During 1998-1999 embankment construction, no water quality violations (including sediment discharge to wetlands) occurred.

Table 4-4. Summary of temporary impacts to wetlands from the STIA Master Plan Update improvements.

Wetlands	Temporary Impacts
Runway Safety Area Extension	
Wetlands 3, 6, 7, and 10	Wildlife could possibly be disturbed by construction noise near Wetlands 3, 6, 7, and 10; however wildlife is already tolerant of air traffic and roadway (SR 518 and S 154th St.) noise.
Wetlands 4 and 5	Temporary disturbance is possible to small portions of wetland along southern border of Wetlands 4 and 5 adjacent to retaining wall. Siltation could cause impacts along southern wetland boundaries. Construction activity and noise could cause disturbance to wildlife.
Third Runway	
Wetlands 9 and 11	A small portion of Wetland 9 and the remaining portion of Wetland 11 could be disturbed. Siltation could cause impacts within the southern portion of Wetland 9 and the remaining portion of Wetland 11. Wildlife could be disturbed by construction activity and noise.
Wetlands R1, R2, R3, R4, R5, R6, R7, R8, R9, and R10	Construction impacts will be minimized because of a 50-foot setback from Miller Creek. Disturbance will be in limited areas including the S 156th St. bridge crossing area (Wetlands R1 and R2) and the stormwater outfall location (adjacent to Wetland R6). Siltation could cause impacts at the bridge crossing area (Wetlands R1 and R2). There could be disturbance to wildlife from construction activity and noise, especially in the bridge crossing area (Wetlands R1 and R2) and stormwater outfall location (adjacent to Wetland R6).
Wetlands A5, A9, A10, A11, A12, and A13	Temporary disturbance is possible to small portions of Wetland A12 outside the footprint of fill slope and Perimeter Road. Siltation is possible within portions of Wetlands A5, A6, A8, and A12 that are immediately adjacent to the footprint of fill slope and Perimeter Road. Construction activity and noise could cause disturbance to wildlife.
Wetlands 18 and 37	Disturbance (0.17 acres) is possible from the construction of temporary construction stormwater management facilities (e.g., detention pond) in Wetland 37. (Note: Permanent stormwater management facilities will be located outside of wetland areas.) A narrow band of temporary disturbance (0.38 acres) is immediately adjacent to the fill pad footprint and roadbed for the Perimeter Road (outside of temporary stormwater facility areas). This disturbance will come within 30 ft of Miller Creek in Wetland 37. There may be limited areas of siltation within Wetlands 18 and 37. Construction activity and noise could cause disturbance to wildlife. Temporary disturbance is possible to wetland drainage patterns/hydrology in Wetland 37 due to the construction of the temporary stormwater management facilities.

Wetlands	Temporary Impacts
Wetland 44a	Temporary disturbance of a limited area immediately adjacent to the fill pad footprint and the roadbed for the Perimeter Road is possible. Limited areas of siltation are possible immediately bordering the fill pad footprint. Construction activity and noise could cause disturbance to wildlife.
Staging Areas	No temporary impacts are expected. All staging areas will be a minimum of 50 ft from Miller Creek and placed outside of wetland areas. In wetlands bordering intended staging areas, wildlife may be disturbed by activity and noise during construction of each staging location.
Borrow Area 1	
Wetlands B1 and 32	Excavation will avoid Wetlands B1 and 32; all other wetlands will be permanently impacted by excavation or dewatering. Interruption in hydrology for Wetlands B1 and 32 is not anticipated; buffers will maintain seasonal perched water regime. Wildlife will be disturbed by excavation activities and noise.
Borrow Area 3	
Wetlands 29, 30, B5, B6, B7, B9, and B10	All wetlands are being avoided and 50-foot setback maintained. Wetland hydrology will be maintained by preserving conditions in watershed basin upgradient and immediately surrounding each wetland; no alteration to site hydrology will occur. Wildlife will be disturbed by excavation activity and noise.
South Aviation Support Area	
Wetland 52	Disturbance of wildlife from construction activity and noise. Potential minor sedimentation or water quality impacts.
Mitigation Area	
Farmed wetlands and Wetland A1 in Vacca Farm; emergent wetlands on the Auburn site.	Wetlands will be excavated, graded, and replanted with native vegetation. Temporary disturbance of wildlife due to human activity and construction noise. Temporary sedimentation and water quality impacts.

Third Runway: Wetlands 9 and 11 lie at the northern end of the Third Runway. During the relocation of South 154th St. for the runway safety area, small portions (0.03 acres) of Wetland 9 and the remaining portion (0.16 acres) of Wetland 11 will be disturbed by construction activity. Minor siltation within these wetlands during construction could occur. Wildlife will likely be eliminated from remaining portions of Wetland 11 during construction and be disturbed near the south edge of Wetlands 9 by construction activity and noise.

Temporary disturbance will occur in portions of Wetlands 18 (0.36 acres), 37 (0.71 acres), and 44 (0.30 acres)[3], located outside the footprint of the fillslope and the perimeter road. Minor siltation could occur in limited portions of these wetlands as a result of installing silt fences and up-slope construction. Physical disturbance to Wetlands A9, A10, A11, and A13

3 This area of 0.30 acre has been rounded up and differs from 0.29 acre reported in the reevaluation document.

is not proposed however temporary disturbance to wildlife could result from construction activity and noise.

Temporary impacts to Wetland 37, Wetland 18, and Wetland 44 include disturbance from the construction of temporary stormwater management facilities, including detention ponds, during the construction phase of the Third Runway. These stormwater facilities will be removed and the wetland area restored after the completion of the Third Runway. Permanent stormwater facilities will be located outside of wetland areas.

Disturbance to riparian wetland will occur in three limited areas: at the proposed S 156th St. bridge crossing (affecting the southern edge of Wetland R1 and the northern edge of Wetland R2, and a stormwater outfall that will lie adjacent to Wetland R6. Minor siltation could occur in the temporarily disturbed portions of Wetlands R1 and R2. Disturbance to wildlife from construction activity and noise could occur in all riparian wetlands, but is most likely in Wetlands R1, R2, and R6 because in these areas construction will be near the wetland edge.

Construction Staging Areas - Construction impacts to wetlands in the staging areas are not expected because all staging activity will be placed outside of any wetland areas and a minimum of 50 feet from Miller Creek. In wetlands bordering intended staging areas, wildlife will likely be disturbed by traffic activity and noise

Borrow Areas - Within Borrow Area 1, Wetlands B-1, B-4, and 32 will be avoided and protected with a minimum 50-foot buffer. Indirect impact to wildlife using these Category III wetlands may occur once the Third Runway is in operation. Other wetlands in Borrow Area 1 will be permanently affected by excavation. Borrow Area 3 has been redefined to protect all wetlands with a 50-foot buffer. Temporary impacts to wildlife using Category II (Wetlands 29, 30) and Category III (B-5, B-6, B-7, B-9, B-10) could result from construction noise and other human activity. Since the borrow areas will be greater than 200 feet from Des Moines Creek, no impacts to the creek are anticipated.

South Aviation Support Area - Wetland 52, a Category III wetland adjacent to the SASA, would be temporarily affected by construction. Impacts to this wetland would include temporary disturbance to wildlife due to construction noise and other human activities. Construction impacts to the wetland also could include minor sedimentation or soil disturbance resulting from construction of the taxiway bridge connecting SASA to the airfield.

Mitigation Impacts - Several wetlands would be temporarily affected during construction of on- and off-site wetland mitigation. In general, these impacts occur to Category III or Category IV wetlands that are farmed, or dominated by non-native vegetation, and would not displace significant numbers or types of wildlife. Wetland A-1 (a Category II riparian wetland would be temporarily disturbed by construction associated with the relocation of Miller Creek. Following implementation of the mitigation projects, wetland areas will be restored to higher quality Category II wetlands by improved hydrologic conditions and greater diversity of plant types.

3. Indirect Impacts

Indirect impacts include potential long-term effects of construction and operation of the Master Plan Update projects near wetlands. These include potential alteration of wetland hydrology and ongoing disturbance of wildlife by aircraft noise and human disturbance.

Runway Safety Area Extension -Eight wetlands (Wetlands 3, 4, 5, 6, 7, and 10) are near the north end of the existing runways. The relocation of S 154th St. to accommodate the RSAs will decrease the amount of wetland buffer. Increased traffic noise may disturb wildlife using these wetlands. This impact is not expected to be significant because wildlife species in these wetlands already are tolerant of high levels of noise from aircraft and automobile traffic on SR 518.

Other operational impacts could occur from changes to wetland hydrology as a result of construction near the wetlands. The retaining wall used to minimize wetland fill and creek relocation will include an internal drainage system that will allow ground water to continue to enter the wetland. Stormwater runoff (water quality and quantity) conditions will be improved because the new roadway will include detention and water quality treatment.

Third Runway: Wetlands near the north end of the Third Runway will be subjected to greater amounts of aircraft noise, which may cause increased disturbance of wildlife. The relocation of S 154th St will decrease the amount of wetland buffer, which could result in increased disturbance of wildlife using these wetlands because of greater traffic noise. This impact is not expected to be significant because wildlife species in these wetlands are tolerant of high levels of noise from aircraft and automobile traffic on SR 518. This potential impact would be offset by elimination of humans and pets from the overall area, which will improve the habitat value of the wetlands. The sparse vehicular traffic on the safety and perimeter roads will not adversely affect wildlife.

Operational impacts could occur from changes to wetland hydrology as a result of construction near the wetlands. Retaining walls will allow ground water to continue to enter the wetlands. Stormwater runoff (water quality and quantity) conditions will be improved because the new facilities will include detention and water quality treatment.

Long-term indirect impacts to several isolated Category III wetlands and three Category II wetlands could result from changes to the amount and timing of water entering the wetlands. The potential impacts to the hydrology of these wetlands will be minimized using several approaches that will maintain ground water flow to the wetlands, provide surface water flow to the wetlands, and allow flexibility in the amount of water directed to the wetlands. These measures are expected to provide ground and surface water necessary to maintain the wetlands.

Potential impacts to water quality in the wetlands would not occur. Any stormwater entering the wetlands will be treated using water quantity and water quality best management practices (BMPs). Since the existing area lacks water quality and quantity treatment BMPs, a net improvement may occur.

Wetlands occur on hillslopes immediately west of the existing fill that continue to be wet following the expansion of the airfield during the early 1970s. The wetlands (Wetlands 19 and 20) contain no field evidence that wetland size has been reduced since the 1970 airport expansion. For example, no relic hydric soils were observed and no remnant facultative-wetland or facultative plant communities dominate the area outside the existing wetland boundaries as would be expected if hydrologic conditions had been recently altered. This indicates that these wetlands have remained stable even with the excavation and fill activities immediately to the east.

Ten small wetlands (Wetlands R1, R2, R3, R4, R5, R6, R7, R8, R9, and R10) lie immediately adjacent to Miller Creek along the western periphery of the Third Runway expansion area. Negative impacts to the riparian wetlands will not occur because the wetlands will be protected with 50-foot minimum buffers. Most of these areas currently lack buffers. Moreover, runoff from all new facilities must include management for stormwater quality and quantity. Under current development, runoff is untreated. Impacts from humans and pets will be eliminated from the overall area, which will improve the habitat value of the area. The sparse vehicular traffic on the safety and perimeter roads will not adversely affect wildlife since it will be over 50-feet from the wetlands. No increased level of disturbance to wildlife is expected in Wetlands R1 and R2 at the new 154th St. bridge crossing since this new bridge will simply replace an existing bridge.

Staging Areas - Long-term impacts from construction staging would not occur since these are temporary land-uses that would be removed following project construction.

Borrow Areas - Two wetlands in Borrow Area 1 (Wetlands B-1 and 32) will be avoided. All remaining wetlands will be permanently impacted by excavation or dewatering (Wetland B-4). Setbacks will maintain the current seasonal perched water regime for Wetlands B-1 and 32. No long-term impacts are expected.

All wetlands in Borrow Area 3 will be avoided, and a 50-foot setback will be maintained. Wetland hydrology will be maintained by preserving conditions in the watershed basin upgradient and immediately surrounding each wetland. Groundwater analyses indicate that groundwater movement is from northwest to southeast. The areas west and northwest of the wetlands will remain undisturbed.

South Aviation Support Area (SASA) - The SASA will be designed to avoid significant impacts to Wetland 52 by avoiding the wetland and providing a 75-foot buffer. This wetland will be subjected to greater amounts of aircraft noise, which may increase disturbance of wildlife. This impact is not expected to be significant because wildlife species in these wetlands are tolerant of noise from aircraft.

Operational impacts to the wetlands could occur from changes to wetland hydrology as a result of construction near the wetlands. Stormwater runoff (water quality and quantity) conditions will be improved because the SASA facility would be built with water quantity and quality treatment BMPs that would replace golf course and parking areas that lack stormwater management facilities.

4. Cumulative Impacts

Additional impacts to wetlands could occur as a result of other projects planned in the vicinity of the Airport. These projects include Washington Department of Transportation's proposed SR-509/South Access Freeway, the Des Moines Creek Regional Detention Facility, the LINK light rail project, and potential redevelopment of Borrow Areas.

Each of these projects may have direct or indirect impacts to wetlands near the airport and result in some unknown cumulative loss of wetland area and functions. SEPA, NEPA, and § 404 review for these projects are required to evaluate options that avoid and minimize impacts to wetlands and the aquatic environment. Under § 404, mitigation must be provided for unavoidable impacts to wetlands.

5. Impact Avoidance and Minimization

To the extent feasible and practical, the development projects have been designed and redesigned to avoid and minimize impacts to wetlands. Over 170 acres of wetlands are known to exist near the Airport, and it is likely that un-inventoried wetlands exist on private property that will not be affected by the project. Un-inventoried wetlands are likely to include numerous small wetlands in developed and partially developed residential areas. These wetlands are likely to be similar in character and function to many of the smaller wetlands occurring within the acquisition area.

While a number of small wetlands would be affected or eliminated by the Master Plan improvements, several large wetland complexes would not be affected by the improvements. These wetlands contain physical and biological features that indicate a variety of wetland functions at high to moderate levels. A 30-acre wetland (Wetland 43) occurs between Des Moines Way and SR 509 immediately north of S 176 St. This wetland contains a diversity of vegetation types, including forested, shrub, emergent, and open water wetlands. Walker Creek flows through the wetland. The diversity of plant types, the presence of permanent open water, and hydrologic connections to Walker Creek indicate the wetland provides moderate to high biological functions for a variety of wildlife groups (resident fish, passerine birds, small mammals, amphibians, and waterfowl). Its location near the headwaters, the presence of adjacent developments, and topographic conditions in the depression the wetland occupies suggest it also provides substantial physical functions, including baseflow support, surface runoff storage, sediment trapping, and water quality benefits.

A 17-acre wetland (Wetland 33) occurs south of Sunset Park and includes Tub Lake. This wetland contains forested, shrub, emergent, and open water wetland classes, and Miller Creek flows through the wetland. The diversity of wetland classes, the presence of permanent open water connections to other undeveloped land, and hydrologic connections to stream habitat result in moderate to high biological function for a variety of wildlife groups (resident fish, passerine birds, small mammals, amphibians, and waterfowl). The location near the headwaters of Miller Creek, presence of upslope development, and topography of the basin indicate the wetland provides major physical functions, including baseflow support, surface runoff storage, sediment trapping, and water quality benefits.

Bow Lake is a 25-acre wetland (Wetland 54) located east of SR 99 and north of S 188th St. This wetland contains open water and shrub vegetation classes, and forms the headwaters of the East Branch of Des Moines Creek. The biological functions of the wetland are limited by the proximity of adjacent commercial and residential development. However, the wetland probably provides moderate biological function for passerine birds, small mammals, waterfowl, and amphibians. Likely physical functions provided by the wetland include groundwater recharge, storage of runoff, and water quality improvement.

Wetland 28 is adjacent to the Tyee Golf Course and is about 35 acres. The wetland is composed of open water, emergent, and shrub wetland habitat. A tributary of Des Moines Creek flows through the wetland. The presence of open water, habitat diversity, and hydrologic connections to stream habitat result in moderate to high function for a variety of wildlife groups (resident fish, passerine birds, small mammals, amphibians, and waterfowl). The wetland is a headwater of the West Branch of Des Moines Creek, is downslope of developed areas, and is in a favorable topographic setting to provide physical functions, including baseflow support, surface runoff storage, sediment trapping, and water quality benefits.

A series of wetlands (Wetlands 3, 4, 5,* 6, 7, 8, and 9) totaling about 25 acres comprise the Miller Creek Detention Facility. The wetlands consist of open water, emergent, shrub, and forested wetlands that are hydrologically connected to Miller Creek. The diversity of wetland classes, permanent open water, and hydrologic connections to stream habitat indicate the wetland provides moderate to high biological function to a variety of wildlife groups (resident fish, passerine birds, small mammals, amphibians, and waterfowl). The location near the headwaters, presence of adjacent developments, and topographic conditions suggest the wetland also provides physical functions such as baseflow support, surface runoff storage, sediment trapping.

* Minor fill impacts (0.14 acres) occur in this wetland. Because this fill will be located above the floodplain, near disturbed areas, and along the perimeter of the wetland, significant impact to the functions of this wetland is not expected.

Chapter V

HYDROLOGY AND SEISMIC STABILITY

Upon gaining access to the properties on which the embankment will be developed, the Port was able to conduct additional geotechnical explorations. These studies have clarified a number of issues that were raised in the public comments. The following subsections address the impact of the development of the embankment and associated retaining walls on area hydrology and slope stability, including:

- Mechanically Stabilized Earth
- Fill Zones and stability
- Impact on Hydrology
- Mitigation of Post-Construction Hydrogeology

1. Mechanically Stabilized Earth

During the past two years, Port staff and consultants have completed geotechnical, hydrologic and wetland studies, to identify alternatives and verify that proven mechanically stabilized earth (MSE) technology can provide safe and relatively cost-effective construction of retaining walls for soil conditions at the site. A large number of embankment slope and retaining wall alternatives were considered to avoid or reduce impacts to Miller Creek and adjacent wetlands. MSE retaining walls were selected as the recommended alternative to be developed, as follows:

- At the north end of the embankment, MSE walls will be used to limit the impact to Miller Creek and the extent of filling of Wetlands A-1 and 9.
- Near the middle of the west side of the embankment, an MSE wall will be used to avoid filling a significant part of Wetland 37a, and to avoid relocating part of Miller Creek.
- Near the south end of the new runway, an MSE wall will be built to limit the extent of filling of Wetland 44a.

MSE is a method of constructing earth embankments using a combination of compacted soil and reinforcing elements. MSE technology includes a range of steel and polymer (plastic) products (mesh, strips, and grids) used to retain and reinforce soil, and provides a number of advantages over other types of retaining walls. The MSE technology improves soil strength by incorporating reinforcing strips or sheets (geogrids or geotextiles) into the soil embankment.

2. Fill Zones and Stability

Native soils, which will provide a suitable foundation to support the embankment, have been observed at depths ranging from zero to around 20 feet below the existing ground surface across the site. Available information generally indicates very little subgrade preparation will be needed on most of the site. Wetland soils and other unstable soils in some specific areas will have to be improved or replaced to support the fill and MSE walls.

Existing subgrade soils which are unsuitable to provide structural support for the embankment (because they are soft, wet, or contain organic materials), will be removed and replaced with compacted structural fill, or improved in situ. The unsuitable subgrade material that is removed will be reused where possible in non-structural areas of the embankment, to minimize export and disposal of waste soils.

The Third Runway embankment will be designed as a zoned embankment, with different types of soil and/or degrees of compaction used in specific areas to meet strength, compressibility and drainage requirements. These zones include:

- **Pavement Subgrade.** High-strength, low-compressibility granular soil used in the upper few feet immediately below airfield pavements.
- **Drainage Material.** Free-draining fill used in the underdrain and in areas of overexcavation to improve foundation support.
- **Pavement Support Fill.** Low-compressibility embankment fill used below the pavement subgrade zone.
- **MSE Reinforced Backfill.** High strength granular soil used in the reinforced zone behind retaining walls.
- **Common Embankment Fill.** Moderate strength compacted fill.
- **Non-structural Fill.** Soil removed from foundation areas because it is unsuitable for foundation support.

Construction of a zoned embankment in this manner provides significant environmental benefits, including:

- Seasonal accommodation of high quality, low fine content material in wet weather will reduce erosion and sediment control problems;
- Regional conservation of high quality gravel resources by use of relatively silty soils as "fair weather fill" for common embankment construction during dry weather months; and
- Ability to construct an embankment underdrain which collects infiltration and seepage, for controlled discharge to promote infiltration, and preserve groundwater recharge to downgradient wetlands and Miller Creek.

In light of new retaining wall concepts, and further information about the soil stability in the area, the Port conducted "proof of concept analyses" of embankment slope stability, as well as representative MSE wall sections in, or adjacent to, wetlands for both the north and west areas. These analyses were conducted to re-verify suitability of the embankment slopes and retaining walls, and to assess base preparation required to avoid instability.

The analyses confirmed that the safety target factors could be attained for the Wetland 37 wall and, with proper soil replacement or *in situ* improvement, safety target factors could be attained for the wall slope combinations analyzed for the north end of the embankment (in the area where Miller Creek will be relocated).

3. Impact on Hydrology

Post-construction effects of the embankment on the Miller Creek drainage were analyzed. These effects include the extent to which infiltration into the new embankment and from the existing airfield will recharge groundwater. While the relative amount of runoff will increase in new paved areas and embankment slopes, infiltration is anticipated to increase on about 80 acres of relatively flat grassland between the runway and taxiway pavements.

In the area affected by construction, specific groundwater recharge contributions to Miller Creek will include:

- Infiltration into the top surface of the new embankment;
- Infiltration into the side slopes of the new embankment and management of runoff from the side slopes;
- Maintenance of existing shallow interflow below the embankment; and
- Flow from the Shallow Regional Aquifer into Miller Creek.

Infiltration into the unpaved portion of the top surface of the new embankment will exceed existing on-site infiltration in the same area for the following reasons:

- Large area (about 80 acres) of relatively flat grass land between runway and taxiway pavements will permit greater infiltration compared to pre-construction sloping ground in the same areas;
- Post-construction grass area between pavements will have less evapo-transpiration (ET) compared to scrub forest on the pre-construction slopes; and
- Soil conditions within the embankment will promote infiltration in some areas and have better average groundwater transmission characteristics compared with the underlying native soils (glacial till, glacially overridden silty advance sand, and hard silt units).

The depth of the embankment (ranging from essentially zero on portions of the western edge to a maximum height of about 165 feet) provides significant buffering of storm water infiltration, increasing the available groundwater recharge and short-term storage before seepage reaches Miller Creek.

Seasonal infiltration into the embankment soil mass will occur until the soil reaches a condition referred to by soil scientists as "field capacity." Additional infiltration will then percolate downward into the embankment. This percolating water will eventually intercept the embankment underdrain at the base of the fill, and most of this seepage will then flow to the west. About 10 percent of the total infiltration is expected to continue to percolate downward to recharge the Shallow Regional Aquifer directly below the embankment.

Infiltration into the new embankment side slopes (nominal 2 horizontal to 1 vertical) is anticipated to be slightly less than existing infiltration over the "foot print" area of the side slopes (38% of rainfall, down from 50% for pre-construction infiltration). The reduction is mainly the result of the increased slope causing increased runoff which is mitigated somewhat by improved infiltration capacity of the embankment fill relative to the existing glacially overridden soils, and reduced evapotranspiration.

Infiltration into the new embankment side slopes will percolate downward until it is also intercepted by the underdrain discussed above. This seepage will be increased slightly by additional infiltration along storm water swales that collect runoff from the embankment slopes.

In addition to intercepting seepage infiltration downward from the top of the embankment, the embankment underdrain also provides a means for existing seepage in the filled area to continue to flow downgradient to the west. The existing ground surface below the embankment will largely be left undisturbed prior to fill placement, as discussed later in this report. Shallow interflow seeps, expressed where silty soil perching layers outcrop on the slope, will be able to continue to discharge into the underdrain, or will continue to flow downslope below the underdrain.

Where soft soils need to be removed to provide embankment foundation support, these areas will be backfilled with free-draining sand and gravel hydraulically connected to the underdrain. In this way existing seepage into wetlands which are filled will continue to be available as seepage through the underdrain downgradient to the west.

The drain layer enables beneficial discharge of water that infiltrates into the embankment from above or below. The completed underdrain will be separated from the surface of the airfield by the full thickness of the embankment. In the event of a contaminant release (such as an airfield fuel spill), there would be substantial opportunity to accomplish source control and remediation because of the long flow path before any contaminants could reach Miller Creek.

A geotechnical analysis was used to assess whether the weight of the embankment would significantly reduce the amount of existing base flow from the Shallow Regional Aquifer to Miller Creek. Experience with earth dams shows seepage under an embankment is typically not reduced by the weight of the fill, and grout curtains or sheet pile cutoffs are typically constructed where control of seepage is necessary below embankments. None the less, the effect of the embankment on seepage below the new fill was calculated.

These calculations indicate that the void ratio within the Shallow, Intermediate, and Deep Aquifers in the area immediately underlying and adjacent to the embankment would be reduced by roughly 1 to 3 percent due to the maximum weight of the embankment. For perspective, this corresponds to about a 4-inch maximum change in thickness for the 50-foot-thick Shallow Aquifer. The magnitude of the change in void ratio would diminish rapidly both laterally and as a function of depth. There would be no effect in the Shallow Aquifer more than 50 feet from the edge of the embankment, and no effect in the Deep Aquifer more than about 500 feet from the edge of the embankment.

Reductions in permeability on the order of 2 to 5 percent corresponding to the change in void ratio are estimated immediately below the embankment, with the effects decreasing with depth.

The estimated 2 to 5 percent change is insignificant, given that differences in permeability are usually evaluated in terms of orders of magnitude (powers of 10).

Effects of the magnitude estimated could conceivably produce a slight groundwater mounding in the Shallow Regional Aquifer on the upgradient side of the embankment (i.e., below the existing airport), but this would probably not be measurable. Baseflow to Miller Creek located west of the embankment is not likely to be affected, since the effect of the mounding would be to locally increase the groundwater flow gradient resulting in no net loss of baseflow.

No impacts are anticipated to drinking water resources in the Intermediate and Deep Aquifers. The effect of the embankment weight diminishes with increasing depth and distance from the fill. There are no wells within the affected area.

4. Mitigation of Post-Construction Hydrogeologic Impacts

The following actions will be undertaken to minimize hydrogeologic impacts upon completion of construction:

Management of Storm Water Runoff - Storm water runoff from the embankment will be collected and handled as described in the following documents (which may be updated during the permitting process for the Master Plan Update Development Actions): (a) Natural Resource Mitigation Plan, Seattle-Tacoma International Airport Master Plan Update Improvements, prepared by Parametrix, dated August 1999; and (b) Comprehensive Stormwater Management Plan, Seattle-Tacoma International Airport Master Plan Improvements, by Parametrix, dated November 1999. Both of these documents are hereby incorporated by reference. Copies of these and other documents incorporated by reference, and their updates if any, are publicly available during regular business hours at the office of the Port of Seattle, Aviation/Project Management Group, Suite 301, Kilroy Building, 17900 International Blvd., SeaTac, Washington 98188. Storm water runoff from the sloping face of the embankment will be collected in a permanent swale alongside the security road and conducted to detention facilities below the toe of the slope. The swales provide some opportunity for infiltration. These swales will be rock-lined or otherwise protected against erosion along the toe of MSE walls. Infiltration in this area will recharge the Shallow Regional Aquifer and enhance groundwater discharge into wetlands and Miller Creek.

Discharge of Seepage from the Embankment Underdrain - Most seepage collected from the embankment via the underdrain will discharge into a collection swale at the toe of the slope or below the toe of the MSE wall. The remainder will infiltrate directly into the Shallow Regional Aquifer under the embankment footprint. Seepage into the swale is likely to occur discontinuously along the length of the embankment, with flow concentrating at topographic low spots or in areas where there are pre-existing seeps.

The purpose of the swale is to collect seepage from the underdrain and conduct it laterally along the toe of the embankment for surface discharge to wetlands. Additional infiltration to recharge shallow interflow and the Shallow Regional Aquifer, will occur along the swale. Facilities to enhance infiltration can be constructed at specific locations to augment water supplies for existing wetlands that are left undisturbed beyond the area of impact for the project. Facilities will be designed to infiltrate water from the drainage layer into the shallow subsurface soils that form the delineated wetlands.

Post-Construction Base Flow to Miller Creek and Riparian Wetlands - The embankment underdrain plays a key role in collecting percolating water that has infiltrated into the surface and facing slopes of the embankment. The underdrain intercepts percolation and enables some control of groundwater recharge for the Shallow Regional Aquifer beneath the embankment. Collecting and re-infiltrating seepage from the underdrain as described above, the impact of runway construction on baseflow to Miller Creek will be minimal.

Chapter VI

WETLAND AND AQUATIC RESOURCE MITIGATION PROGRAM

The Port has committed to comprehensive mitigation measures designed not only to fully compensate for adverse impacts to wetland and other aquatic resource functions, but also to positively augment, improve, and enhance the wetland and other aquatic resource functions. This is done by mitigating the acceptable wetland functions and values in the basin, and only mitigating those functions and values outside the basin that can not safely be mitigated in-basin. This section describes and explains all mitigation measures incorporated into the Master Plan Update improvement projects that will avoid, minimize, rectify, or compensate for adverse impacts to wetlands and other aquatic resources. Some of these mitigation measures have been developed and added to the Port's commitments very recently as a result of the new information on the nature, extent, and location of affected wetlands and other aquatic resources. **Table 6-1** summarizes such mitigation actions and their relationship to NEPA, SEPA, and the Clean Water Act. **Table 6-2** summarizes on-site and off-site compensatory mitigation for watershed, wetland, and stream impacts of the proposed Airport improvements.

As a result of the Port's mitigation commitments, including recent additional mitigation commitments in response to new information on affected wetlands and other aquatic resources, all significant adverse impacts to such resources will be mitigated below the level of significance.

It is not possible to mitigate most impacts on the avian habitat function of affected wetlands within the same watershed or basin. Wetland habitat attracts birds and, thus, presents potential aircraft dangers if located within 10,000 feet of active runways. Beyond 10,000 feet from the runways, but within the same watershed, adequate suitable land for the mitigation of adverse impacts on habitat functions is not available. Consequently, adverse impacts on most wetland functions (hydrologic, water quality, fish habitat) will be mitigated within the same watershed ("on-site" or "in-basin"). But most adverse impacts on wetland bird habitat functions must be mitigated outside of the watershed on a 69-acre parcel in the City of Auburn immediately west of the Green River and within 6 miles of the airport.

1. On-Site (In-Basin) Mitigation

In-basin mitigation to compensate for potential impacts to the hydrology and aquatic habitat of Miller and Des Moines creeks will create significant stormwater management facilities, restore riparian buffers, restore segments of the Miller Creek channel and streams, establish a watershed trust fund, and improve base flows. This mitigation plan focuses on potential in-basin stream impacts by improving hydrology, water quality, and aquatic habitat in both creeks.

Most mitigation for wildlife habitat (bird and small mammals) is provided out-of-basin in a large, high-quality wetland system in the City of Auburn. At this location the mitigation complies with the FAA Advisory Circular regarding wildlife attractants near airports. In-basin mitigation in the Miller Creek and Des Moines Creek basins are summarized in the following Sections and **Tables 6-1 and 6-2.**

Miller Creek Floodplain Buffer Enhancements

A buffer area will be established along the east side of the relocated segment of Miller Creek between the creek and the new 154th Street. The buffer will be a minimum of 50 ft wide and will provide soil stabilization functions and also reduce human intrusion into the riparian zone.

A 25-ft buffer will be established around the west and north perimeter of Lora Lake. This mitigation action is intended to avoid existing impacts from residential uses (e.g., structures, lawn, and lawn chemicals) next to Lora Lake, and to establish woody vegetation around the lake. Existing features, such as houses, outbuildings, driveways, and other structures, will be removed. The 25-ft buffer will be established from the edge of ordinary high water mark (OHWM) landward surrounding the north and west sides of Lora Lake; it will be enhanced with native trees and shrubs to provide approximately 0.60 acre of shoreline buffer. This buffer will reduce waterfowl habitat by eliminating lawn areas used as foraging habitat.

A buffer between the floodplain enhancement area and Des Moines Memorial Drive will be established and enhanced. This area will be planted with native upland vegetation to provide a physical buffer between the road and the enhanced shrub floodplain wetland and relocated creek. The width of this buffer will vary between 20 and 50 ft.

The Miller Creek floodplain area in the vicinity of the Vacca Farm will be restored to a native shrub vegetation community. The restoration will convert the existing farmed area to native shrub wetland community. This conversion will reduce chemical runoff reaching aquatic environments and fish populations in Miller Creek, increase nutrient removal and recycling in the riparian zone, and decrease wildlife attractants within 10,000 feet of the airfield (as required by FAA).

Miller Creek Buffer Enhancement

Downstream of the floodplain enhancement areas, on the west side of Miller Creek a 100-ft buffer will be established along the west side of approximately 6,500 linear ft of Miller Creek (within the acquisition area). The buffer enhancements will improve creek habitat and eliminate yard chemicals, untreated stormwater runoff, and septage from reaching the creek. They will enhance water quality and aquatic habitat.

This buffer enhancement project will protect a total of about 24 acres of riparian habitat along Miller Creek. Buffer averaging will be used on the east side of the creek, where a minimum 50-ft buffer will be established. Where the embankment design allows, buffers will be increased so the average buffer width on the east side of the creek is 100 ft. Stormwater facilities will be included in the calculation of average buffer widths because they will receive infrequent human use and are protective of riparian functions.

The planting approach along the length of the buffer will vary depending upon the existing condition of the buffer, in sections of the buffer that are primarily lawn, areas will be planted with native trees and shrubs. Areas that contain some native and some non-native vegetation, would be enhanced by either inter-planting native species to produce a continuous tree canopy or under-planting native shrubs beneath an existing canopy that lacks understory vegetation. Some areas that contain invasive species (such as Himalayan blackberry and Japanese knotweed) will be cleared, graded, and also planted with native woody vegetation.

In-Stream Habitat Features

In-stream habitat enhancement will occur at four locations within Miller Creek (see Figure 4.1-1). The first will occur south of the Vacca Farm site, enhancement will include removal of rock riprap from portions of Miller Creek, removal of footbridges, and removal of trash. Large woody debris would be placed throughout these sections of the creek and ditch. The associated wetland and upland areas along the creek will be planted with native wetland and upland vegetation species.

Approximately 200 ft north of South 160th Street, the second enhancement project would consist of three primary actions. This would include installing large woody debris in the creek channel, grading a small section of the west bank of the creek to create a gravel bench in the flood plain, and planting the upland area with native trees and shrubs.

South of the South 160th Street culvert, the third enhancement project would consist of grading a section of the west bank to re-establish a floodplain along the creek. Additional enhancement in this location includes removing a rubber tire bulkhead and installing large woody debris in the creek and on its banks. The buffer areas will be planted with native trees and shrubs.

In the southern portion of Miller Creek, east of 8th Avenue S., enhancement will be similar to that described for the South 160th Street project, above, except that grading will occur on both the east and west banks. Footbridges and portions of concrete block walls will be removed.

In addition to these specific enhancements, debris such as tires, garbage, and fences will be removed throughout the entire stretch of Miller Creek from the Vacca Farm site south to Des Moines Memorial Drive. In areas where access is readily available, large woody debris will be selectively placed throughout the creek to improve in stream habitat conditions.

Drainage Channel Mitigation

Approximately 1,290 linear feet of drainage channels located west of the airfield will be filled to accommodate the Third Runway embankment. The functions of these channels will be replaced by a drainage channel located between a perimeter road, and the Third Runway embankment. The drainage channels will be revegetated with native grass and low growing shrubs.

Restoration After Temporary Impacts

Approximately 2.71 acres of forested, emergent, and shrub wetland located west of the Third Runway embankment, north of relocated South 154th Street and west of the Miller Creek relocation project will be temporarily filled or disturbed during construction of the embankment and several retaining walls designed to minimize permanent impacts to these wetlands.

After construction activities are complete, fill material will be removed, pre-disturbance topography will be recreated, and the wetlands will be planted with native shrub vegetation. All of these areas will be monitored.

Tyee Valley Golf Course Wetland Restoration

To improve water quality and riparian habitat within the Des Moines Creek Basin, approximately 4.5 acres of an existing turf emergent wetland area, located within the existing and active Tyee Valley Golf Course, will be restored to a native shrub vegetation community. The restoration actions will be coordinated with plans to construct a regional detention facility (RDF) on the golf course. Shrub communities planned for the wetland will be tolerant of the planned hydrologic regime of the final RDF design. Planting a native shrub community on the golf course will reduce chemical runoff reaching aquatic environments and fish populations in Des Moines Creek, increase nutrient removal and recycling in the riparian zone, enhance water quality functions, and decrease wildlife attractants within 10,000 feet of the airfield (as required by FAA).

In-Basin Stormwater Mitigation

The Port will construct the necessary stormwater conveyance, detention, and treatment facilities to manage runoff from both newly developed project areas and existing airport areas. These facilities will not only mitigate new construction impacts, as required by current stormwater regulations and mitigation goals identified during the environmental review process, but they will also help to reduce current flood peaks in these basins to further mitigate the impacts of airport stormwater discharges.

Stormwater Detention Based on Higher Stormwater Standards

Detention storage provided would exceed that normally required by local regulations, and result in additional mitigation of stormwater impacts from Master Plan Update improvement project areas. To reduce the peak stormwater runoff impacts on Miller and Des Moines creeks, the flow control standards adopted by the Port will comply with the approved Master Plan Update FEIS/FSEIS, the Governors Certificate, the King County Surface Water Design Manual, and SMMPS (Ecology 1992).

At a minimum, stormwater detention from Master Plan Update development projects will be designed to an enhanced Level 1 standard (e.g., control of the 2-, 10-, and 100-year peak flows to pre-developed conditions)[4], as measured at the points of discharge to the streams and at downstream locations on Miller and Des Moines creeks.

The total volume of proposed new stormwater detention storage is 76.6 acre-feet, to be constructed in 8 separate facilities.

Retrofit existing airport areas with stormwater detention

To further reduce stormwater peak flows and flow volumes, and to comply with the redevelopment provisions of Ecology's stormwater manual that requires retrofitting of stormwater detention to existing airport areas, the Port has committed to achieving Level 2-type streamflows in Miller and Des Moines Creeks (e.g., control of flow duration between 50 percent of the 2-year and 50-year events to pre-developed conditions).

On Miller Creek, storage in the existing Miller Creek Regional Detention Facility will be expanded by 16.4 acre-feet. This would achieve the target watershed flow regime for all areas draining to that facility. Stormwater detention facilities that drain to lower Miller Creek, which includes a large portion of the Third Runway, will be designed to King County's Level 2 standard because the Miller Creek Detention Facility cannot achieve the target watershed flow regime in that portion of the stream.

On Des Moines Creek, the proposed Des Moines Regional Detention Facility will retrofit detention storage to mitigate the impacts of past development. The facility also will achieve the target watershed flow regime in Des Moines Creek under full Master Plan Update development, through on-site facilities designed to the enhanced Level 1 standard. In cooperation with King County and the cities of SeaTac and Des Moines, the Port is providing financial assistance and property for the proposed regional facility.

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4 All hydrologic analyses are performed using the Hydrologic Simulation Program – FORTRAN (HSPT) model.

Maintain base flows

To lessen the impacts of new impervious surfaces, which reduce groundwater recharge and result in decreased base flow rates, existing water rights along Miller Creek will be acquired to eliminate current surface water diversions from that stream. On Des Moines Creek, a flow augmentation project is planned, to provide supplemental water to the stream during critical low-flow summer months.

Provide infiltration at stormwater detention facilities

Further improvements to base flows can be achieved by infiltrating stormwater at the detention facilities. Because site conditions must be favorable for infiltration to be feasible, the Port will evaluate infiltration during the project design phase. Infiltration will be incorporated into constructed facilities when geologic conditions permit.

Watershed Basin Trust Funds

Watershed trust funds will be established, to enhance aquatic habit in Miller Creek and Des Moines Creek. These trust funds will provide $150,000 for restoration projects in each basin for projects that comply with the FAA Advisory circular regarding wildlife attractants near airports. Examples of projects eligible for trust fund monies will be defined by the Des Moines Creek Basin plan, the Stream Survey Report for Miller Creek, or other projects that meet the key criteria used to evaluate proposals. Requests for monies must be made by King County, City of SeaTac, City of Des Moines, City of Burien, City of Normandy Park, special districts, tribal governments, non-profit organizations, or combinations of such governments through interlocal agreements.

Water Quality Mitigation

The Master Plan Update improvements are not expected to affect existing water quality because:

1. the quality of runway stormwater has been shown to be comparable to or better than regional urban stormwater, and
2. in contrast to existing land uses, all projects will be served by BMPs in compliance with the Stormwater Management Manual for the Puget Sound (bioswales, filter strips, wet vaults, infiltration).

Since both Miller Creek and Des Moines Creek drain urban watersheds, both are subject to inputs of heavy metals, oils and grease from nearby urban highways, fecal coliforms from failing residential septic systems and adjacent farms, suspended solids and litter carried in urban runoff, and increased levels of phosphorus and nitrogen from fertilization of cultivated areas. These impacts are typical of an urban environment supporting an assortment of residential, commercial, and industrial activities. Sources of many of these pollutants will be removed as part of implementing development within the approximately 258-acre acquisition area. Because actions to mitigate impacts to water quality will be in place, the quality of stormwater runoff in the future will be equal to or better than, current stormwater quality.

The following actions will be undertaken by the Port to mitigate potential impacts to future water quality impacts.

- Employ source identification and control (sweeping, rooftop coatings, etc.) to reduce sources of particulates and the leaching of pollutants entering surface waters.
- Divert de-icing compounds in snowmelt to the Industrial Wastewater System (IWS).
- Construct erosion and sedimentation controls to reduce the impacts of suspended and settleable solids to the streams.
- Enhance wetlands in both Miller Creek and Des Moines Creek to improve water quality by trapping particulates and assimilating dissolved pollutants.
- Restore and enhance stream channels and buffers in Miller Creek to improve biofiltration of runoff from areas adjacent to the stream.
- Restore and enhance buffers in Miller Creek to provide shade that will reduce stream temperature and increase dissolved oxygen capacity.
- Implement level 2 hydrologic controls (larger stormwater detention volumes) to reduce erosive peak stream flows, thereby reducing sediment supply to downstream reaches.

2. Off-Site Avian Habitat Mitigation

Off-site mitigation of impacts to wetland avian habitat function is proposed because FAA regulations prohibit the siting of potential wildlife attractants (including wetland mitigation) within 10,000 ft of active runways. The Port has concluded that potential wetland habitat mitigation sites are not available in either the Des Moines Creek or Miller Creek watersheds. These watersheds are almost totally within the 10,000-foot exclusion area for wildlife habitat mitigation. The areas of the watersheds that are more than 10,000 feet from existing runways are not suitable for mitigation due to their small size, developed nature, forested condition, or the lack of hydrologic conditions necessary to support wetlands.

To mitigate loss of wildlife habitat on site, the Port will construct a 34.56-acre wetland mitigation area on a 67-acre parcel in the city of Auburn. This wetland mitigation area will replace lost wetland functions at a 2:1 ratio by providing a diverse wetland habitat. Approximately 26 acres of forest, 3.4 acres of shrub, 5.2 acres of emergent, and 0.1 acres of open water wetland habitat will be created at the Auburn site. In addition, about 6 acres of emergent wetland will be enhanced by planting native tree and shrub vegetation within the wetland. The wetland will be protected by a minimum of 15 acres of upland buffer.

Table 6-1. Summary of mitigation actions and their relation to NEPA, SEPA, and Clean Water Act mitigation sequencing requirements.

Mitigation Requirement	Proposed Mitigation Action
New Third Runway	
Avoid the impact by not taking a certain action or parts of an action.	Avoid fill in wetlands and Miller Creek by designing the runway to meet the minimum operational, engineering, safety, and maintenance standards. Locate, where feasible, permanent stormwater detention ponds in uplands. Avoid excavation within 50-feet of Category II and III wetlands in Borrow Area 3. Avoid wetlands in Borrow Area 1 where practical.
Minimize the impact by limiting the degree or magnitude of the action.	Construct retaining walls at the northwest end of the runway to reduce impacts to Miller Creek and Category II wetlands (Wetlands 8, 9, and A-1) located at the north end of the project. Install a retaining wall near the west central portion of the embankment to reduce impacts to Category II Wetlands 18 and 37 and avoid relocation of Miller Creek. Place a retaining wall near the southwest end of the runway to reduce impact to a Category II wetland (Wetland 44). Design Borrow Areas 1 and 3 with a 200-foot minimum setback from Des Moines Creek to minimize potential impact to the creek and its buffers. Implement stormwater pollution prevention plans (SWPPPs) prior to any construction project.
Rectify the impact by restoring the affected environment.	Remove temporary stormwater management facilities located in wetlands following construction. These disturbed areas will be restored to pre-construction conditions.
Reduce the impact over time by preservation and maintenance actions during the life of the action	Establish a 100-ft average (minimum 50-ft) buffer on the east side of Miller Creek with a 100-ft buffer on the west side of the creek to reduce potential construction and operational impacts to the creek. Provide water quantity and water quality mitigation to protect aquatic habitat in Miller Creek from stormwater impacts during operation.

Mitigation Requirement	Proposed Mitigation Action
Compensate for the impact by replacing, enhancing, or providing substitute resources.	Restore the Vacca Farm wetland/floodplain area, including creating new floodplain, restoring wetland vegetation, and providing protective buffers. Restore and enhance Miller Creek stream habitat in the Vacca Farm area. Enhance Miller Creek and Miller Creek buffers for fish habitat at three locations between S 160th St. and Des Moines Memorial Drive. Restore Miller Creek instream habitat south of the Vacca Farm site to Des Moines Memorial Drive. Restore wetlands on the Tyee Valley Golf Course including restoring wetland vegetation to reduce wildlife hazards and improve water quality. Provide a trust fund to enhance fisheries habitat in Miller Creek and Des Moines Creek. Create replacement wetlands at an off-site location for the loss of wildlife habitat within 10,000 feet of the airport runways.
Monitor the impact and take appropriate corrective actions.	Monitor mitigation projects for compliance with performance standards and other permit conditions. Monitor stormwater runoff for compliance with National Pollutant Discharge Elimination System (NPDES) requirements. Monitor remaining wetlands for indirect impacts to wetland hydrology.
Runway Safety Areas	
Avoid the impact by not taking a certain action or parts of an action.	Construct retaining walls to support a relocated S 154th St. and avoid permanent fill in Wetlands 3 and 4.
Minimize the impact by limiting the degree or magnitude of the action.	Construct retaining walls to support a relocated S 154th St. and reduce permanent fill and temporary impacts in Wetland 5. Implement SWPPPs prior to any construction project.
Rectify the impact by restoring the affected environment.	Restore wetland areas temporarily impacted by required temporary erosion and sediment control facilities.
Reduce the impact over time by preservation and maintenance actions during the life of the action	Provide water quantity and water quality mitigation to protect wetlands and other receiving waters from stormwater impacts during operation.
Compensate for the impact by replacing, enhancing, or providing substitute resources.	Restore the Vacca Farm wetland/floodplain area to provide hydrologic and water quality functions. Create replacement wetlands for wildlife habitat (greater than 10,000 feet from the airport runways at the Auburn site).

Mitigation Requirement	Proposed Mitigation Action
Monitor the impact and take appropriate corrective actions.	Monitor remaining wetlands for indirect impacts to hydrology. Monitor mitigation projects for compliance with performance standards and other permit conditions. Monitor stormwater runoff for compliance with NPDES requirements.
South Aviation Support Area	
Avoid the impact by not taking a certain action or parts of an action.	Redesign the SASA footprint to avoid relocation of Des Moines Creek.
Minimize the impact by limiting the degree or magnitude of the action.	Redesign the SASA to avoid direct impacts to forested wetland (Wetland 52) that provides groundwater discharge functions.
Rectify the impact by restoring the affected environment.	Restore potential temporary impacts to Des Moines Creek and non-forested areas of Wetland 52.
Reduce the impact over time by preservation and maintenance actions during the life of the action.	Design water quantity and water quality mitigation to protect wetlands from stormwater impacts.
Compensate for the impact by replacing, enhancing, or providing substitute resources.	Restore wetlands on the Tyee Valley Golf Course to provide water quality and hydrologic benefits to replace lost wetland functions. Construct replacement wetlands for wildlife habitat (greater than 10,000 feet from the airport runways at the Auburn site). Provide a trust fund for enhancement of fisheries habitat of Des Moines Creek.
Monitor the impact and take appropriate corrective actions.	Monitor Wetland 52 for indirect impacts to wetland hydrology. Monitor mitigation projects for compliance with performance standards and other permit conditions. Monitor stormwater runoff for compliance with NPDES requirements.
On-site Borrow Source Areas	
Avoid the impact by not taking a certain action or parts of an action.	Redesign development areas within Borrow sites 1 and 3 to avoid excavation of nine wetlands (Wetlands B1, B4, B5, B6, B7, B9, B10, 29, and 30).
Minimize the impact by limiting the degree or magnitude of the action.	Establish a minimum 100-ft buffer between Borrow site 1 and Des Moines creek to minimize impacts to creek hydrology. Follow a TESCP to eliminate siltation reaching wetlands or Des Moines Creek from excavation activities.

Mitigation Requirement	Proposed Mitigation Action
Reduce the impact over time by preservation and maintenance actions during the life of the action	Maintain Best Management Practices (BMPs) throughout the operating period to ensure adjacent wetlands will be protected from adverse construction related activities.
Compensate for the impact by replacing, enhancing, or providing substitute resources.	Restore wetlands on the Tyee Valley Golf Course to compensate for water quality and hydrologic support functions impacted in Des Moines Creek basin.
	Provide a trust fund for enhancement of fisheries habitat of Des Moines Creek.
Monitor the impact and take appropriate corrective actions.	Monitor Wetlands B1, B4, B5, B6, B7, B9, B10, 29, and 30 for potential indirect impacts to wetland hydrology from excavation activities.
	Monitor stormwater runoff and TESC for compliance with NPDES requirements.

NEPA = National Environmental Policy Act

SEPA = State Environmental Policy Act

Table 6-2. Summary of on- and off-site compensatory mitigation for watershed, wetland, and stream impacts at STIA.

Description of Impact	Mitigation Action	Explanation/Comment
On-Site Mitigation[a]		
Permanent Impacts		
Fill approximately 980 linear ft of Miller Creek channel to accommodate third runway embankment.	Relocate approximately 1,080 ft of Miller Creek channel.	Channel relocation will enhance aquatic habitat by providing stream buffers, instream habitat features, and increase channel length by approximately 100 ft.
		Establish a buffer around the channel relocation project with native trees and shrubs. (This buffer extends into the floodplain area.)
Fill drainage channels to accommodate third runway embankment.	Create new drainage channel and establish protective buffers.	Create approximately 1,290 ft of new drainage channel(s) with associated buffer habitat.
Fill approximately 8,500 cy of Miller Creek floodplain to accommodate third runway embankment and S 154th St. relocation.	Replace lost floodplain.	Excavate approximately 9,600 cy to achieve storage of 5.94 acre-ft from the Vacca Farm site, providing an excess of 0.7 acre-ft of floodwater storage.
Impact approximately 18.33[b] acres of wetland during construction of the third runway embankment and other construction related projects.	Restore Vacca Farm to historic floodplain shrub wetland.	Approximately 11 acres of prior converted wetland and farmed wetland will be planted with native trees, shrubs, and emergent species. Restoration of the area will stabilize soils, improve water quality, and enhance Miller Creek habitat. It will reduce wildlife habitat attractants and conform to FAA mandates regarding wildlife attractants for airport safety.
	Establish 50-ft buffer between the floodplain enhancement area and Des Moines Memorial Drive.	The buffer will be established and enhanced by planting native upland trees and shrubs to provide approximately 1.89 acres of upland buffer.
	Restore wetlands on the Tyee Valley Golf Course.	Plant approximately 4.5 acres of historic peat wetlands on the Tyee Valley Golf Course with native shrub communities. This enhancement will be coordinated with Des Moines Creek Basin Committee planned RDF. The enhancement and RDF will improve hydrologic functions of the watershed, reduce wildlife attractants near the airfield, and restore a peat wetland.
Temporary Impacts [a]		
Construct temporary stormwater management ponds and other construction impacts, which may impact up to 2.17 acres of wetland.	Restore wetland areas after construction is complete.	Wetlands that will be temporarily filled or disturbed will be restored. Restoration will include establishing pre-disturbance topography and planting with native shrub vegetation.

Description of Impact	Mitigation Action	Explanation/Comment
Indirect and Cumulative Impacts [a]		
Filled wetlands near Miller Creek that reduce aquatic habitat value of the creek.	Establish and enhance buffers along Miller Creek corridor between S 156th St. and Des Moines Memorial Drive.	Establish a 100-ft buffer on the west side of Miller Creek and a 100 ft average (50-ft minimum) buffer on the east side of the creek. These buffers will provide approximately 24 acres of riparian buffer habitat.
	Establish a 25-ft buffer around Lora Lake.	Approximately 0.60 acre of buffer around Lora Lake will be converted from lawn to native shrub vegetation.
Additional development in the watersheds could result in additional cumulative impacts.	Participate in developing and implementing Miller Creek and Des Moines Creek basin plans.	These planning processes will identify effective, long-term solutions to restore additional fish habitat to Miller and Des Moines creeks. The Port will contribute both staffing resources and funds, and work with other cooperating jurisdictions to plan and implement appropriate watershed restoration projects.
The runway fill may eliminate water sources that contribute to remaining wetlands down slope of the runway.	Design internal drainage and conveyance channels.	Subsurface and surface conveyance channels will continue to collect and distribute groundwater currently surfacing near 12th Ave. S to Miller Creek and associated wetlands.
	Monitor wetlands adjacent to the third runway embankment.	Wetlands subject to potential indirect impacts will be monitored to determine if unmitigated indirect impacts have occurred. If significant new wetland impacts are verified, corrective actions will be implemented.
Off-Site Mitigation		
Permanent Impacts		
Loss of approximately 18.33 acres [b] of wetland wildlife (avian) habitat	Replace avian habitat function off-site at an overall ratio of 2:1	Due to conflicts with avian habitat and aviation safety concerns, new wetlands habitat will be created in Auburn, Washington. This wetland creation will increase overall avian and other wildlife use and diversity in an area that will not compromise aviation safety.

[a] All mitigation areas (including, but not limited to, streams, wetlands, buffers, and floodplains) located within 10,000 ft of a runway shall be subject to the provisions of the Port of Seattle's Wildlife Hazard Management Plan for the management of wildlife and wildlife attractant areas.

[b] These values represent an increase of 0.05 acre of impacts to Wetland 53 made subsequent to completing the impact assessment and natural resource mitigation plan. The change is reflected in the ACOE public Notice for the project.

Chapter VII

TEMPORARY HIGHWAY INTERCHANGES

The Final Supplemental EIS for the Master Plan Update improvements at Seattle-Tacoma International Airport evaluated the construction and use of temporary construction-only interchanges proposed for the purpose of mitigating traffic-related impacts from hauling fill to construct the Third Runway and Runway Safety Areas. Since the publication of the Final Supplemental EIS in May 1997, the Port has further refined the design for a temporary construction-only interchange facility and conducted additional coordination with the Washington State Department of Transportation. The purpose of this section is to present the evaluation of noise and vibration that was conducted based on the design and alignment. Based on that analysis, this mitigation item has been refined slightly to include:

- A noise attenuation wall along the southbound off-ramp at SR 509 to ensure that truck traffic does not create a significant noise effect on adjacent properties;
- Offer to acquire the residence closest to the southbound off-ramp (Home 1) at South 176th Street due to the potential for significant vibration effects if the off-ramp pavement becomes worn.
- Insulation of homes where the sound generated by the construction activity using the temporary interchange would increase noise to sound levels above 67 DNL (the WSDOT land use criteria). It is anticipated that the number of homes to be insulated would depend on use of the interchange at night but would number less than a half dozen homes along South 176th Street west of the interchange.

This section summarizes the construction mitigation actions included in the Final Supplemental EIS as well as the noise and vibration analysis conducted based on this design.

I. Background

The Final Supplemental EIS (FSEIS) for the Master Plan Update improvements at Seattle-Tacoma International Airport evaluated the construction and use of temporary interchanges proposed for the purpose of mitigating traffic related impacts hauling fill for the Third Runway and Runway Safety Areas. As was noted, construction of these projects will require the import of fill material from one or more off-airport sites. Assuming a five-year construction period, the FSEIS assessed the impact of transporting the fill material that could require up to 1,600 one-way haul trips per day.[5] To facilitate the delivery of fill material and to further minimize impacts to local arterials, the Port proposes constructing temporary construction-only interchanges to reduce the impacts from construction traffic to the existing freeway system and the local arterial streets. Consideration was given to use of two interchange locations: 1) SR 509 at South 176th and 2) SR 518 at either Des Moines Memorial Drive or South 20th Street. Based on further discussions with the Washington

[5] *Final Supplemental Environmental Impact Statement for Master Plan Update Development Actions*, Federal Aviation Administration, May 1997 forecasts haul rates of between 26 and 66 trips/hour (624-1600 trips/day).

State Department of Transportation, the temporary interchange at SR 509 has been designed. This EIS Addendum analyzes the potential noise and vibration impacts associated with the use and operation of the temporary construction interchange at SR 509, and proposes a method for mitigating the identified impacts to nearby residences.

The impacts of the construction haul trips have been identified in previous environmental documents. The specific noise impacts of the construction-only interchanges were not analyzed at that time because neither the construction schedule nor the interchange alignments had been designed.

The Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions ("SEIS") reached the following conclusions regarding the impacts of the construction haul traffic:

> The regional highway system has the ability to accommodate the haul traffic associated with the Third Parallel Runway without significant impacts. Preferred access to the construction site is as identified in the Final EIS, by way of State Route 509 and State Route 518. At the reduced truck volumes now forecast, both State Route 509 and State Route 518 operate at LOS D or better throughout the day. Interstate 5, south of Interstate 405 has the ability during most periods of the day to carry additional truck traffic. Truck traffic on Interstate 5 should be avoided or be minimized during the PM peak period. Interstate 405, between Interstate 5 and Interstate 90 has congestion during the AM, Midday, and PM peak periods. Truck traffic on Interstate 405 should be avoided or be minimized during these peak periods.

The Port, in consultation with the Washington State Department of Transportation ("WSDOT") and other agencies, proposed numerous measures to mitigate the general impacts of construction traffic. These mitigation measures were published in the Final SEIS and include:

- Compliance with legal load limits and other hauling requirements on State Highways. In addition to weight requirements, this requires that the tops of loads are 6 inches or more below tops of the truck bins or that the loads are covered.
- Coordinating with Washington State Department of Transportation to establish the haul routes and for approval for all traffic control plans to be implemented on State Routes.
- Maintaining coordination with the Construction Traffic Office to minimize conflicts between Port construction activities and any WSDOT projects along the haul routes.
- Restricting hauling activities, if feasible, during peak hours through congested areas of the State Highway System.
- Repairing identified damage to pavement near the Airport access points for haul.
- Establishing a system to handle complaints of broken windows and other damage to vehicles caused by flying debris from the trucks. Additionally, the contractor should be required to use some system to dislodge and wash away material on the body and undercarriage of the trucks.
- Avoiding or minimizing the use of arterial routes with afternoon peak hour congestion of LOS E or LOS F, which include State Route 99 between State Route 518 and State Route 516, South 188th Street, and South 200th Street.
- Avoiding or minimizing the use of arterial routes during evening and night conditions with abutting residential land use, which would include South 188th Street, South 200th Street, South 154th Street/Southcenter Boulevard/Grady Way, and Des Moines Memorial Drive.

- Avoiding or minimizing the use of roadways that are under construction. The contractor should be required to coordinate activities with contractors working on roadway projects.
- Coordinating with WSDOT and surrounding communities on the proposed schedule of area roadway improvements.

Exhibit 7-1 shows the location and alignment of the proposed temporary construction-only interchange from SR 509 at South 176th Street. As was noted earlier, the Port of Seattle has refined its design for this interchange in consultation with the Washington State Department of Transportation (WSDOT). The interchange will be constructed within the WSDOT right-of-way in the south and northbound locations. In the SR 509 Southbound lane, a ramp accessing the interchange will exit SR 509 about 1,300 feet north of South 176th Street and rise to the elevation of the overpass. In the northbound lane, the ramp will merge empty trucks about 1,200 feet north of the overpass. As a result, the grade change will provide a natural deceleration brake for full trucks leaving SR 509 as they travel over the incline to reach the overpass, before proceeding east on the overpass. Because acquisition will have been completed to the area west of the Third Runway embankment, as defined in the Final EIS and Final Supplemental EIS, S.176th will be closed to through traffic at the easterly edge of the overpass (this will be done so as to not affect public access to the residential area west of SR 509). As a result, trucks exiting SR 509 will not be required to stop before turning east over the overpass.

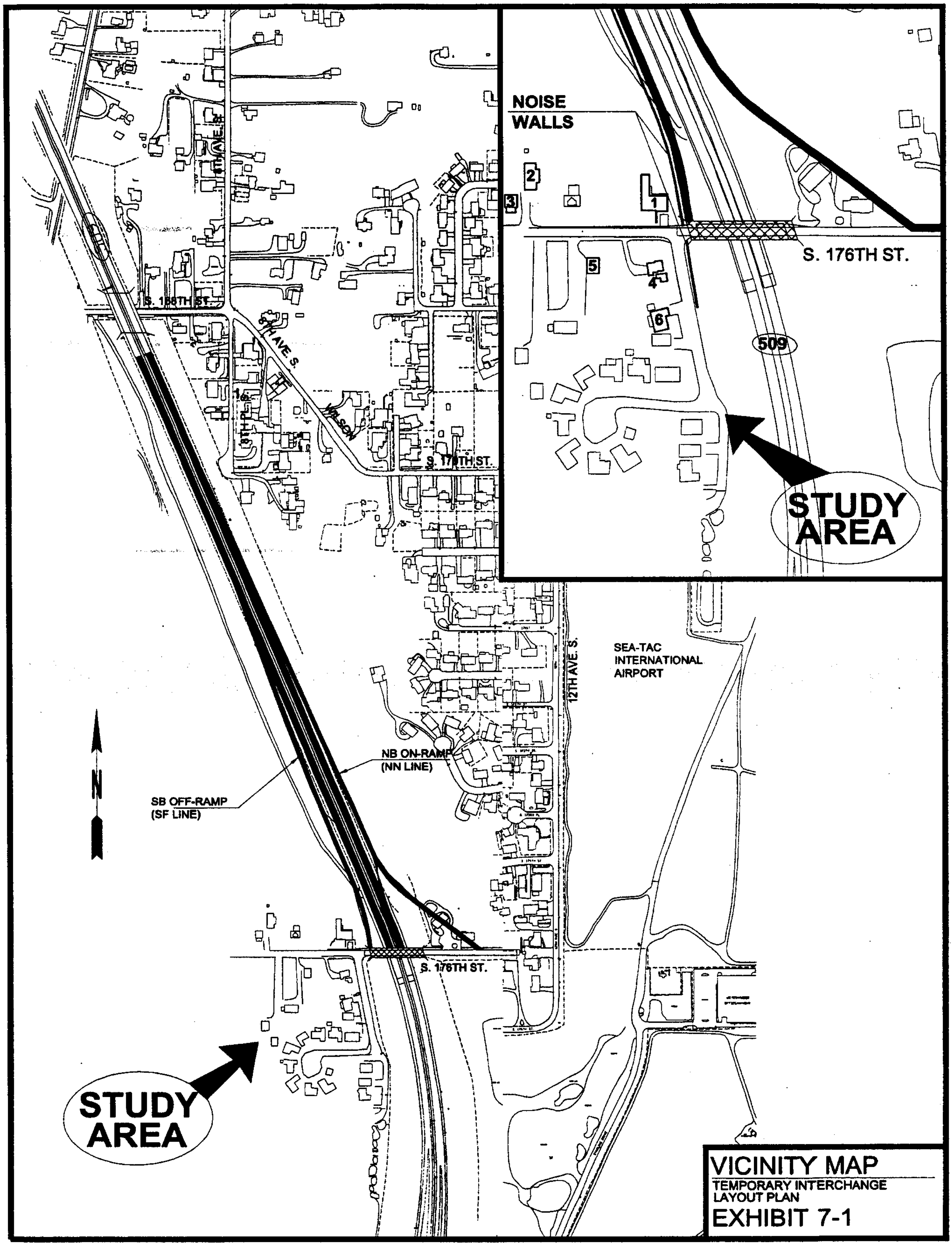
II. <u>Vibration Analysis</u>

The potential for vibration impacts generated by construction truck use of the interchange was examined. To evaluate vibration effects, two techniques were used: measurements of ground-borne vibration at the site to obtain a site signature, and evaluation of the site signature based on known vibration from construction truck traffic. This subsection briefly summarizes the results of the analysis the led to the conclusion that the home located closest to the ramp off SR 509 should be acquired on a voluntary basis due to potential vibration effects from haul trucks existing the expressway using the temporary interchange.

The U.S. Department of Transportation has established criteria for evaluating the impact from ground-borne vibration. To determine the significance of the potential vibration from traffic using the interchange, projected vibration was compared with these thresholds. The criteria for acceptable ground-borne vibration are expressed in velocity levels in decibels (VdB). DOT has found that significant impacts to residential locations can occur at 72 VdB for frequent events, or 80 VdB for infrequent events. This threshold represents a significant amount of vibration for residences and buildings where people normally sleep. For purposes of this evaluation, the frequent event threshold was used, as it is more conservative and during the haul periods, the truck trips are expected to be frequent.

The analysis of vibration effects found the following for the <u>home closest to the ramp</u>:

- DOT threshold of effect to residential buildings – vibration equal to or above 72 to 80 VdB


NOISE
WALLS
S. 176TH ST.
509
STUDY
AREA
S. 168TH ST.
8TH AVE. S.
WILSON
S. 176TH ST.
12TH AVE. S.
SEA-TAC
INTERNATIONAL
AIRPORT
NB ON-RAMP
(NN LINE)
SB OFF-RAMP
(SF LINE)
N
S. 176TH ST.
STUDY
AREA
VICINITY MAP
TEMPORARY INTERCHANGE
LAYOUT PLAN
EXHIBIT 7-1

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- Smooth surface road – house without a crawl space – 57 VdB
- Smooth surface road – house with a crawl space – 63 VdB
- Rough surface road – house without a crawl space – 67 VdB
- Rough surface road - house with a crawl space – 73 VdB

As the bullets above show, the only potential significant vibration effects that could result would be to the home closest to the southbound off-ramp presuming that the home has a crawl space; the vibration effect at House 1 with a rough road surface would reach 73 VdB, which is greater than the DOT threshold of 72 VdB.

The analysis, as documented in **Appendix A**, shows that soils at the site are loose and sandy which is an inefficient conductor of vibrational energy. Based on the site characteristics and published vibration data for construction trucks, the predicted ground-borne vibration level at the nearest residence is 57 VdB with no mitigation treatments. Because homes in the area often have a crawl space located underneath the home, which could increase the effect, consideration was also given to this type of structure. An elevated structure could experience 63 VdB.

To evaluate a higher vibration condition, consideration was also given to the truck traveling over a worn surface, associated with a rough road service. While it is anticipated that the interchange will initially be developed with a smooth surface, it is possible with a maximum amount of truck travel predicted by the Master Plan Final and Supplemental EIS, that over time, the surface of the road could become rough. With a rough surface, the vibration effect could increase 10 dB, placing impacts at 73VdB, or 1VdB in excess of the DOT threshold. This impact would only be experienced at the home closest to the exit ramp of the interchange, and as a result, the Port will offer to acquire that property. Because other homes are located further from the ramps, the impacts would be below the DOT thresholds.

III. Noise Analysis

Based upon the proposed alignment, and the peak traffic levels identified in the Final Supplemental EIS, a construction traffic noise analysis was performed. **Appendix B** documents the detailed analysis prepared for this addendum, which is summarized in the following section.

A. Noise Level Descriptors

Noise is defined as unwanted sound. Noise and sound are physically the same, the difference being the subjective opinion of the receiver. Sound is measured by its pressure or energy in terms of decibels (dB). The decibel scale is a logarithmic scale. The scale runs from zero to 120 and covers the range of most common sounds. When the decibel count increases by ten, the perceived sound is twice as loud.

The "equivalent sound level" (Leq) is a noise descriptor for environmental noise. It is a measurement of the total average noise level during a specific period of time. Leq measured over a one-hour period is termed the hourly Leq (Leq (h)). The hourly Leq is used by the WSDOT for highway noise and abatement analysis. The "day-night sound level" ("DNL") is also used to describe community noise, including noise from highway traffic. DNL is the Leq averaged over a

24-hour period, with a 10-decibel penalty added to noises that occur during nighttime hours of 10 p.m. to 7 a.m., to account for increased sensitivity to nighttime noise. This descriptor is labeled DNL/Leq in this Addendum. DNL is included for purposes of differentiating the amount of haul traffic that could occur during the nighttime hours.

B. Methodology and Existing Conditions

The evaluation of the effects of the temporary interchange included actual measurements of current noise conditions in the vicinity of the temporary interchange off SR 509. These measurements enabled quantification of current sounds without the presence of the proposed temporary interchange and associated traffic. Measurements were taken over three (3) 24-hour periods between January 3 and 7, 2000. Measurements were conducted at three separate residences near the site: 1) southeast corner of House 2 (40 feet from S. 176th Street), northeast corner of House 4 (45 feet from S. 176th Street); and the northeast corner of House 6 (1,000 feet from S. 176th Street).

Results of the measurements include:

- The DNL levels ranged from 63.2 at the home furthest from SR 509 (House 4) to 68.1 DNL at Home 4
- Maximum sound levels were 88 at House 4, 89.5 at House 6 and 89 at House 2

C. Conditions with Use of the Temporary Construction-Only Interchange

To assess the effect of the temporary interchange on sound levels, the sound associated with actual construction trucks was quantified. To evaluate the construction-traffic noise, sound level measurements were taken from trucks exiting a gravel pit, with a full load. Actual measurements were taken on January 4, 2000 at the intersection of Mountain Loop highway and Gun Club Road in Granite Falls Washington. Four types of truck movement sound were recorded: 1) accelerating full trucks, 2) decelerating full trucks, 3) accelerating empty trucks, and 4) decelerating empty trucks. The purpose of the measurements was to obtain a representative sound pressure level (SPL) to use in traffic noise prediction for the proposed interchange. The results ranged from 73.6 dBA for decelerating empty truck to 79.0 dBA for an accelerating full truck.

To evaluate the impact of the construction truck traffic using the temporary interchange, the overall sound level energy from the measured dump truck activity was used to calculate the effect on the homes in the vicinity of the proposed interchange. By extrapolating the average energy of the measured data to the number of possible daily truck trips, as identified in the Final Supplemental EIS, the DNL levels at each of the nearby homes was calculated. This sound level was then added to the to ambient sound level.

The noise analysis was conducted in a manner that considers the possible distribution of traffic haul that could occur throughout the day. Until a contractor is selected to deliver fill material for the haul, it is not certain as to the location where fill will be obtained. As a result, it is not possible to predict whether or not night haul will be necessary. Therefore, consideration was given to four possible scenarios: 1) all haul during daytime hours; 2) 10% haul during nighttime hours; 3) 50% haul during nighttime hours and 4) 100% haul during nighttime hours. These scenarios were considered for the purpose of ensuring the adequate mitigation is provided.

As **Exhibit 7-1** shows, Home 1 is located closest to the ramp at about 37 feet. This residence is located immediately west of the proposed ramp alignment, and is north of S. 176th Street. Because Home 1 is proposed to be acquired due to vibration the noise analysis is not presented in this summary, but is available in the Appendix. The second closest home, Home 4, is located almost 3 times are farther than Home 1, and is located on the south side of S. 176th across the street from Home 1. Home 2 is located about 235 feet from the proposed ramp and is located west of Home 1.[6]

To enable the evaluation to differentiate between possible scenarios that would have some of the haul traffic occur at night, the DNL levels were calculated at the two closest sites. The following DNL levels were calculated:

TABLE 7-1

Sound Levels With the Proposed Temporary SR 509 Interchange (no mitigation)

DNL based on peak traffic haul of 1,600 daily truck trips

	Home 2		Home 4		Home 6	
Day/Night Traffic Levels	Existing	With Interchange	Existing	With Interchange	Existing	With Interchange
All haul during daytime	66.4	67.6	68.1	69.9	63.2	65.4
10% of haul at night	66.4	68.5	68.1	71.5	63.2	66.5
50% of haul at night	66.4	70.7	68.1	74.5	63.2	69.7
100% of haul at night	66.4	72.4	68.1	76.8	63.2	71.8
Range of change with project	1.2 - 6.0		1.8-8.7		2.2-9.6	

In evaluating the noise impacts, the criteria established by the Washington State Department of Transportation were used. WSDOT has established guidelines for roadway noise levels based on the Equivalent Sound Level (Leq) noise measurement. WSDOT considers an increase caused by a project in average sound level of 10 dBA or greater to be a significant impact. The Leq over a 24-hour period would be the same as the DNL, if a sound level penalty was not applied to nighttime traffic levels. Therefore, the DNL levels were then compared to the WSDOT criteria to ascertain if the sound level caused by the temporary interchange is significant, and represent a conservative/protective approach. As the table above notes, even with all hauling occurring at night, the interchange will not create a significant change in noise exposure, as none exceed 10 dBA.

In addition, WSDOT has established land use compatibility guidelines for roadway noise. These guidelines indicate that residences, parks, schools, churches and similar noise sensitive areas are sensitive to roadway noise at or above an hourly Leq of 67 dBA. As the table above shows, existing levels currently are in excess of Leq 67 at home 4, the home closest to SR 509. Homes 2 and 6 are currently less than the WSDOT land use guideline. With the proposed interchange, noise levels would being to exceed the WSDOT guideline regardless of the hourly distribution of traffic at Home 2 if no mitigation is included in the interchange. Sound levels with the interchange would

[6] Sound levels are not presented for Home 3 (west of Home 2) as sound decreases with distance, and as such, sound levels would be less at homes west of Home 2. Similarly, sound levels are not presented for homes south/southeast of Home 6, as the project-related effects would be less than predicted for Home 5.

exceed the WSDOT guideline at Home 6 with a night haul greater than 10% if the interchange does not include mitigation.

D. Proposed Mitigation: Construction of a Noise Attenuation Wall at the Interchange

Based on the evaluation of noise conditions with the temporary interchange, mitigation was considered. An industry accepted means of mitigating surface traffic noise includes the development of noise walls. A noise wall is a man made structure that blocks the most direct path of the sound transmitting to the receiver. By increasing the distance that noise must travel to reach the receiver, sound is reduced. Noise walls are used frequently throughout the Puget Sound Region to reduce noise to residential areas from highway traffic. In this evaluation, a Type 15D WSDOT standard noise wall is evaluated and proposed. At a height of 10 feet, such a barrier would achieve a maximum 7 dBA noise level reduction for properties closest to the barrier. Because the benefits of the barrier would decrease as the distance away from the barrier increases, the barrier would be less effective further way from the ramp.

TABLE 7-2

Sound Levels With the Proposed Temporary SR 509 Interchange (With Mitigation)

DNL based on peak traffic haul of 1,600 daily truck trips

	Home 2		Home 4		Home 6	
Day/Night Traffic Levels	Existing	With Interchange and wall	Existing	With Interchange and wall	Existing	With Interchange and wall
All haul during daytime	66.4	67.1	68.1	68.5	63.2	63.7
10% of haul at night	66.4	67.6	68.1	69.0	63.2	64.1
50% of haul at night	66.4	69.3	68.1	70.3	63.2	65.5
100% of haul at night	66.4	70.8	68.1	71.7	63.2	66.7
Range of change with project	0.7-4.4		0.4-3.6		0.5-3.5	

As is shown above, the noise wall would provide substantial reduction in sound level (reducing the project related peak sound level reduction from 9.6 at Home 6 to 3.5 dBA). However, sound levels at Home 2 would continue to exceed the land use guideline regardless of the amount of night haul. To mitigate the sound level effects, the Port will sound insulate the homes where the traffic associated with the use of the temporary construction-only interchange causes sound levels to reach or exceed the WsDOT land use criteria of 67 dBA, as measured with the DNL. The number of homes that would be insulated would depend on the amount of night haul, but as the table above indicates, these homes would be limited to those along S. 176th Street in the immediate vicinity of the interchange. With the construction of the noise wall, it is anticipated that this would be less about a half dozen houses west of house 2.

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Chapter VIII

CONCLUSION

The recently refined wetland delineation, on the basis of on-the-ground inspections and surveys of previously inaccessible properties, identified some previously unobserved isolated wetlands and ascertained that some previously identified wetland areas were larger and some smaller than had been determined by the earlier delineations. The net result of the more refined delineation and several project design modifications, was an increase in wetlands that would be affected by the planned Airport improvements. Quantitatively, the area of affected wetlands increased from 12.23 to 18.28 acres plus temporary and indirect impacts. Qualitatively, the affected wetlands virtually all fell into the poor to average categories of wetland function established by the state Department of Ecology.

The Port, in the interest of assuring a systematic "hard look" at the new information and providing a public record, has conducted a study re-evaluating wetland impacts in light of the refined wetland delineations. After this systematic reassessment of wetland impacts, the Port, as SEPA lead agency, has concluded that preparation of a new SEIS is not required by SEPA or NEPA.

While the new information reveals that a greater total area of wetlands would be affected by the projects, the functions of the additional wetlands are essentially the same as those analyzed in the 1996 FEIS and 1997 FSEIS. Most importantly, the Port's extensive mitigation commitments, including new mitigation measures and project design-modifications in response to the new information, will fully compensate for all impairment of wetland functions and may result in a net increase in wetland functions. Since the project incorporates mitigation measures that will avoid or compensate for all significant adverse wetland impacts, including those related to the new information, there will be no net significant adverse impacts to wetlands and no warrant for preparation of a new SEIS.

To aid in mitigating traffic related impacts from haul assocaited with the Third Runway, the Port proposed to develop temporary construction-only interchanges. Based on the final design of the temporary construction-only interchange at SR 509/South 176th Street, to ensure that adequate mitagation is provide, the Port proposes to complete the following:

- A noise attenuation wall along portions of the temporary interchange to ensure that truck traffic does not create a significant noise effect on adjacent properties;
- Offer to acquire the residence closest to the southbound off-ramp (Home 1) at South 176th Street due to the potential for significant vibration effects if the off-ramp pavement becomes worn.
- Insulation of homes where the sound generated by the construction activity using the temporary interchange would increase noise to sound levels above 67 DNL (the WSDOT land use criteria). It is anticipated that the number of homes to be insulated would depend on use of the interchange at night but would number less than a half dozen homes along South 176th Street west of the interchange.

Appendix A

Vibration Analysis of Temporary Construction-Only Interchange

INTRODUCTION

An environmental noise study of the SR509 construction-only traffic interchange was conducted between January 3rd and January 11th, 2000 in Burien and Sea-Tac, Washington. The study included taking measurements of existing noise levels at three residences next to the interchange site. Measurements of noise levels from dump trucks were also taken on January 4th, 2000 in Granite Falls, Washington. Noise levels from the interchange were then predicted for select residences, accounting for dump truck volume, topography, building heights, and distances from the roadway. Using the same conditions, noise levels were then predicted at the same properties with the addition of a noise barrier. Resultant noise levels with and without a barrier were then compared to pertinent guidelines in order to determine whether criteria were met.

SITE DESCRIPTION

The construction-only traffic interchange connects SR509 and South 176th Street in Sea-Tac, Washington. The interchange site is bordered on the east by residential property, on the west by the construction site, on the north by SR509 and South 176th Street, and on the south by SR509.

Currently, the primary sources of noise at the interchange site are SR 509 and aircraft noise from Seattle-Tacoma International Airport. Other minor sources of noise include occasional traffic on South 176th Street and residential noise from the property east of the site.

AMBIENT MEASUREMENT DESCRIPTION

Three 24-hour measurements of ambient noise levels were taken between January 3rd and January 7th, 2000 using a Larson Davis 700 sound level meter. Two one-half hour measurements were also taken during the same time with a Bruel & Kjaer 2231 sound level meter. The measurements were taken at three separate residences near the site. Measurements 1 and 4 were taken at the southeast corner of House #2, 40 feet from

South 176th Street. Measurements 2 and 5 were taken at the northeast corner of House #4, 45 feet from South 176th Street. Measurement 3 was taken at the northeast corner of House #6, 1000 feet from South 176th Street. All house numbers correspond to the same house numbers described in previous reports and are shown in Figure 1. For all measurements, the microphones were placed 5 feet from the ground and were pointed toward SR509. All measurements were calibrated before and after to ensure the quality of the data.

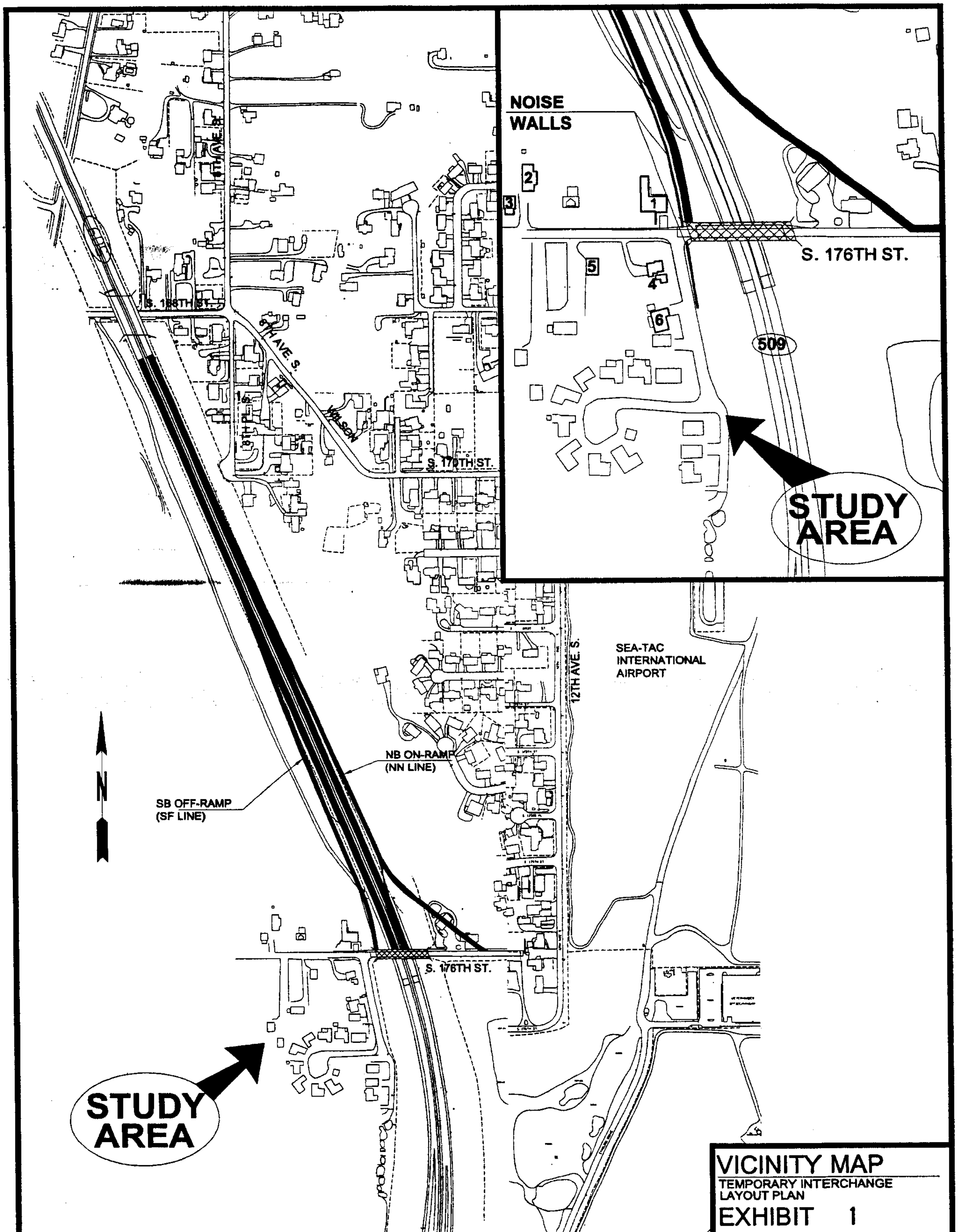
AMBIENT MEASUREMENT RESULTS

The acoustical data presented in this report uses "A-weighted" sound level descriptors which are frequency weighted to account for the human ear's perception of noise. L_{eq} is the energy average sound pressure level, dB re 20 micropascals. L_{max} is the maximum sound pressure level (rms) and L_{min} is the minimum sound pressure level (rms), also dB re 20 micropascals. L_{dn} is the Day-Night Equivalent Noise Level, which is a 24-hour continuous sample of L_{eq}, with a 10 dB(A) penalty added to sound occurring between 10:00 pm and 7:00 am. L_n is the noise level which is exceeded n percent of the time. See Appendix I for a more detailed discussion of noise descriptors.

The purpose of the measurements was to obtain an ambient L_{DN} level at each residence. The sound pressure level (SPL) data measured at the residences are presented in Appendix II. The calculated ambient L_{DN} levels are listed below.

Table 1: Calculated Ambient L_{DN} Levels

Measurement Location	Calculated L_{DN} (dB(A))
House #2	66.4
House #4	68.1
House #6	63.2



NOISE WALLS
1
2
3
4
5
6
S. 176TH ST.
509
STUDY AREA
S. 168TH ST.
6TH AVE. S.
8TH AVE. S.
WILSON
S. 170TH ST.
12TH AVE. S.
SEA-TAC INTERNATIONAL AIRPORT
N
NB ON-RAMP (NN LINE)
SB OFF-RAMP (SF LINE)
S. 176TH ST.
STUDY AREA
VICINITY MAP
TEMPORARY INTERCHANGE LAYOUT PLAN
EXHIBIT 1

AR 004296

DUMP TRUCK NOISE MEASUREMENT DESCRIPTION

In order to accurately represent the noise levels expected from dump truck traffic, measurements of dump truck noise were taken. The measurements were taken on January 4, 2000 with a Bruel & Kjaer 2231 sound level meter, at the intersection of Mountain Loop Highway and Gun Club Road in Granite Falls, Washington. Noise levels were ascertained for four types of truck events: accelerating and decelerating full and empty trucks. The microphone was placed fifty feet from the intersection, fifty feet from the road, and five feet above ground for all measurements. The sound level meter was calibrated before and after the set of measurements to ensure the quality of the data.

DUMP TRUCK NOISE MEASUREMENT RESULTS

The purpose of these measurements was to obtain a representative sound pressure level (SPL) to use in traffic noise predictions for the interchange. The sound pressure level data measured for each condition are presented in Appendix III. The representative sound pressure levels used in the predictions are listed in Table 2.

Table 2: Representative Sound Pressure Levels For Dump Truck Traffic

Measurement Condition	SPL (dB(A))
Accelerating, Full Truck	79.0
Accelerating, Empty Truck	78.2
Decelerating, Full Truck	74.7
Decelerating, Empty Truck	73.6

For most cases, 3 events per measurement condition were recorded. The numbers above represent an average of the highest and lowest measured SPL for each condition. The arithmetic average of the measured sound pressure levels per condition is slightly lower than the high/low average. This makes the representative sound pressure levels in Table 2 conservative.

RECOMMENDED NOISE LEVELS FOR RESIDENTIAL LAND USE

The impact of ambient and dump truck noise levels on the residential area can be determined by comparing them to pertinent criteria. In this case, three different guidelines may be used. The Washington State Department of Transportation (WSDOT) has established criteria for roadway traffic which are based on the energy average sound pressure levels, or L_{eq}. These guidelines state that noise sensitive areas, such as residences, are perceptive to traffic noise at or above an hourly L_{eq} of 67 dB(A). WSDOT also considers an impact to occur if the increase in ambient noise levels at a residence due to a project is 10 dB(A) or more.

Federal government recommendations can also be used to assess residential noise levels near busy streets or highways. Noise levels recommended by the Federal Government are given in a report written by the Federal Interagency on Urban Noise (FICUN) [1]. The recommended noise levels and corresponding land uses documented in the FICUN report, in agreement with HUD guidelines, are as follows:

Exterior Noise levels L_{dn}	*Recommended Land Use*
0-55 dBA	Residential without restrictions.
55-65 dBA	Residential property generally acceptable. The guidelines note that some people may find noise levels in this category objectionable, but considering the cost of mitigating measures, these noise levels are generally acceptable for residential use.
65-75 dBA	Generally unacceptable for residential use. Acceptable for commercial use. Residential use in this environment requires special construction techniques to achieve a minimum Noise Level Reduction (NLR) of 25 dB for noise levels between 65 dBA and

[1] The Federal Interagency Committee on Urban Noise members included HUD, the Environmental Protection Agency, and the Department of Veteran Affairs. Guidelines for acceptable residential noise Development (HUD).

70 dBA and a NLR of 30 dB for noise levels between 70 dBA and 75 dBA.

Interior Noise levels L_{dn} (windows closed)	*Recommended Land Use*
Less than 45 dBA	Acceptable for residential use.
Greater than 45 dBA	Unacceptable for residential use.

Lastly, noise levels at residential locations may be evaluated using EPA Region 10 guidelines. These guidelines are similar to the impact statement in the WSDOT criteria. The EPA guidelines consider a slight impact to occur if the increase in ambient noise levels at a residence due to a project is 0-5 dB(A). A significant impact will occur if the increase is between 5 and 10 dB(A). For a significant impact, mitigation measures are suggested. Any increase in ambient noise levels over 10 dB(A) results in a serious impact at the residential location. Mitigation measures are required for a serious impact.

Using these guidelines, one should note that measured ambient L_{DN} levels at houses #4 and #2 are already considered generally unacceptable for residential use by HUD guidelines. The ensuing interchange construction noise levels will only add to this already high ambient level.

PREDICTION OF INTERCHANGE NOISE

To evaluate the impact of increased construction traffic on neighboring properties a computer simulation was used. This simulation takes measured overall energy levels from a reference dump truck event and calculates the acoustic energy from that event at the residential receiver. By extrapolating the average acoustic energy of one truck event to the number of daily truck events, the hourly L_{eq} and 24-hour L_{DN} levels from the dump trucks can be accurately predicted at the receiver location. The L_{DN} levels from the dump trucks were finally added to the ambient L_{DN} levels to obtain a total noise level at the residential receiver location.

L_{DN} levels were calculated for four scenarios: 0% night haul, 10% night haul, 50% night haul, and 100% night haul. It was assumed there would be 1600 daily one-way dump truck events per day. The breakdown of hourly truck events is shown in Table 3. Daytime hours are considered between 7:00 AM and 10:00 PM.

Table 3: Breakdown of dump truck events

Condition	Trucks per Day/Night	Trucks per Hour
0% Night Haul	1600 - Day	106 - Day
10% Night Haul	1440 – Day 160 – Night	96 – Day 18 - Night
50% Night Haul	800 – Day 800 – Night	53 – Day 89 - Night
100% Night Haul	1600 – Night	177 - Night

Table 4 shows the measured ambient and calculated interchange L_{DN} levels for three residential receivers, without barriers, for all four scenarios of truck haul. Again one should note the ambient levels seen in the table are already generally unacceptable for residential use and the increased interchange traffic only adds to the ambient level.

Table 4: L_{DN} results at receiver locations without noise barrier.

Scenario	Measured Ambient L_{DN}	Calculated Interchange L_{DN}	Combined L_{DN}
House 2			
No night haul, no wall	66.4	61.4	67.6
10% night haul, no wall	66.4	64.3	68.5
50% night haul, no wall	66.4	68.6	70.7
100% night haul, no wall	66.4	71.2	72.4

Scenario	Measured Ambient L_{DN}	Calculated Interchange L_{DN}	Combined L_{DN}
House 4			
No night haul, no wall	68.1	65.4	69.9
10% night haul, no wall	68.1	68.8	71.5
50% night haul, no wall	68.1	73.3	74.5
100% night haul, no wall	68.1	76.2	76.8
House 6			
No night haul, no wall	63.2	61.4	65.4
10% night haul, no wall	63.2	63.8	66.5
50% night haul, no wall	63.2	68.6	69.7
100% night haul, no wall	63.2	71.2	71.8

PREDICTION OF BARRIER IMPACT ON INTERCHANGE NOISE LEVELS

To evaluate the impact of noise barriers on neighboring properties another computer simulation was used. Predictions were made using the Federal Highway Administration Traffic Noise Model version 1.0a, TNM, noise simulation package. To calibrate the prediction model, reference dump truck noise levels were entered and a run was made with 0% night haul and no barrier. The results of this run were then compared with the previous acoustic energy calculations. The two results were within 1dB(A) of each other and showed excellent agreement between noise levels. Barrier predictions were then made for the same four scenarios of night haul.

As in the previous calculations, predicted L_{DN} levels from the dump trucks with noise barriers were added to the ambient L_{DN} levels to obtain a total noise level at the residential receiver location. No decrease in ambient noise level due to the barrier was considered in the prediction. This makes the final noise levels at the receiver locations conservative. The noise barrier will decrease the ambient traffic noise from SR509 however it will have no effect on the overhead aircraft noise.

Table 5 shows the measured ambient and calculated interchange L_{DN} levels for three residential receivers, with barriers, for all four scenarios of truck haul.

Table 5: Final L_{DN} results at receiver locations with noise barrier.

Scenario	Measured Ambient L_{DN}	Calculated Interchange L_{DN}	Combined L_{DN}
House 2			
No night haul, with barrier	66.4	58.8	67.1
10% night haul, with barrier	66.4	61.6	67.6
50% night haul, with barrier	66.4	66.2	69.3
100% night haul, with barrier	66.4	68.8	70.8
House 4			
No night haul, with barrier	68.1	58.4	68.5
10% night haul, with barrier	68.1	61.8	69.0
50% night haul, with barrier	68.1	66.3	70.3
100% night haul, with barrier	68.1	69.2	71.7
House 6			
No night haul, with barrier	63.2	54.4	63.7
10% night haul, with barrier	63.2	56.8	64.1
50% night haul, with barrier	63.2	61.6	65.5
100% night haul, with barrier	63.2	64.2	66.7

CONCLUSIONS AND MITIGATION

As shown in Table 4, residential noise levels resulting from the SR509 construction-only traffic interchange with no noise barrier are within the threshold of the WSDOT impact criteria of an increase of 10 dB(A) over ambient levels. However, because of the high ambient noise levels, the WSDOT criterion of 67 dB(A) is only met at House #6 during 10% night haul or less. L_{DN} levels at all receivers are above a L_{DN} of 65 dB(A) during all conditions of night haul and therefore exceed the FICUN residential acceptable levels. When compared with EPA guidelines, the construction traffic provides a 5 to 10 dB(A) increase in ambient level which is considered a significant impact.

Table 5 shows that residential noise levels resulting from the construction interchange with a noise barrier are also within the threshold of the WSDOT impact criteria. However, the WSDOT criterion of 67 dB(A) is only met at House #6 for all conditions of night haul and at House #2 for no night haul. L_{DN} levels are above a L_{DN} of 65 dB(A) for all receivers during 50% and 100% night haul and therefore exceed the FICUN residential acceptable levels. For Houses #2 and #6, the 65 dB(A) criteria is met for 0% and 10% night haul. For House #4, the guideline is met for only 0% night haul. When compared with EPA guidelines, the construction traffic provides a 0 to 5 dB(A) increase in ambient levels which is considered a slight impact.

Mitigation measures for the residences should take a two step approach. First, the noise barrier should be constructed as shown. The barrier will not only help to decrease the noise from the construction interchange, but will also reduce the existing traffic noise from SR 509. With the barrier in place, a threshold for further mitigation should be applied to all residences with noise levels over 67 dB(A). The WSDOT criterion of 67 dB(A) should be used for the mitigation threshold for the following reasons:

- A significant part of the existing noise at the residential site is traffic noise, making traffic noise or WSDOT standards the most appropriate to use.

- Ambient noise levels at the residential sites are already above FICUN guidelines of 65 dB(A). This makes these guidelines difficult to apply to the current project.
- The WSDOT standard of 67 dB(A) is more restrictive and therefore more conservative than EPA Region 10 guidelines. It therefore provides a reasonable compromise between the FICUN guidelines and the EPA Region 10 guidelines.

Appendix B

Noise Analysis of Temporary Construction-Only Interchange

GROUND-BORNE VIBRATION STUDY

CONSTRUCTION ACCESS ROAD SR-509

December 17, 1999

Prepared for :
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Prepared by:
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EXECUTIVE SUMMARY

Measurements were made of Ground-borne vibration levels at the site of the proposed temporary construction access road off of State Route (SR) 509 in SeaTac, Washington. The results of these measurements were used to develop the "signature" associated with the ground response to a known impulse force. These signatures were then applied to vibration levels produced by construction truck traffic to predict vibration levels for residences in the proximity of the new access road. The predicted vibration response was then evaluated for the potential of "impact" and structural damage to the nearby residences.

The generally accepted threshold for determining ground-borne vibration impact is 72 VdB as defined by the U.S. Department of Transportation and the Federal Transit Authority (FTA) for residences and buildings where people normally sleep. The threshold for minor cosmetic damage to buildings is 100 VdB as defined by USDOT.

Soils at the site of the proposed off ramp are loose and sandy which is an inefficient conductor of vibrational energy. The predicted ground-borne vibration level at the nearest residence, for haul trucks traveling 45 MPH and slowing on the off ramp, is 57 VdB, 37 feet from the ramp with no mitigation treatments implemented.

A structure raised off of the grade, with a crawl space beneath, could add 6 dB to the response inside of the home. This could raise the level to 63 VdB. This also falls below the accepted threshold impact level of 72 VdB defined by the Federal Transit Authority (FTA).

An additional 10 dB vibration level could result from a rough road surface While we would encourage the construction of a smooth road surface for the off ramp, it is likely that the predicted volume of traffic over an extended construction period will cause the road surface to deteriorate from the smooth surface of the newly constructed ramp to a rougher road surface. This could increase the intermittent level to 73 VdB, triggering the FTA threshold for impact at the nearest residence. However, the 73 VdB falls below the threshold for causing minor structural damage.

In conclusion, the predicted ground-borne vibration levels at the residences included in this study show "no impact", based on FTA guidelines, for all but the nearest residence. The 73 VdB predicted for the nearest property reflects a worst case condition including a rough road surface along the off ramp route. A potential property buy-out may warrant consideration at this one location.

1.0 INTRODUCTION

1.1 General Introduction

Measurements were made on November 15, 1999 at the site of the proposed temporary construction access road (SR 509). Vibration velocity levels were

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measured to document the amount of vibration energy transferred through the ground at the proposed access road site. Levels of energy associated with a known impulse force and from general highway traffic were measured for the analysis and ground-borne vibration predictions.

The proposed construction route is located near the South 176th Street exit off of SR-509 as shown in the enclosed site map. The proposed temporary access road is located within 37 feet of the nearest residence, labeled as location 1 on the site map.

1.2 Study Objectives

The purpose of this study was to predict the levels of ground-borne vibration energy associated with the operation of a temporary construction access road off of SR-509 and to evaluate the potential for intrusion into the neighborhood around the new construction route. The analysis also included evaluating ground-borne vibration levels from existing activities on SR-509.

2.0 NOMENCLATURE

2.1 Ground-borne Vibration

Vibration is an oscillatory motion which can be measured in a variety of ways: displacement, velocity or acceleration. The displacement is a measure of the distance that a point moves away from its resting position. The velocity represents the instantaneous speed of the movement and acceleration is the rate of change of the speed. The response to this vibration by humans, buildings and equipment is more accurately described using either velocity or acceleration. Standards for vibration studies involving transportation vehicles are typically defined in terms of velocity, so for the purposes of this study, velocity levels are reported.

Decibel notation is also the standard method of reporting levels of vibration due to the logarithmic nature of the descriptor and its ability to compress the wide range of numbers required to describe vibration. VdB is the common notation for decibels describing vibration to minimize the confusion with sound decibels.

Typical background velocity levels are well below the threshold of human perception. Enclosed in Table 1 are common vibration sources and human response to them.

The frequencies of interest for ground borne vibration are typically between 8 Hz and 200 Hz.

Table 1 Common Ground Borne Vibration Sources

Typical Sources, 50 Ft. from the Source	RMS Velocity Level in VdB	Human/Structural Response
Blasting from construction projects	100	Threshold, minor cosmetic damage to fragile buildings
Bulldozers and other heavy tracked construction equipment	92	
	90	Difficulty with tasks such as reading a VDT screen
Commuter Rail, upper range	84	
Rapid Transit, upper range	80	
Commuter Rail, typical	75	Dividing line between barely perceptible & distinctly perceptible
Bus or Truck over bump	72	Residential Annoyance with frequent events
Rapid Transit, Typical	70	
	65	Approximate threshold for human perception
Bus or Truck, typical	62	
Typical Background Vibration	52	

Source: FTA, 1995

3.0 CRITERIA

The U.S. Department of Transportation has established criteria for environmental impact from ground-borne vibration. The criteria that is presented in Table 2 accounts for variation in project types as well as the frequency of events, which differ widely among projects. The criteria for acceptable ground-borne vibration are expressed in terms of rms velocity levels in decibels (VdB). The limits are specified for the three land use categories below.

Table 2. Ground-Borne Vibration Impact Criteria

Land Use Category	***Ground-Borne Vibration Impact Levels (VdB re 1 micro inch/second)***	
	Frequent Events [1]	***Infrequent Events*** [2]
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 VdB	65 VdB
Category 2: Residences and buildings where people normally sleep	**72 VdB**	80 VdB
Category 3: Institutional land uses with primarily daytime use.	75 VdB	83 VdB

Notes:
1. "Frequent Events" is defined as more than 70 Vibration events per day
2. "Infrequent Events" is defined as fewer than 70 vibration events per day

Source: U. S. Department of Transportation,
"Transit Noise and Vibration Impact Assessment April 1995"

The 72 VdB criteria has been used as the basis for this study.

4.0 ANALYSIS

4.1 General

Vibration levels were recorded on November 15, 1999, at the site of the construction access road along State Route 509. The weather during the measurement period was overcast and rainy with damp soil due to earlier rains. The prediction method used in this analysis is outlined in chapter 11 of the FTA "Transit Noise and Vibration Impact Assessment Final Report", April 1995.

4.2 Test Support Hardware

Sony PC208AX, 8 channel DAT Recorder

Larson Davis 2900, 2 channel Spectral Analyzer

IMI 626A02, Industrial Piezoelectric ICP Accelerometers

PCB 480E09, ICP Sensor Power Unit

PCB 086C50, Calibrated Impact Hammer

4.3 Ground Borne Vibration Measurements

4.3.1 Test Description

The approach taken to assess ground-borne vibration levels involved two test configurations. The first configuration was a vertical array directed away from the source of vibration. The second configuration was a horizontal array of transducers directed perpendicular from the source of vibration. The test procedure was consistent with Chapter 11 of the FTA, "Transit Noise and Vibration Impact Assessment Final Report" of April 1995.

4.3.2 Test Measurements

4.3.2.1 Transducer Locations

The impulse source was located 10 feet away from State Route 509. The accelerometers wete mounted on 12 inch wooden stakes driven into the soil at distances described below.

4.3.2.1.1.1 Accelerometers in a vertical array

Accel. 1: 20 feet from the impulse source

Accel 2: 32 feet from the impulse source

Accel 3: 44 feet from the impulse source

Accel 4: 66 feet from the impulse source

As shown in the sketch below (Figure 1).

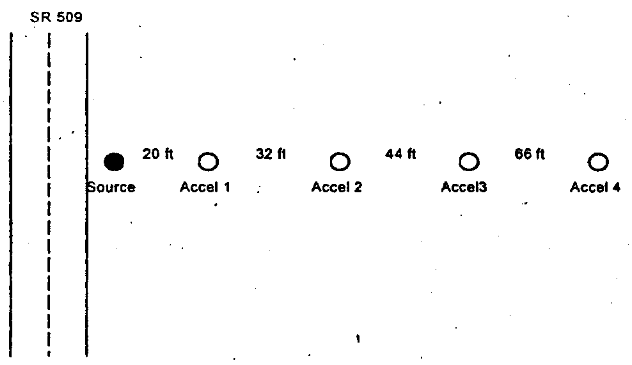


Figure 1. Sketch of the Vertical Transducer Array.

4.3.2.1.1.2 Accelerometers in Horizontal Array

Accel 1: Located 30 feet from accelerometer 4

Accel 2: Located 20 feet from accelerometer 4

Accel 3: Located 10 feet from accelerometer 4

Accel 4: Located 66 feet from the impulse source

As shown in the sketch below (Figure 2).

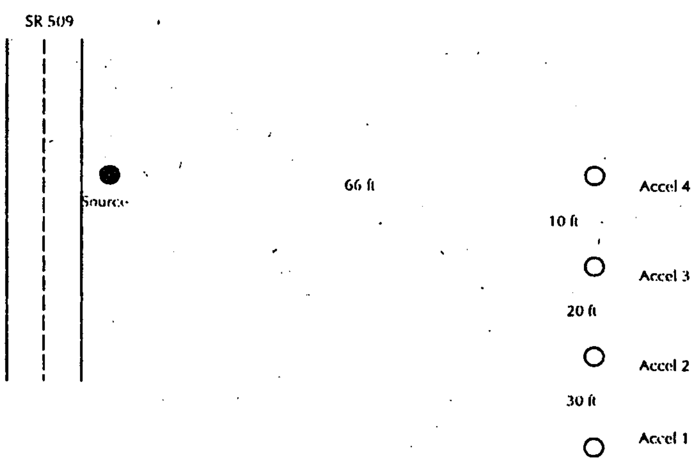


Figure 2. Sketch of Horizontal Transducer Array

4.3.3 Ground-Borne Vibration Measurement Procedure

Transducer positions were selected based on preliminary field data. The force gauge and accelerometers were calibrated at the beginning and at the end of the test period. Both, the 12 LB impact hammer (impulse excitation) and highway traffic, were used to excite the ground where the accelerometers were planted. Recordings were made for ground-borne vibration as well as the impulse forces. Ground-borne vibration data and impact force data were stored on an 8 channel Sony DAT Recorder (PC208).

The data was reduced in the laboratory using a Larson Davis 2900 Analyzer. Transfer functions between the calibrated impact hammer and the accelerometers were performed using a 400 line FFT over a period of 20 spectra averages.

The transfer functions were then plotted to produce the transfer mobility curves for each 1/3 octave band between 20 and 200 Hz. The transfer mobility curves are presented in this document as Figures 3 thru 13. The transfer mobility curves were applied to the baseline force, derived from the measured traffic vibrations and presented in Figure 14, as a means of predicting the vibration levels at the nearby residence. The projected ground-borne vibration at a distance of 37 feet (nearest residence) is presented in Figure 15 and represents an overall vibration level of 57 VdB re 1 micro in/sec.

5.0 EVALUATION & RESULTS

The predicted level of 57 VdB at position 1, which is the residence nearest to the access road, falls well below the 72 VdB threshold for the ground-borne vibration impact criteria outlined in Table 2 (Land Use Category 2: residences and buildings where people normally sleep).

The soil conditions have a strong influence on the transmission of vibrational energy. Stiff clay or rock concentrate the energy near the surface and efficiently translate the energy for greater distances. Layering or loose sandy soil provides some damping of the energy. Soil conditions at this site are loose and sandy.

The receiving structure is also a key component in the evaluation since the perception of ground-borne vibration occurs inside the building as the energy propagates through the foundation, potentially exciting resonances in various building components. Rattling of dishes or windows may be the perceptible manifestation of the energy. In lighter structures, a low rumble may be audible as the ground motion energizes the wall and floor plates, causing them to act as diaphragms re-radiating the sound as audible airborne energy. This added response due to resonance in the receiving structure could potentially increase the predicted level of 57 VdB by 6 dB, resulting in an overall level of 63 VdB.

Road surface will also have an effect on the source energy transmitted. An additional 10 dB can be added by a rough surface. This additional 10 dB could increase the vibration level at the nearest residence to 73 VdB. A level of 73 VdB would be an absolute maximum with two added conditions: a resonant structure and a rough road surface. This level exceeds the FTA threshold for impact by 1 dB for more than 70 events per day. We anticipate that peak volume will include 90 trucks per hour. We would highly recommend that care is exercised in constructing the road surface and that regular maintenance be scheduled to ensure a smooth surface throughout the period of use. However, the high volume of traffic anticipated for this roadway is likely to continually cause deterioration of the road surface, potentially triggering the "impact" condition over time at Home 1.

Vibration levels at Homes 2 through 10, due to truck activity on the off ramp, fall below 45 VdB. Typical ambient conditions are normally around 52 VdB. This could potentially increase to a worst case condition of 61 VdB with structural resonance and rough roadway conditions. This level is well below the 72 VdB FTA threshold for impact. The threshold of 100 VdB for cosmetic or structural damage is also not met at any of the 10 properties in this study.

In conclusion, there is no impact at Homes 2 through 10 due to vibration levels associated with truck activity on the proposed temporary construction off ramp on SR-509. Worst case conditions with floor resonances and rough roadway surfaces could potentially trigger the "impact" threshold defined by FTA for Home 1.

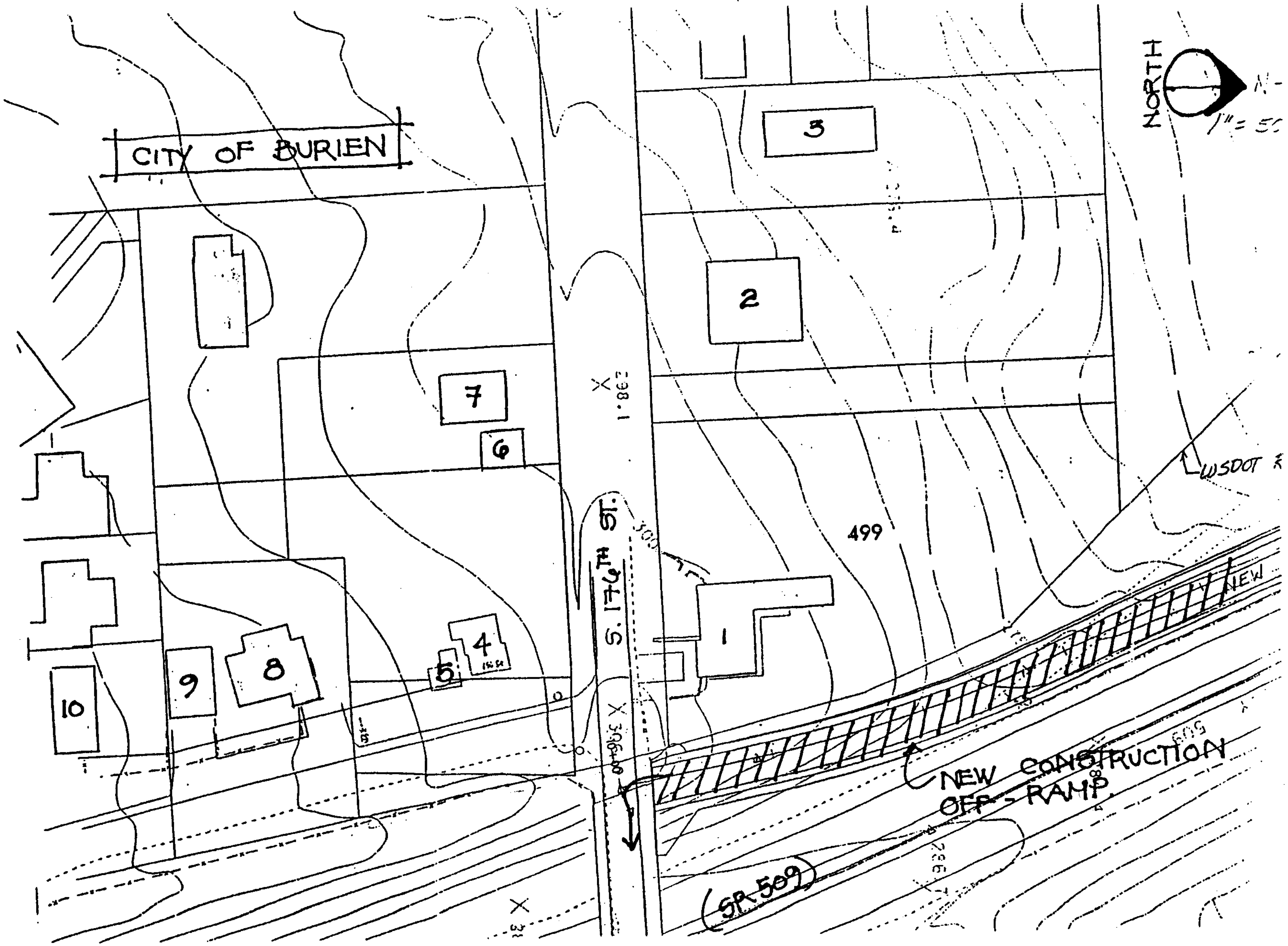


FIGURE 2 - SITE MAP
LOCATION OF RESIDENCES INCLUDED IN THE VIBRATION STUDY
(NOT TO SCALE)

Transfer Mobility as a Function of Distance
Vertical Array (SR 509)

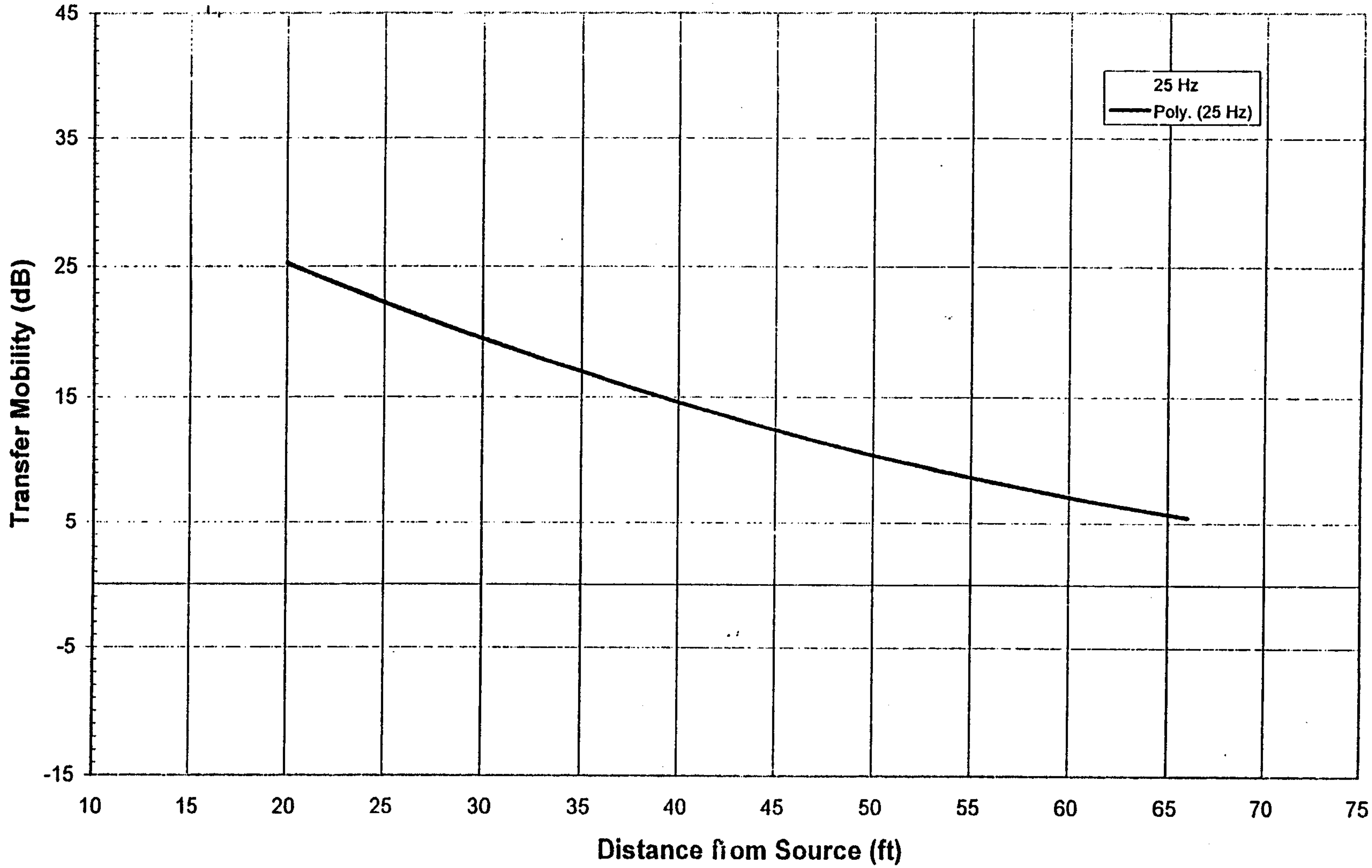
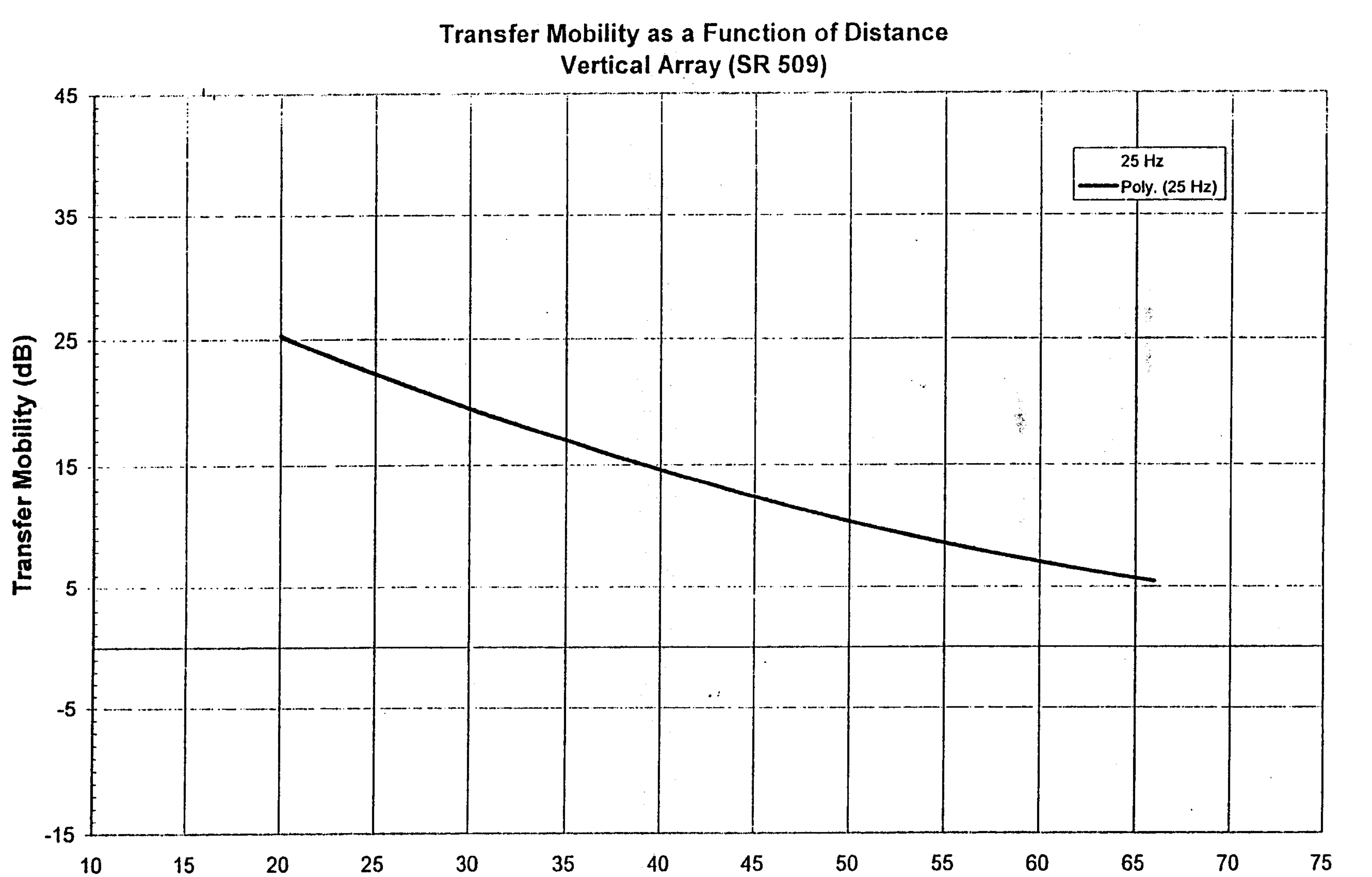


Figure 4.



Transfer Mobility as a Function of Distance
Vertical Array (SR 509)
Transfer Mobility (dB)
45
35
25
15
5
-5
-15
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Distance from Source (ft)
25 Hz
Poly. (25 Hz)

Figure 4.

Transfer Mobility as a Function of Distance
Vertical Array (SR 509)

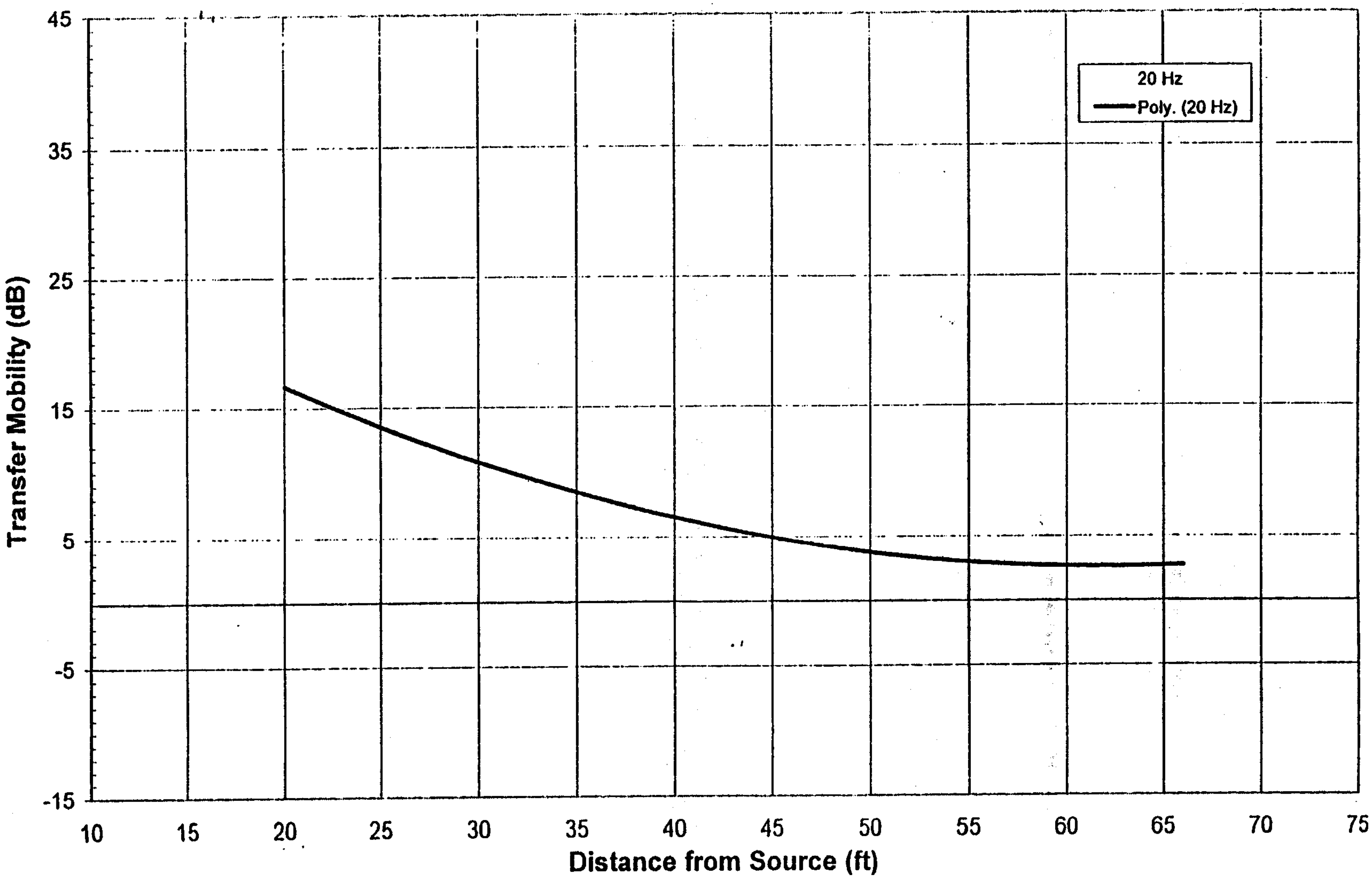


Figure 3.

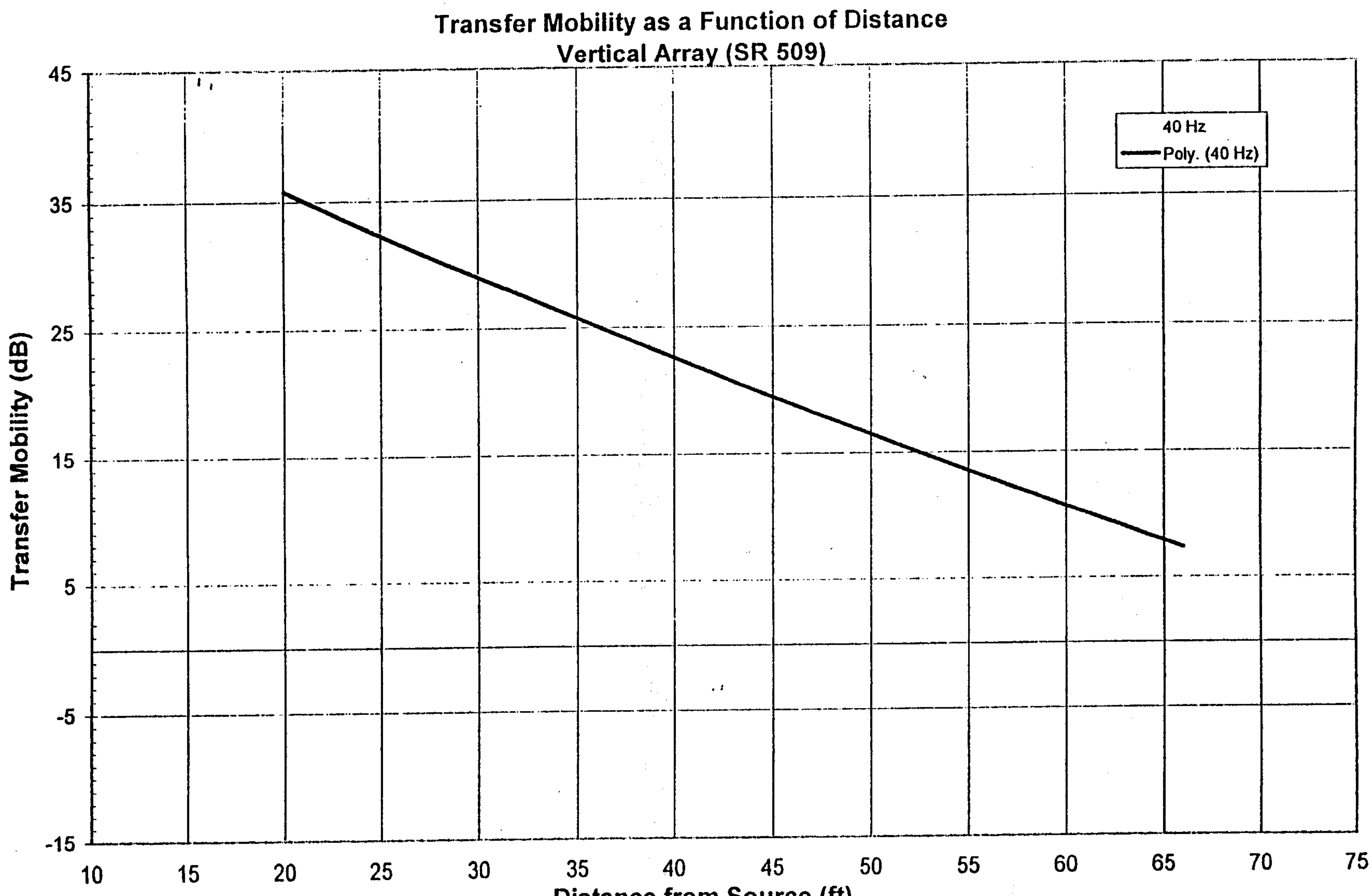
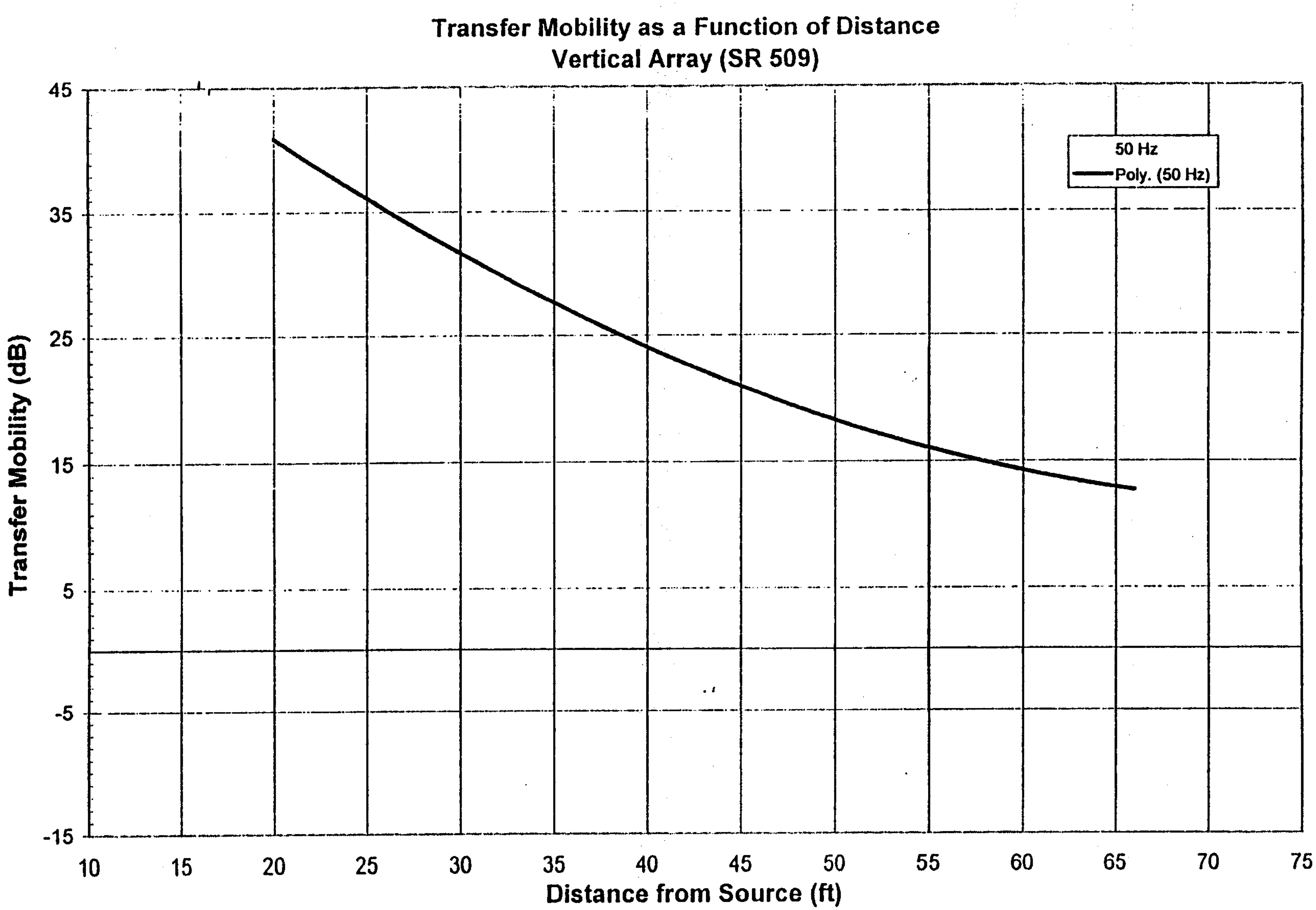

Transfer Mobility as a Function of Distance
Vertical Array (SR 509)
40 Hz
Poly. (40 Hz)
Transfer Mobility (dB)
45
35
25
15
5
-5
-15
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Distance from Source (ft)

Figure 6.



Transfer Mobility as a Function of Distance
Vertical Array (SR 509)
45
35
25
15
5
-5
-15
Transfer Mobility (dB)
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Distance from Source (ft)
50 Hz
Poly. (50 Hz)

Figure 7.

Transfer Mobility as a Function of Distance
Vertical Array (SR 509)

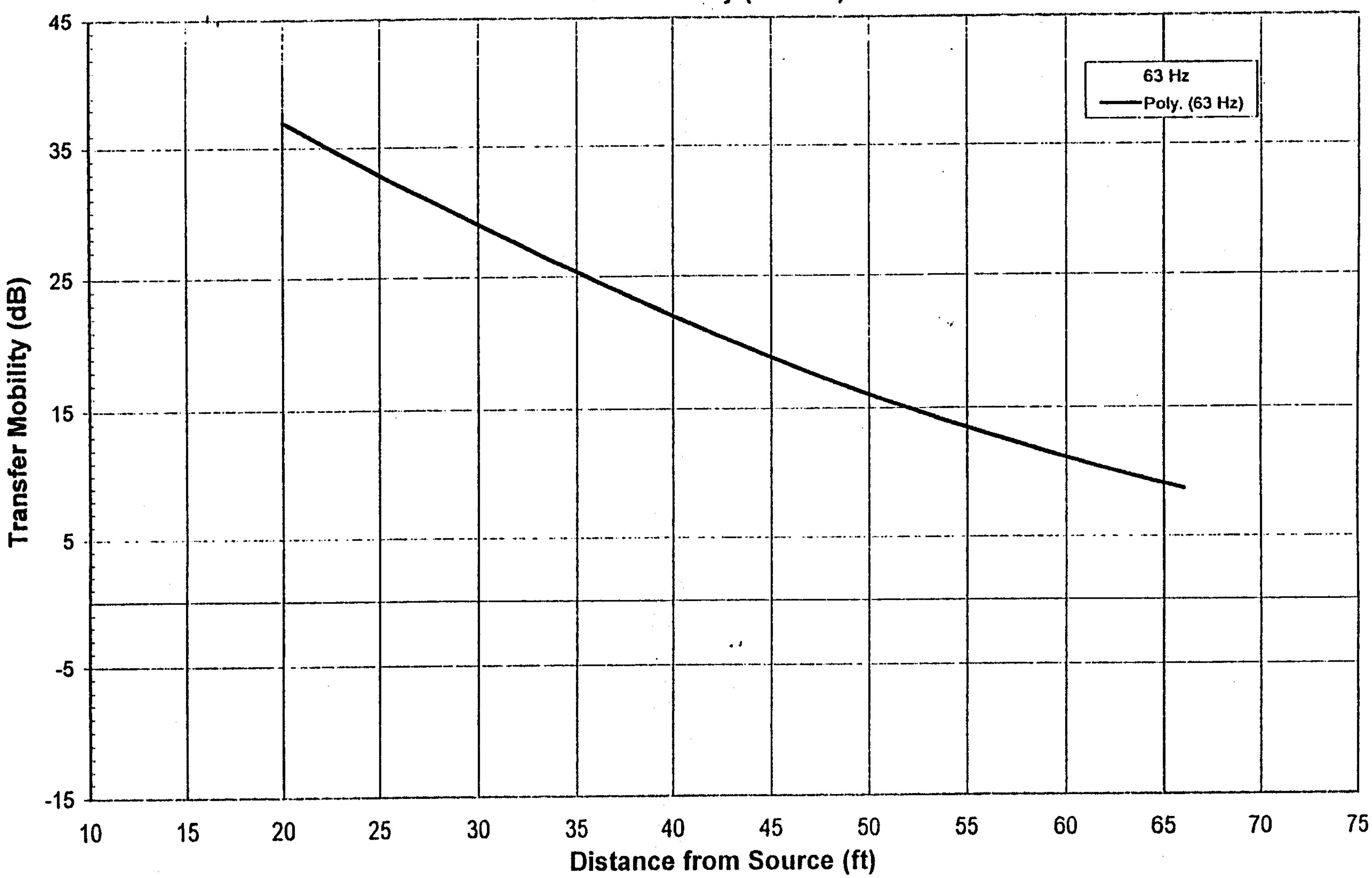
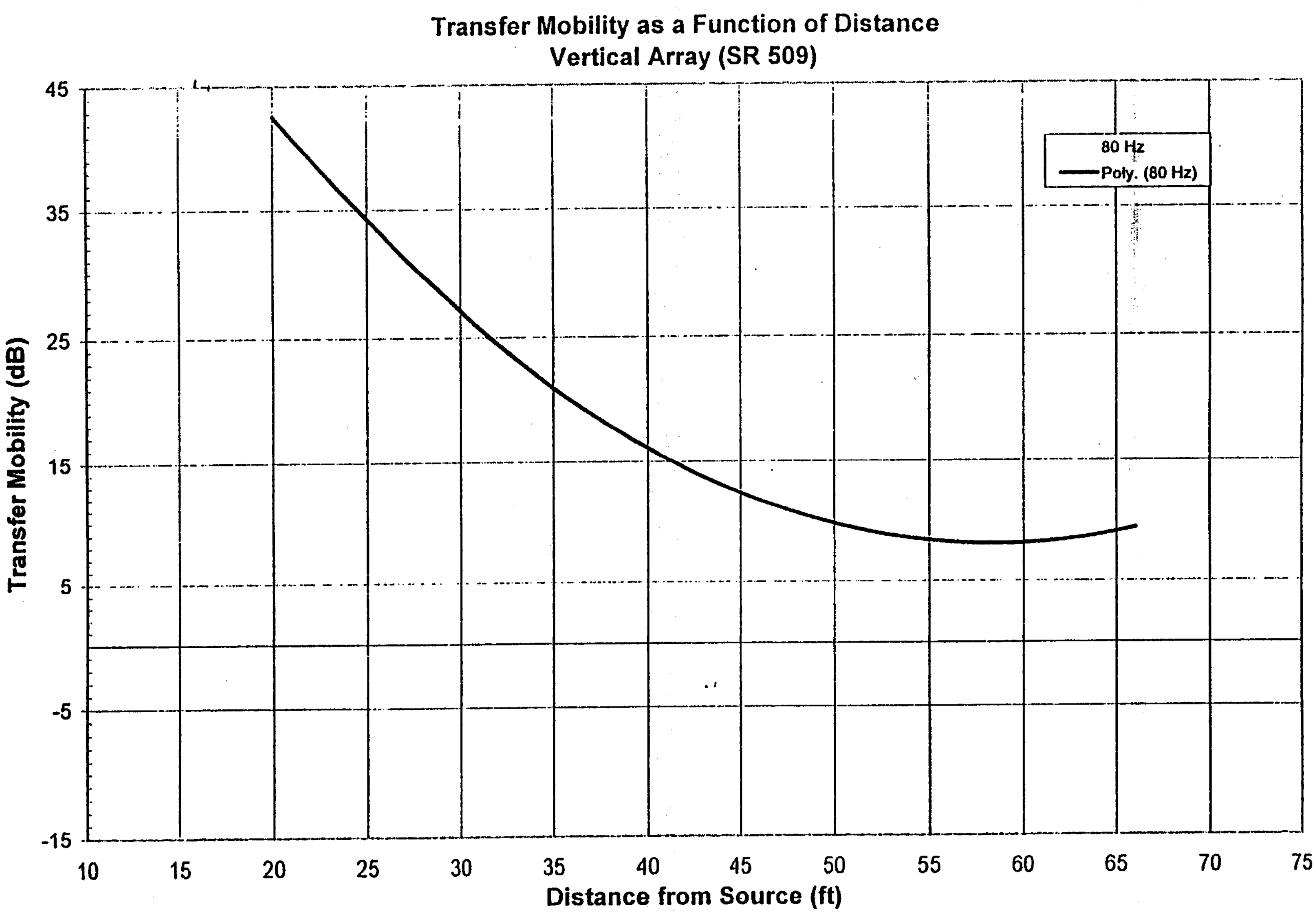
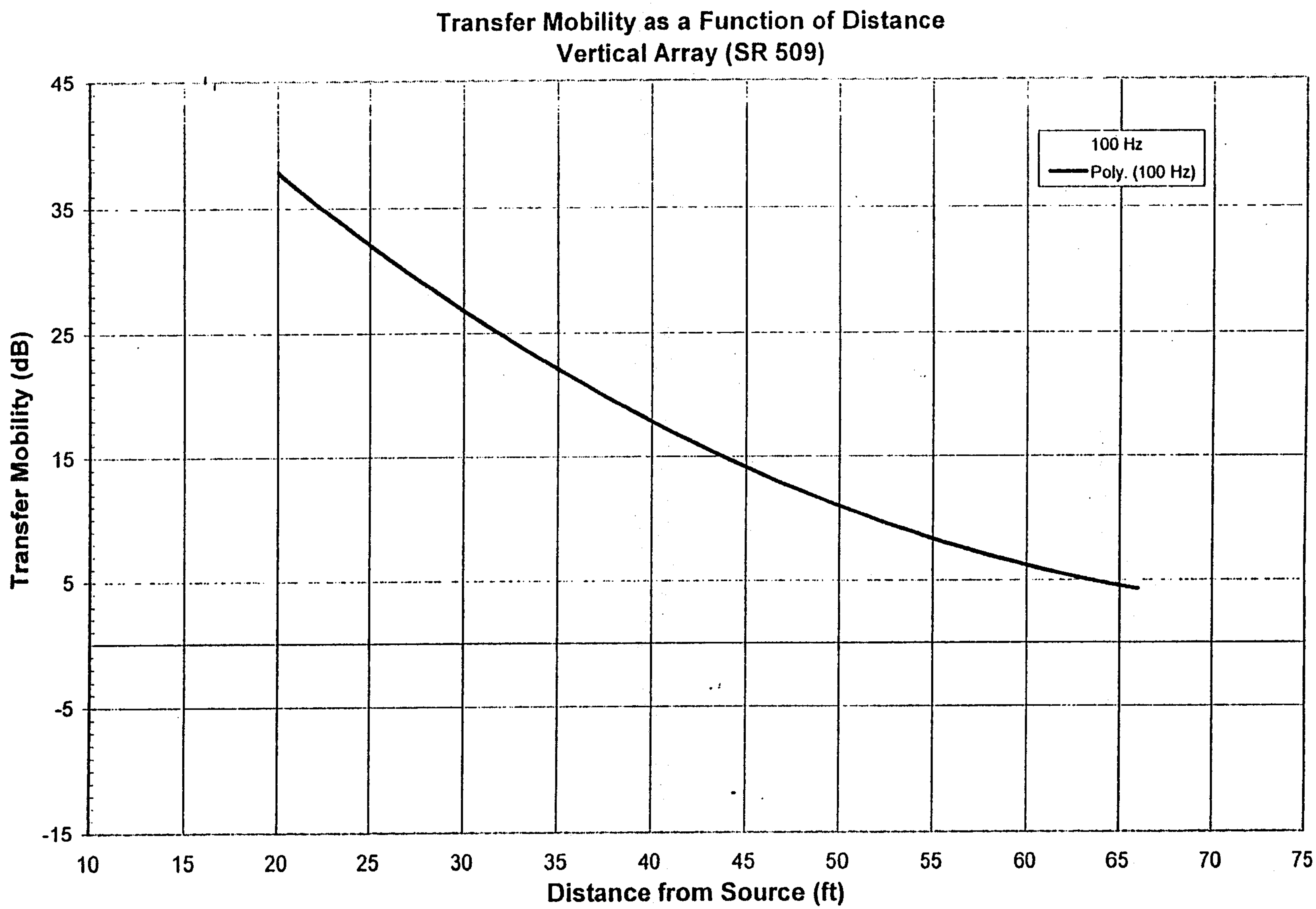


Figure 8.


Transfer Mobility as a Function of Distance
Vertical Array (SR 509)
80 Hz
Poly. (80 Hz)
Transfer Mobility (dB)
45
35
25
15
5
-5
-15
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Distance from Source (ft)
Figure 9.



Transfer Mobility as a Function of Distance
Vertical Array (SR 509)
Transfer Mobility (dB)
45
35
25
15
5
-5
-15
10
15
20
25
30
35
40
45
50
55
60
65
70
75
100 Hz
Poly. (100 Hz)
Distance from Source (ft)

Figure 10.

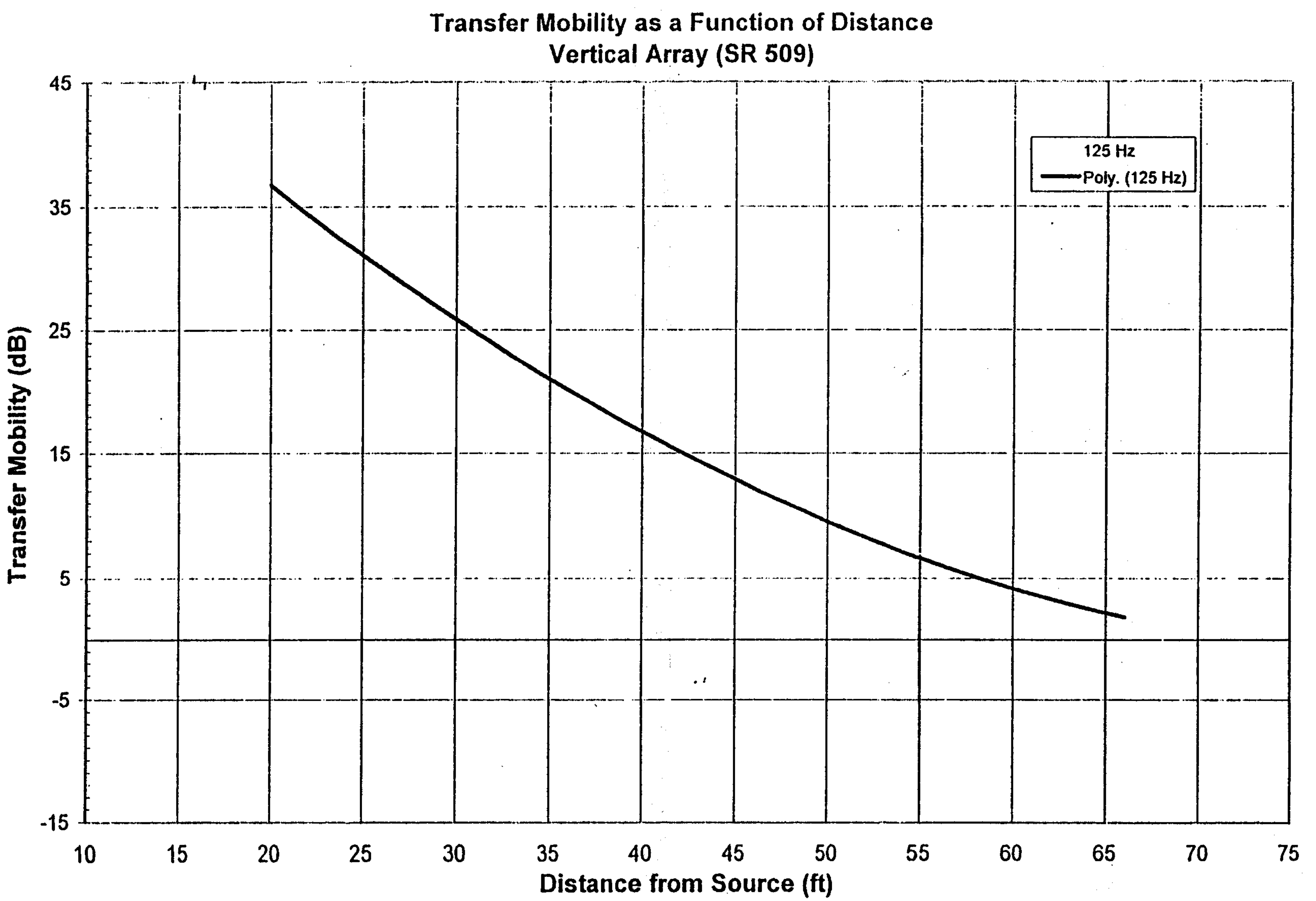

Transfer Mobility as a Function of Distance
Vertical Array (SR 509)
125 Hz
Poly. (125 Hz)
45
35
25
15
5
-5
-15
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Transfer Mobility (dB)
Distance from Source (ft)

Figure 11.

Transfer Mobility as a Function of Distance
Vertical Array (SR 509)

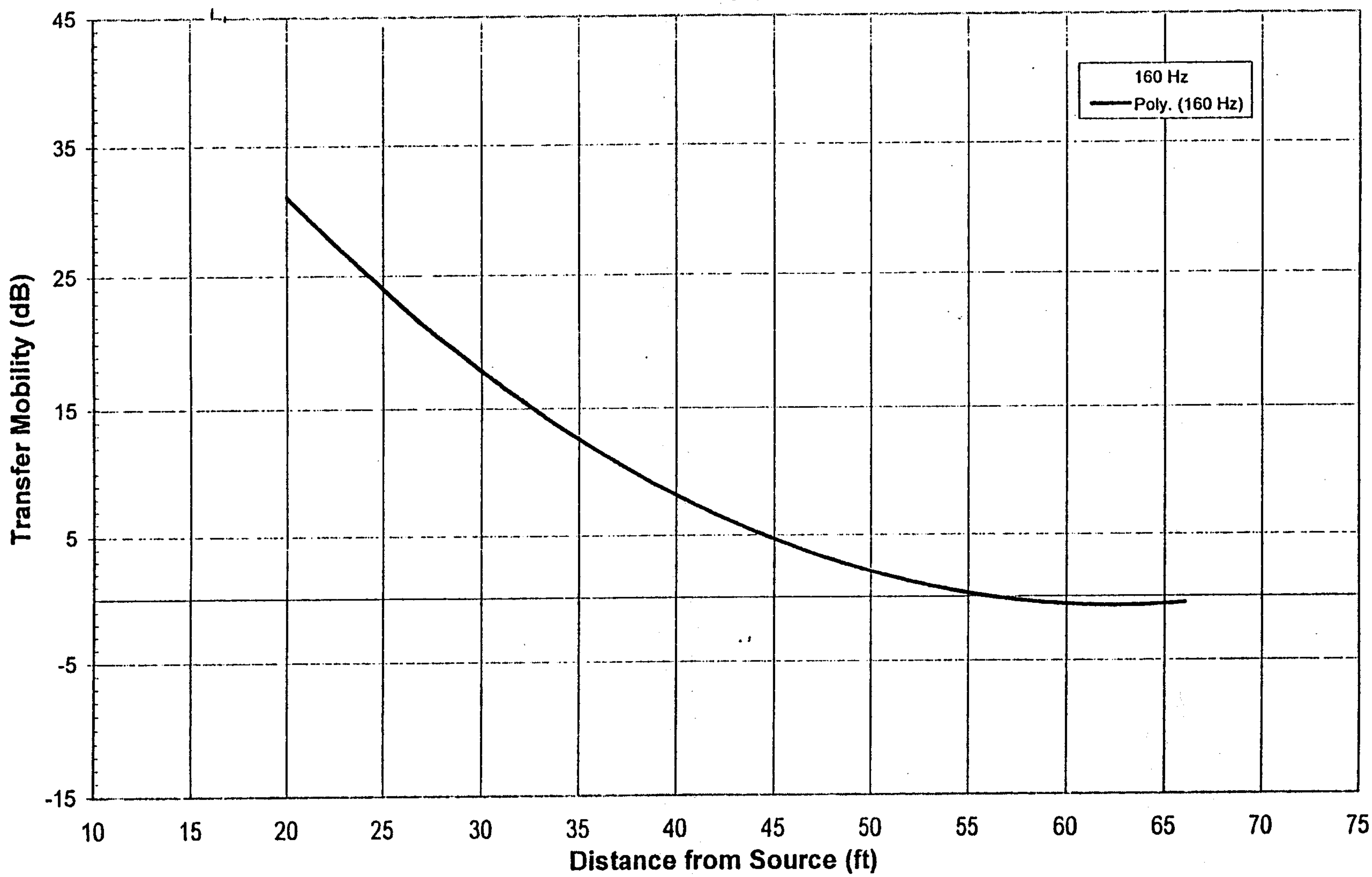


Figure 12.

Transfer Mobility as a Function of Distance
Vertical Array (SR 509)

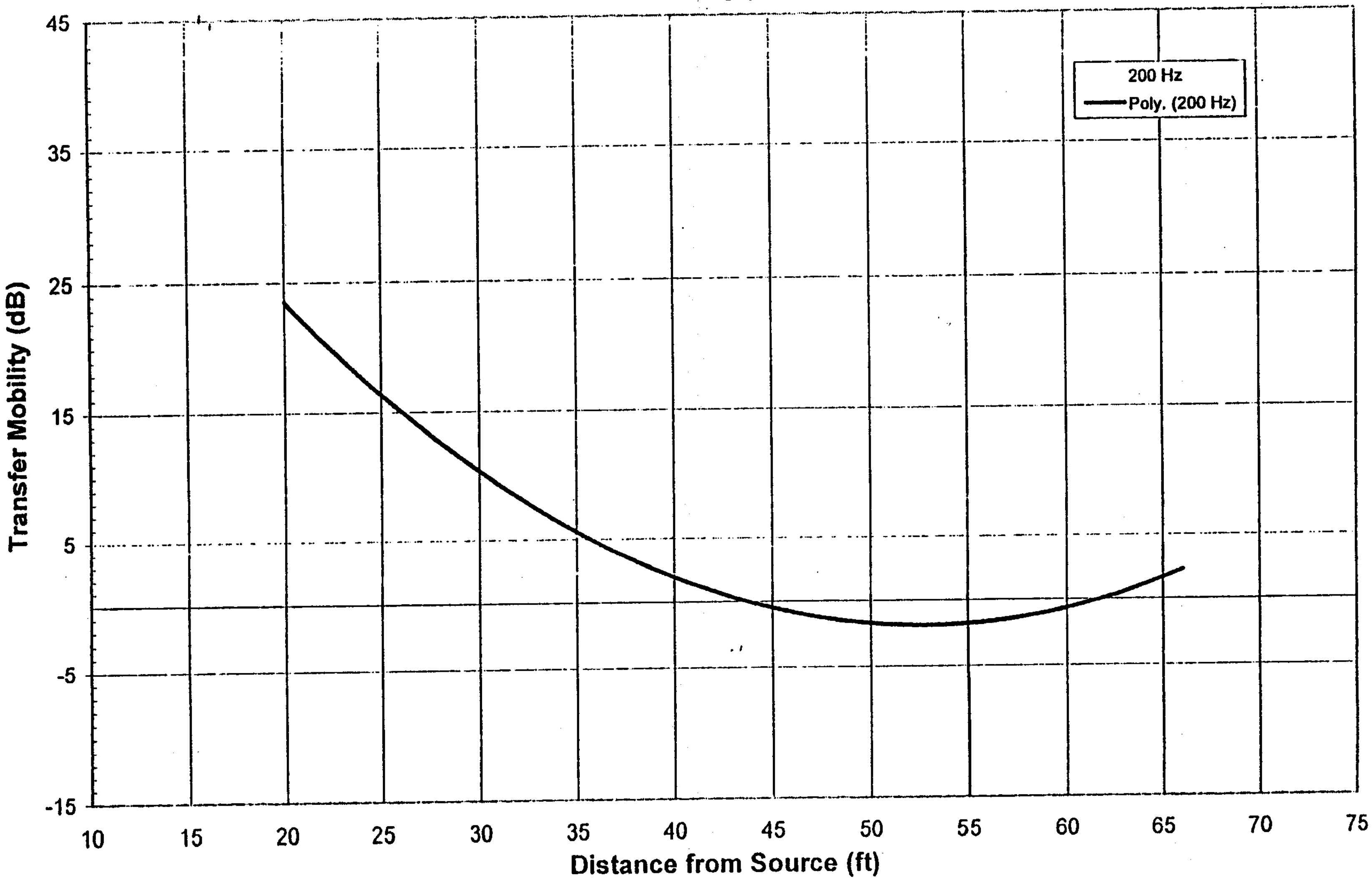
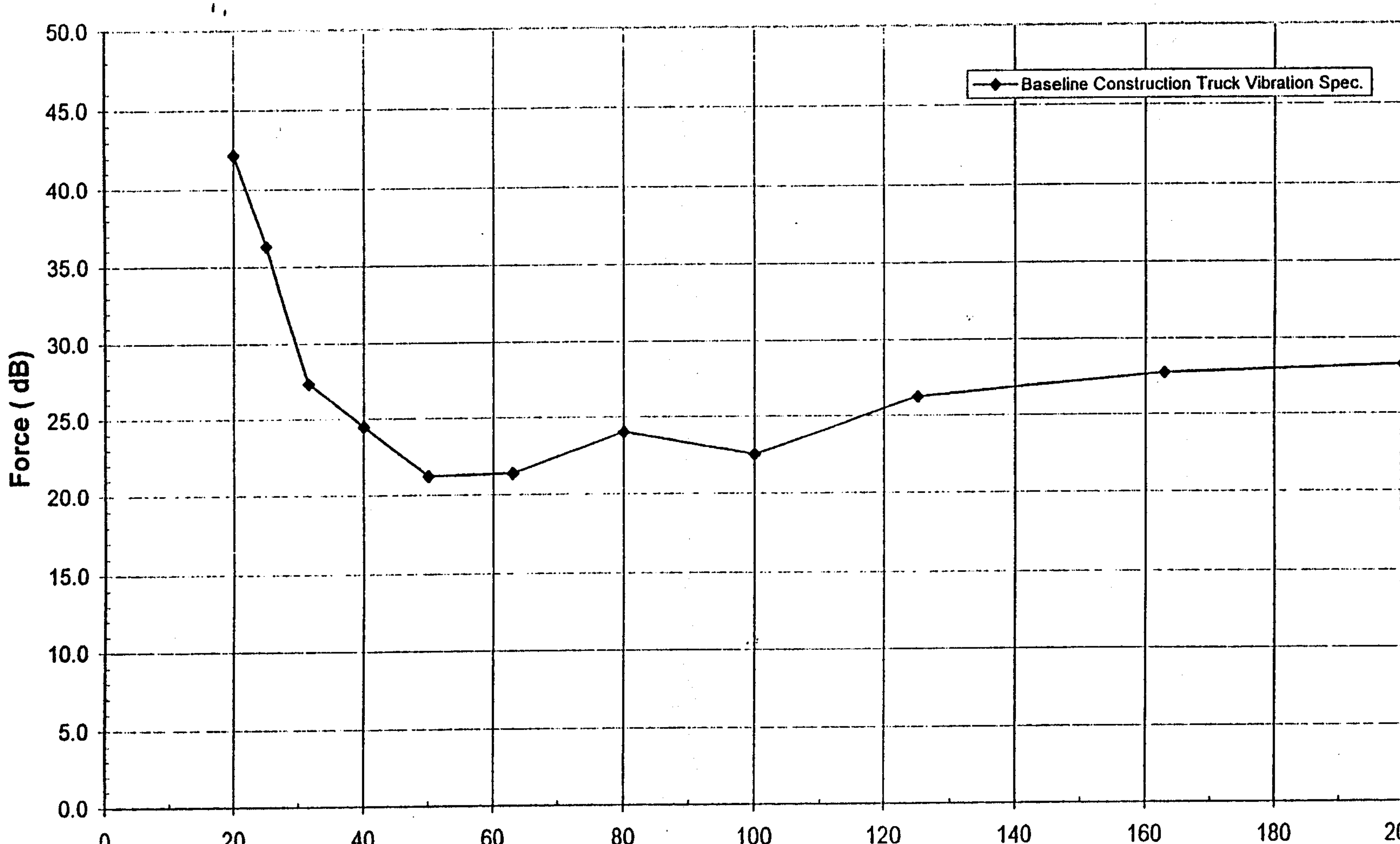


Figure 13.

Baseline Force for Construction Truck Traffic



Frequency (Hz)

Figure 14.

Predicted Velocity Level
Nearest Residence 37 Feet from Access Road

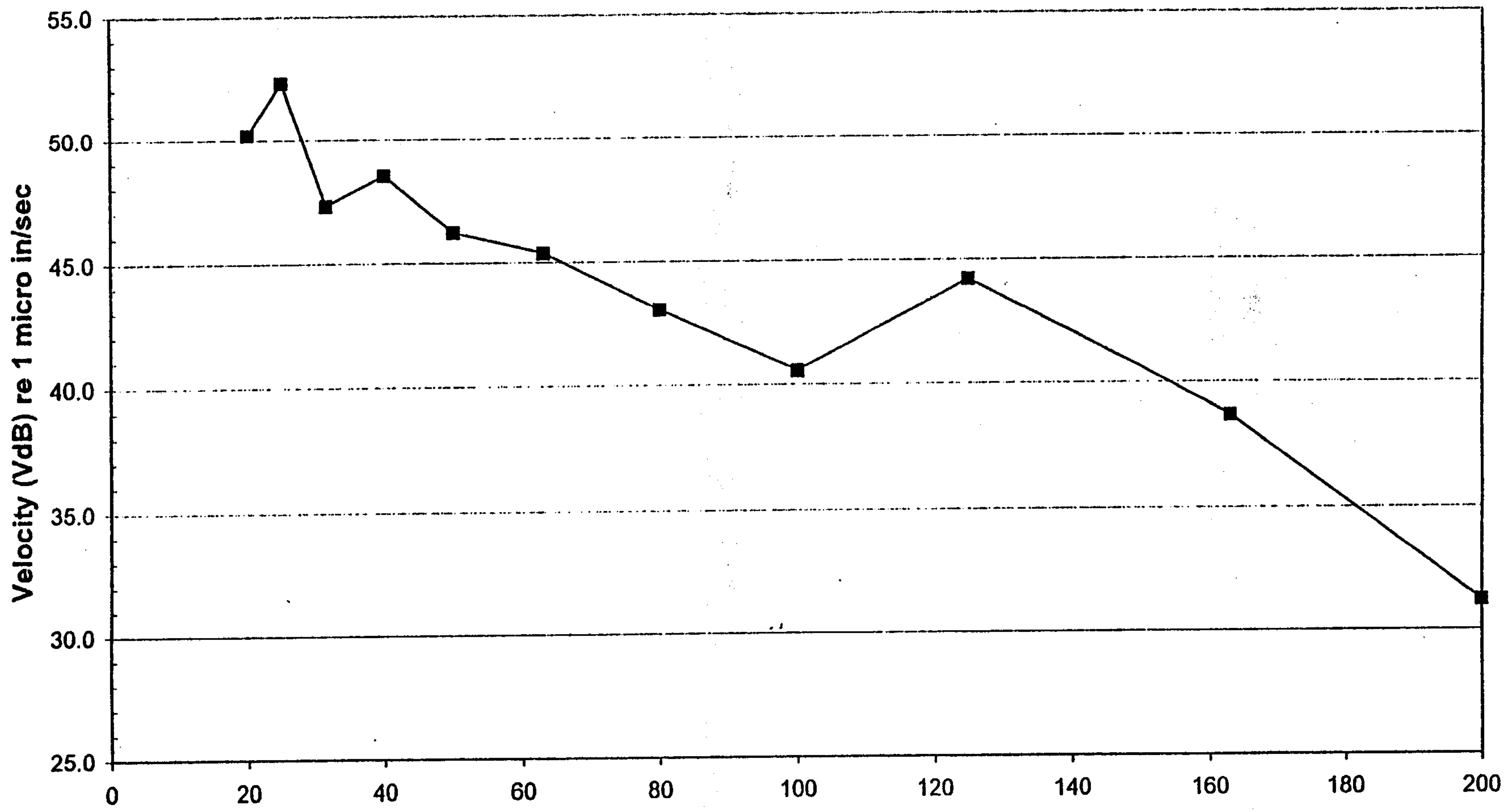


Figure 15.

K

Port of Seattle

Addendum to the Final Supplemental Environmental Impact Statement For the Proposed Master Plan Update Development Actions At Seattle-Tacoma International Airport and SEPA Environmental Checklist

Auburn Wetland Mitigation Project

May 5, 2000

Addendum to the Final Supplemental Environmental Impact Statement For the Proposed Master Plan Update Development Actions And SEPA Environmental Checklist for the Auburn Wetland Mitigation Project

This document is a State Environmental Policy Act (SEPA) Addendum to the *Final Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport* issued May 13, 1997 by the Federal Aviation Administration (FAA) and the Port of Seattle, and the *SEPA Environmental Checklist for the Auburn Wetland Mitigation Project* issued August 1998. This addendum has been prepared in accordance with Chapter 197-11-625 of the Washington Administrative Code, and Port of Seattle SEPA Policies and Procedures Resolution No. 3028. The purpose of this document is to describe and analyze the modification to the Master Plan Update Development Actions for mitigating proposed wetland fill, and to modify the SEPA environmental checklist. These modifications do not substantially change the analysis of significant impacts described in the *Final Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport or the Environmental Checklist for the Auburn Wetland Mitigation Project.*

PROJECT NAME

Port of Seattle Master Plan Update Improvement Actions at Seattle-Tacoma International Airport – Auburn Wetland Mitigation Project (POS SEPA No. 00-07)

EXISTING ENVIRONMENTAL DOCUMENTS

Final Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport, U.S. Department of Transportation (USDOT), FAA, and Port of Seattle, February 1996

Final Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport, US DOT, FAA, and Port of Seattle, May 1997

SEPA Environmental Checklist for the Port of Seattle Master Plan Improvements Wetland Mitigation Project, Port of Seattle, August 1998

Natural Resource Mitigation Plan Master Plan Update Improvements Seattle-Tacoma International Airport, Port of Seattle and Parametrix, August 1999

SEPA Addendum to the Final Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport, FAA and Port of Seattle, January 24, 2000

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PROJECT DESCRIPTION

As part of the Master Plan Update Development Actions at Seattle-Tacoma International Airport (STIA), wetlands will be filled or impacted during construction of new facilities. New facilities include the Third Runway, the South Aviation Support Area facilities, and two Runway Safety Areas. In addition, some wetlands will be filled during work in the borrow areas and for a haul road. Construction will take place over approximately 700 acres and result in filling approximately 18.33 acres of wetlands. The wetland fill will affect approximately 8.27 acres of forested wetlands, 2.92 acres of shrub wetlands, and 7.14 acres of emergent wetlands (refer to the January 24, 2000 SEPA Addendum identified above for additional information on wetland impacts at STIA).

To compensate for the unavoidable loss of wetland area and wildlife function of wetlands, a wetland mitigation project is proposed for development on an approximately 67-acre parcel near the Green River in the City of Auburn. The proposed activities include the creation and enhancement of wetland areas, development of avian wildlife habitat, and increasing flood storage capacity. The project will create approximately 34 acres of new wetland and enhance six acres of existing wetland, for a total of 40 acres of wetland area on the mitigation site.

Since the issuance of the SEPA environmental checklist in 1998 the design of the mitigation project has increased in size and advanced from a conceptual plan to a 60 percent design. Therefore, the following discussion is presented to provide a more detailed explanation of the current proposal.

PROJECT GOALS

The wetland mitigation goals and objectives, identified below, are based on overall wetland functions and acreage lost as a result of implementing the proposed Master Plan Update improvements at STIA.

Goals

The overall wetland mitigation goal is to compensate for unavoidable wetland impacts by in-kind replacement of habitat. This would be accomplished by creating a diverse replacement habitat with a net gain in functional value and acreage. The general mitigation goals are as follows:

1. Achieve no net loss of wetland acreage by establishing a diverse, in-kind replacement habitat with forested, shrub, and emergent wetland classes.
2. Provide in-kind wildlife habitat replacement outside the 10,000-ft aircraft operations safety radius by creating a large wetland ecosystem off-site with connection to other habitat corridors.
3. Provide in-kind wildlife habitat replacement while maximizing public safety and minimizing wildlife hazards to aircraft.
4. Enhance the existing emergent wetland.

The proposed compensatory mitigation actions at the Auburn site are summarized below in Table 1.

Table 1. **Summary of wetland impacts and off-site compensatory design objectives for the proposed Master Plan Update improvements.**

Project Impact	Compensatory Design Objectives	Potential Acreage Provided	Compensation Ratio
Fill 8.27 acres of forested wetland and loss of associated wildlife habitat.	Provide in-kind replacement of forested wetland vegetation cover and increase overall wildlife habitat function.	25.96 acres of forested wetland	3.4:1
	Enhance existing emergent wetlands to create native forested habitat.	6.00[a] acres of enhanced forested wetland	NA
Fill 2.92 acres of shrub wetland and loss of associated wildlife habitat.	Provide in-kind replacement of shrub wetland vegetation cover and increase overall wildlife habitat function.	3.40 acres of shrub wetland	1.1:1
Fill 7.14 acres of emergent wetland and loss of associated wildlife habitat.	Provide functional replacement of emergent wetlands and increase wildlife habitat function.	5.17 acres of emergent wetland	0.68:1[b]
	Provide pockets of open-water habitat.	0.03 acre of open-water wetland	NA
	Protect the wetland from potential off-site disturbance and provide enhanced upland wildlife habitat.	Approximately 15.00 acres of forested upland buffer	NA

NA = Not applicable.

[a] Enhancement of this wetland is assumed to generate two acres of mitigation credit in the 3.4:1 ratio above.

[b] Most emergent wetland communities impacted from Master Plan Update improvement projects consist of lawn, farmland, or other disturbed plant communities. Historically, these wetlands would have been forest or shrub wetland communities, but due to clearing and development, the forested or shrub components were removed. Therefore, replacement ratios for emergent communities are reduced, and increased for higher quality forested communities.

MITIGATION SITE PLAN

The mitigation site plan and general construction methods used to achieve the design objectives are discussed below. This section also contains the evaluation methods and justifications for establishing the wetland water regime, the grading plan, vegetation plan, and monitoring and contingency plans for wetland development.

<u>Water Regime</u>

An adequate water regime is the most critical factor required to establish the desired forest, shrub, and emergent wetland vegetation classes on the mitigation site. The duration and amount of standing water and soil saturation control the wetland community types present on-site. Knowledge of the hydrology requirements of natural Puget Sound wetland communities and over three years of groundwater monitoring on the site indicate that it is feasible to create the hydrologic conditions necessary to sustain a diverse wetland habitat with several plant community types.

These hydrologic conditions would be attained by excavating basins in the mitigation area to approximately two to eight ft below the ground surface to intercept the seasonally high or permanent groundwater table. This would result in typical ground elevations ranging between 45 to

37 ft, which would allow a range of wetland plant communities to persist on soils with varying degrees of flooding or saturation. Excavation in some limited areas will be a maximum of 12 ft. The approximate elevations, hydrologic regime, and wetland vegetation classes proposed for the mitigation are presented in Table 2. The relationship of the proposed wetland vegetation zones to anticipated water levels and site topography is shown in Figure 1.

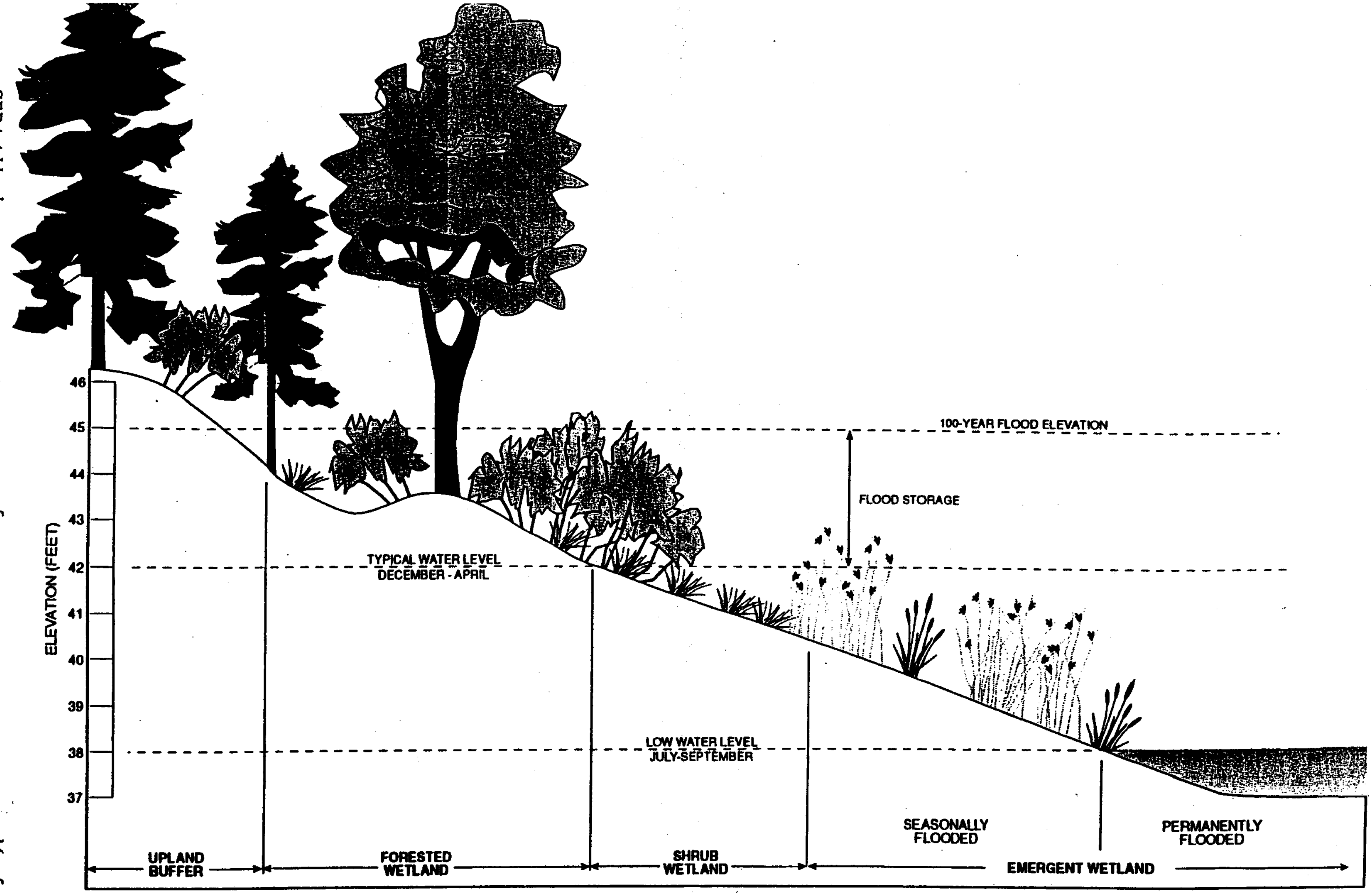
The proposed wetland would become part of the 100-year floodplain of Green River backwater areas (Figure 2) by constructing a vegetated swale from existing ditches located along S. 277th Street to the northwest corner of the wetland. The bottom elevation of this ditch would be at 41 ft.

Table 2. Proposed wetland classes, elevation ranges, and hydrologic regimes.

Proposed Wetland Class	Proposed Elevation Range (ft)	Anticipated Hydrologic Regime
Forested Wetland	46 to 42	Seasonally saturated soil during years of typical rainfall. During a 10-year flood [a], flooding of up to three ft for up to nine consecutive days would occur. Soil would be unsaturated to at least 18 inches below the ground surface during most summer and fall periods.
Shrub Wetland	42 to 41	Seasonally saturated or flooded with up to one ft of water during years of average rainfall. During a 10-year flood, water could be up to four ft deep for nine consecutive days. Soil would generally be saturated within 12 inches of the ground surface during most of the summer and early fall.
Persistent Emergent	41 to 38	Seasonally flooded with up to four ft of water during years of average rainfall. The water table would be at or within six inches of the ground surface during late summer and early fall.
Open Water/Unvegetated	below 38	Permanently to semi-permanently flooded during years of average rainfall. Surface water would generally be six to 24 inches deep during late summer and early fall, but may not be present during years of extremely low rainfall.

[a] Because of flood control management of the Green River, the peak flow for 10-year and 100-year flood events are equivalent.

Two adjustable weirs are proposed in the northwestern portion of the site to control water levels for optimum plant establishment. These weirs will provide flexibility in managing site hydrology. The 100-year flood event would increase water levels in the wetland by up to three ft. The frequency of inundation due to Green River flooding is low (Figure 3), with the greatest probability occurring during late fall through mid-winter. All plants proposed for the wetland area are adapted to a fluctuating water table and periodic inundation, which is common during winter months in floodplain wetlands of western Washington. Therefore, vegetation "die-back" as a result of flooding should not occur.



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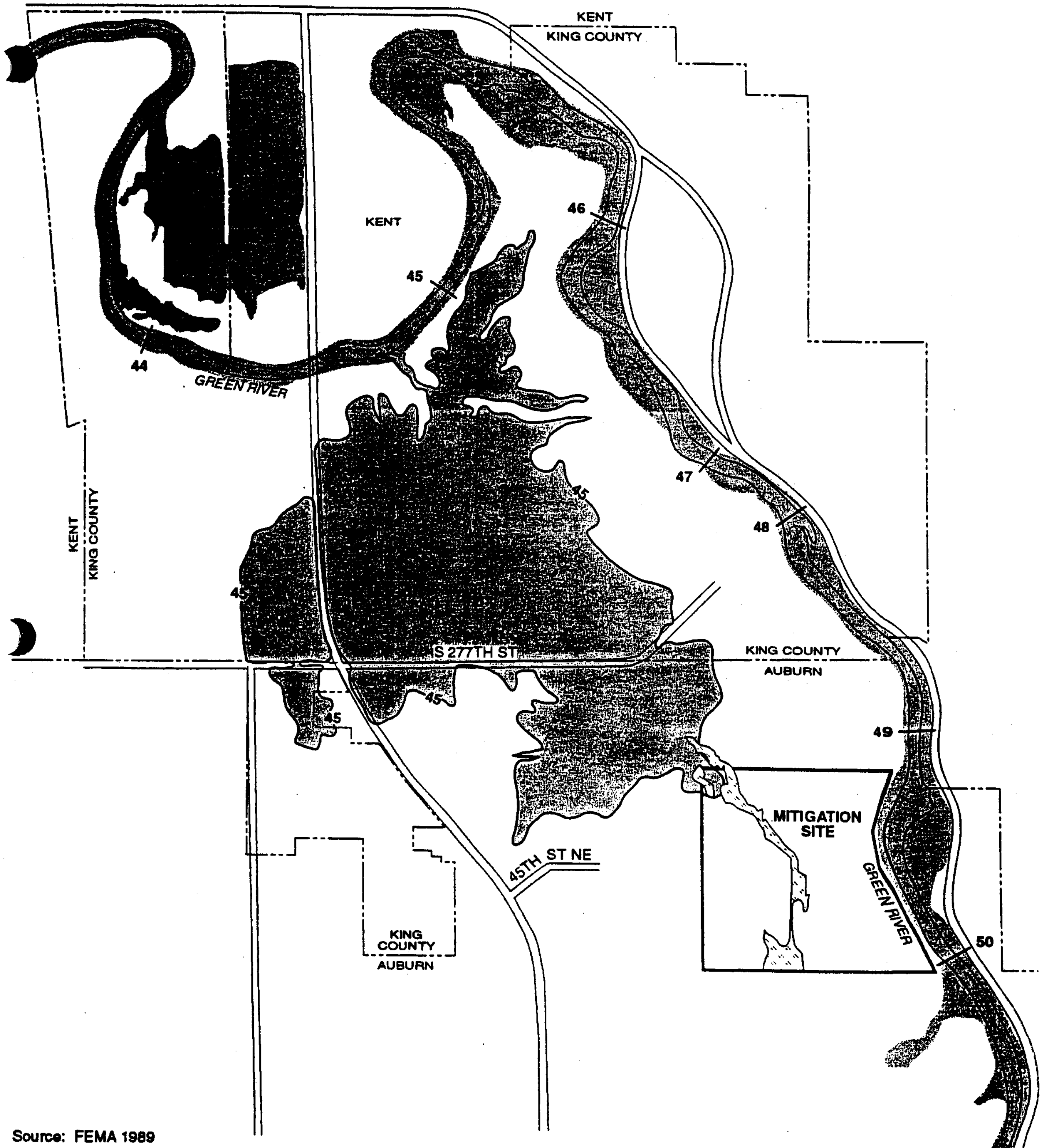
Data Compiled by Parametrix

Figure 1
Relationship of Seasonal Water Level Variations and Soil Surface Elevations to Proposed Wetland Vegetation Classes



Source: FEMA 1989

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Figure 2
100-Year Floodplains On and Near the Proposed Wetland Mitigation Site

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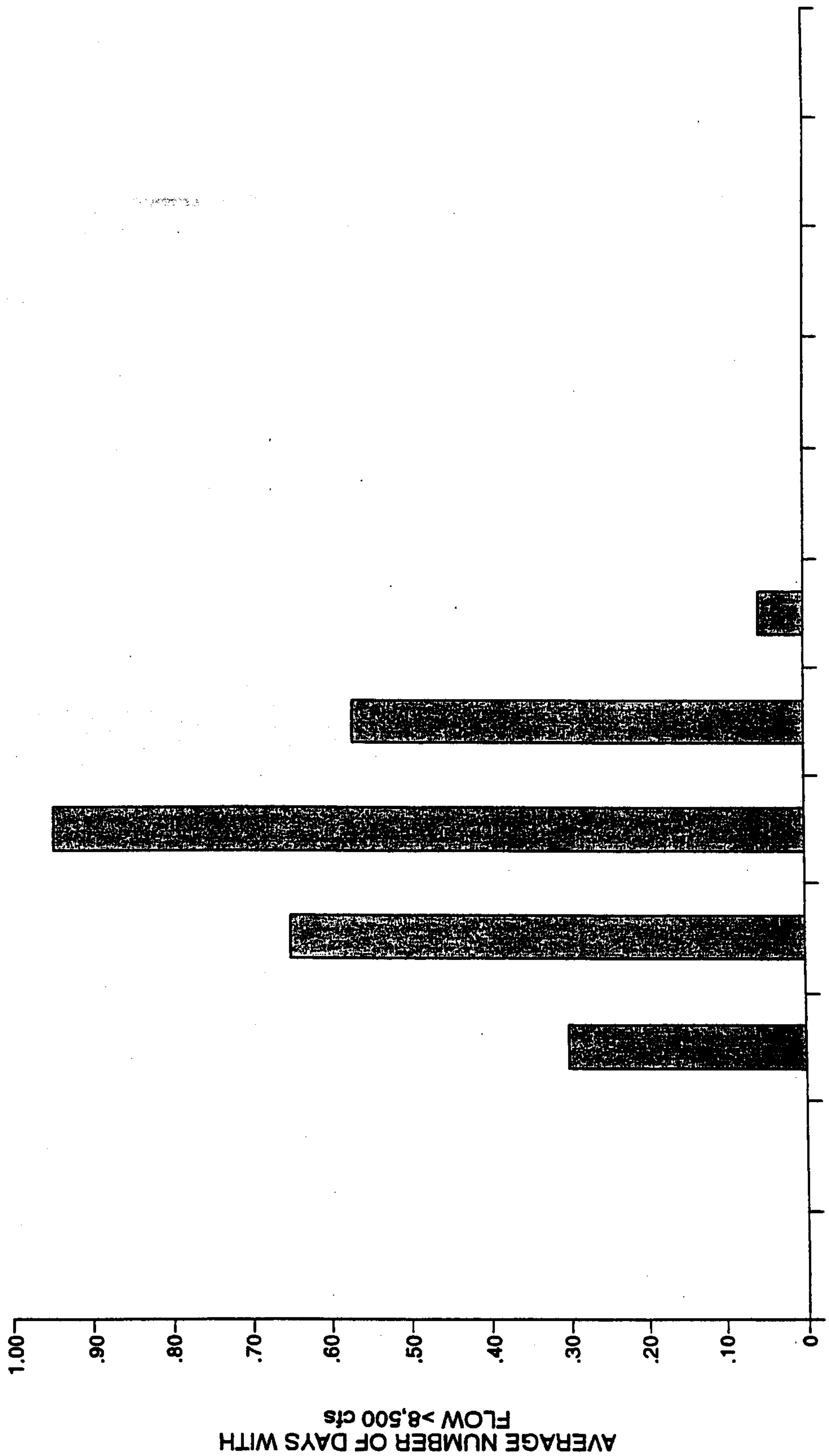

USGS 1996

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Figure 3
Green River Flood Frequency by Month
(Based on 1960-1996 Data for Auburn)

Grading

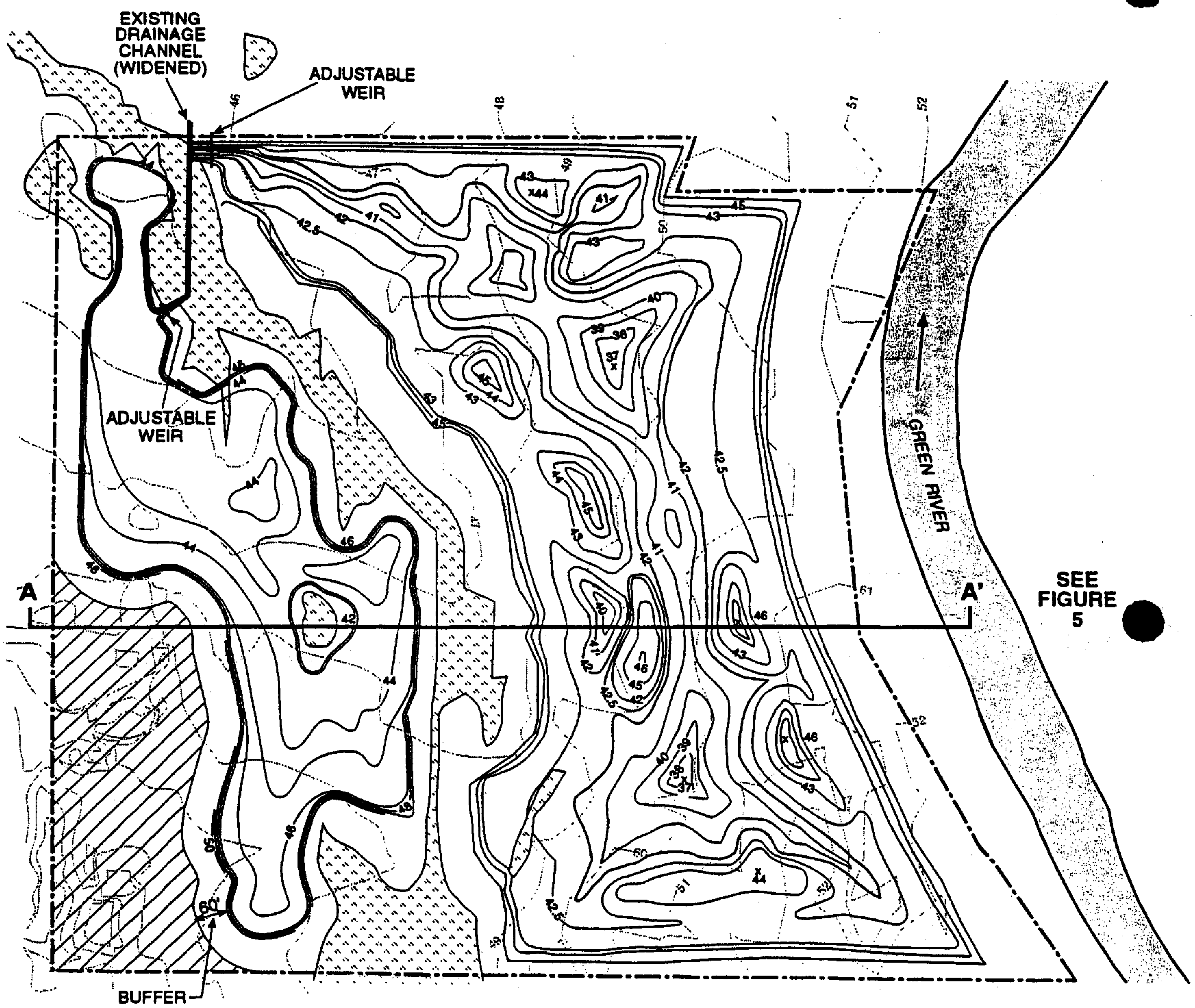
The mitigation design objectives would be achieved by excavating and grading two basins on either side of the existing emergent wetland to intercept the water table (Figures 1, 4, and 5). The proposed grading involves three earthwork construction steps. First, the top 12 inches of soil would be excavated and removed from the site. This soil contains the roots and rhizomes of pasture grasses and other undesirable invasive species such as reed canarygrass. Two to eight ft of underlying sandy silt-loam soils would be excavated to form two basins, with approximately one-third of the soil stockpiled for reuse on-site (two-thirds available for off-site use or disposal). The last grading step is to replace the stockpiled soil (blended with composted organic matter, see next section for description) which would be graded at varying thicknesses to provide the appropriate rooting depth and zones of saturation for each of the desired wetland classes.

The proposed grading would affect about 0.29 acre of the existing emergent wetland; however, all of the existing wetland depression will be replaced by the created wetland, and no net loss of wetland area will result. In addition, approximately 0.43 acre of wetland (0.14 acre on-site and 0.29 acre off-site) will be used as a temporary construction road. These areas will be restored and enhanced with native vegetation after construction is complete.

Surface Soil Removal: Surface soil would be removed to minimize colonization by non-native plants currently growing on the site. Excavation of 12 inches of surface soil would largely eliminate seeds, roots, and rhizomes and reduce colonization by most invasive plants. Based on a site grading area of about 40 acres (including the areas below elevation 45 ft) and removal of 12 inches of surface topsoil, the quantity of topsoil hauled off-site would be approximately 64,550 cy.

Basin Excavation and Dewatering: Approximately 440,000 cy of soil would be excavated to create the two wetland basins, with excavation depths ranging between one and 12 ft. A Shallow Perched Water Zone (0 to 20 ft deep, between elevation 50 and 30 ft), and a Primary Aquifer (20 to 60+ ft deep, between elevation 30 and -10 ft) directly underlie the site. Due to the presence of high groundwater on the site, it will be necessary to lower the groundwater level before grading activities can begin. Dewatering the site will occur prior to and concurrently with grading activities. It is estimated that in order to lower the Shallow Perched Water Zone, approximately 28 to 35 deep wells would be installed. Water would be pumped from the Primary Aquifer to allow the Shallow Perched Water Zone to drain. Excavation activities will proceed with caution, and inspections of the natural subsurface will be made. Where the perched aquifer does not readily drain, gravel drains and/or sump pumping may be required to effectively dewater the perched aquifer. All gravel drains, if used, would be sealed with a bentonite grout.

Two options are available for temporarily conveying and discharging water from the dewatering wells to the Green River. Option A would discharge water to an existing ditch system north of the site. The ditch system would convey water to the Green River about one mile north of the site. Option B would convey water through surface pipes to a temporary outfall in the Green River (Figure 6). The outfall, designed to prevent bank or stream bed erosion, would consist of a six-foot diameter by four-foot high concrete catch basin placed in the river. Dewatering discharge would be conveyed to the catch basin through a 12- to 18-inch pipe that would be anchored to the catch basin. Water from the pipe would flow into the catch basin to dissipate energy and then sheet flow over the top and sides into the river. Two to three ecology blocks may be placed around the catch basin for



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APPROXIMATE SCALE IN FEET

0 150 300

Site Boundary (Approximate)

50 Proposed Grade

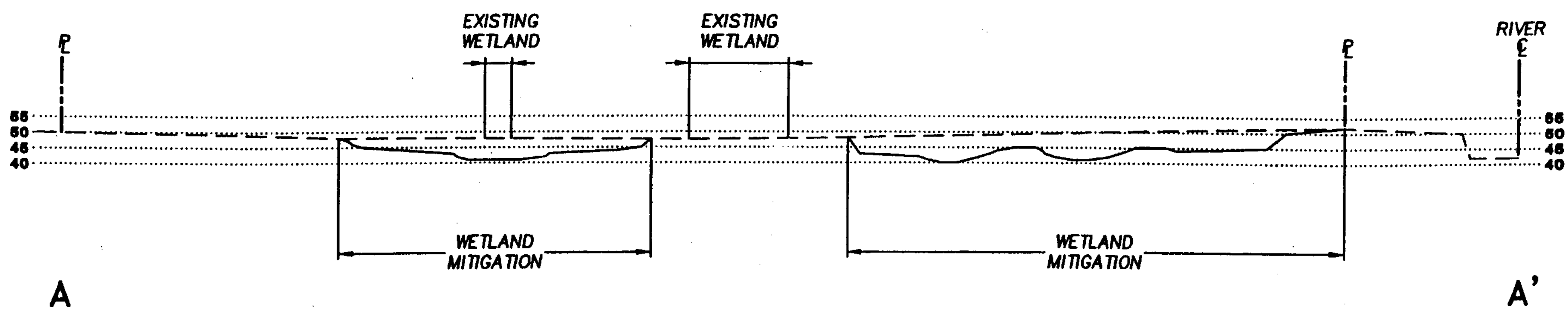
50 Existing Grade

Existing Wetland, to be enhanced

Reserve Area (for future development)

Figure 4
Wetland Mitigation Grading Plan

May 5, 2000



LEGEND:

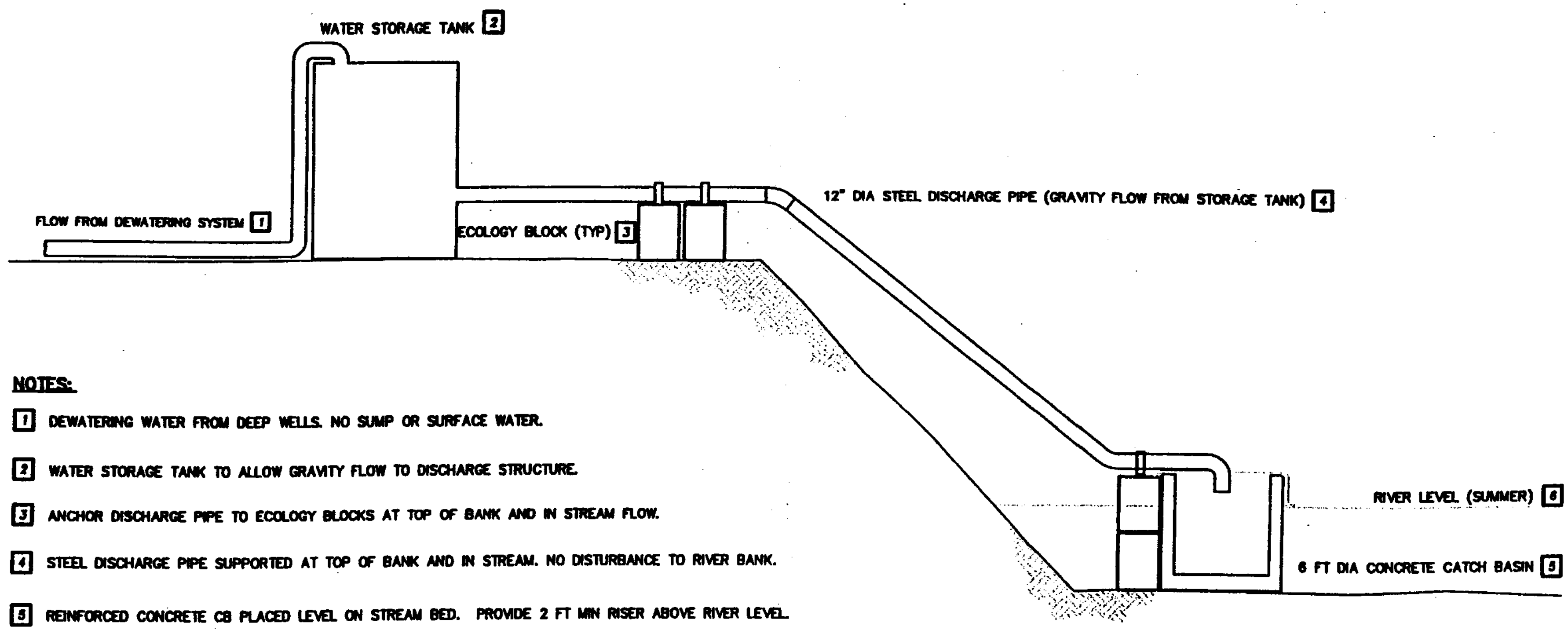
— — — — EXISTING GRADE

———— PROPOSED GRADE

FILE: 291209F5
DATE: 04/27/00

SCALE: HORIZONTAL 1"=200'
VERTICAL 1"=50'

Figure 5
Proposed Grading for Off-Site Wetland Mitigation, Cross Section



NOTES:

1. DEWATERING WATER FROM DEEP WELLS. NO SUMP OR SURFACE WATER.
2. WATER STORAGE TANK TO ALLOW GRAVITY FLOW TO DISCHARGE STRUCTURE.
3. ANCHOR DISCHARGE PIPE TO ECOLOGY BLOCKS AT TOP OF BANK AND IN STREAM FLOW.
4. STEEL DISCHARGE PIPE SUPPORTED AT TOP OF BANK AND IN STREAM. NO DISTURBANCE TO RIVER BANK.
5. REINFORCED CONCRETE CB PLACED LEVEL ON STREAM BED. PROVIDE 2 FT MIN RISER ABOVE RIVER LEVEL.
6. WATER LEVEL IN RIVER VARIES ACCORDING TO UPSTREAM CONTROL.
7. STATED DIMENSIONS ARE APPROXIMATE.

TEMPORARY DEWATERING OUTFALL
CONCEPTUAL
NOT TO SCALE

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DATE: 04/27/00

Figure 6
Temporary Dewatering Outfall
Auburn Wetland Development

stability. For security and safety purposes, a chain link fence may be secured around the discharge system. Water will be conveyed through 12- to 18-inch diameter PVC or steel pipe to a small temporary outfall.

Approximately one-third of the excavated material would be selectively stockpiled at on-site or off-site staging areas for use as backfill in the basin. The basins will generally drain to the northwest at elevations of 42 ft in the east and 43 ft in the west. The transition slope between the newly constructed wetland and the undisturbed grades around the perimeter of the mitigation area would be approximately 3H:1V (horizontal to vertical). Within the newly constructed wetland, slopes would generally be less than 10H:1V, but will be variable to promote diversity of habitats and desired hydrologic regimes.

Topsoil Replacement and Finish Grading

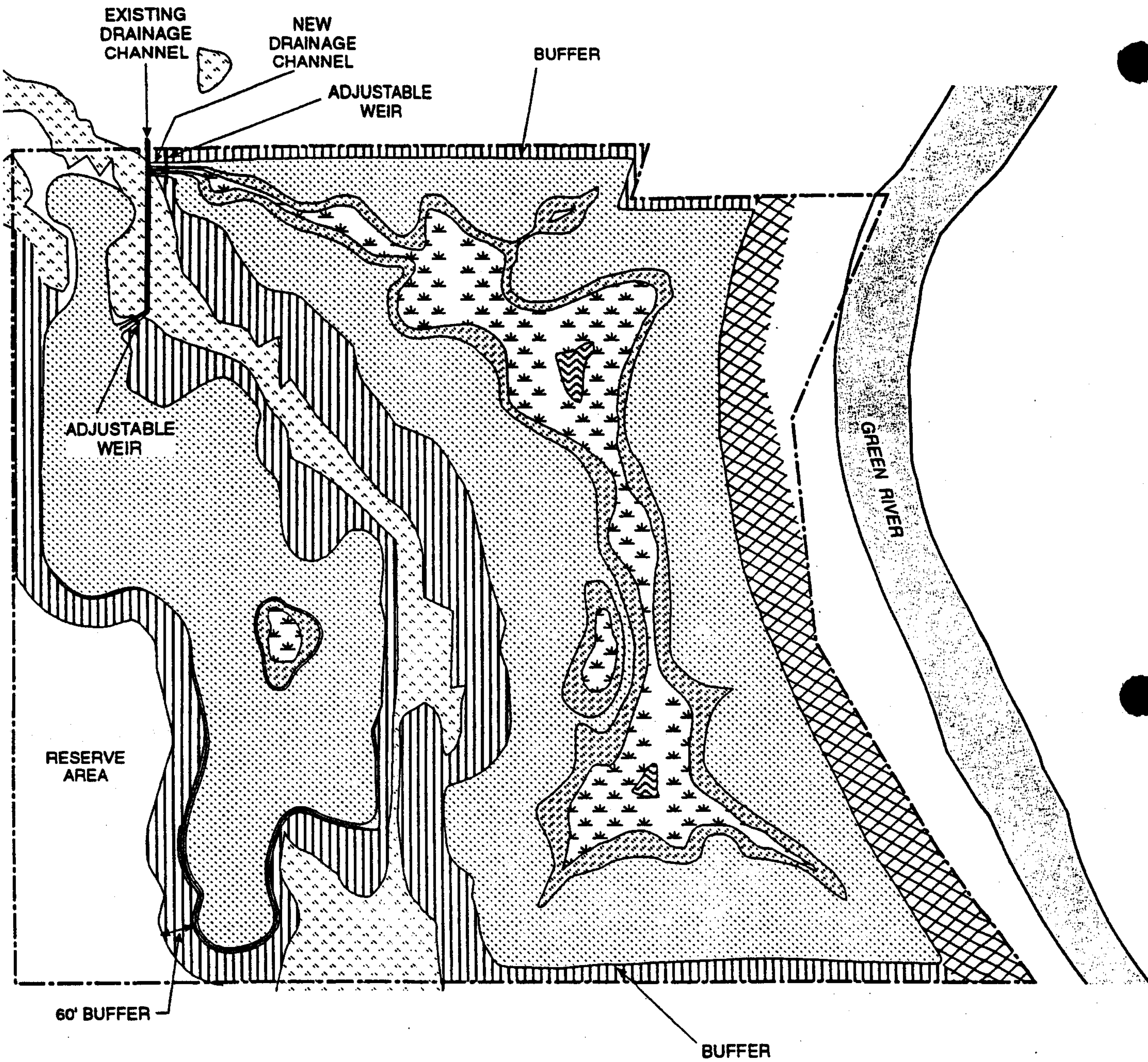
Topsoil will be processed on-site by blending the native subsoil with composted organic matter. Topsoil will be placed and graded to 12 inch thicknesses at elevations of 41 ft and above to provide the proper rooting medium and zone of saturation for the selected vegetation classes. The proposed grading plan and wetland class acreages indicate that approximately 105,000 cy of replacement soil are needed. When suitable some of the on-site sandy loam material may be used as a topsoil.

Landscape Plan

Four wetland vegetation classes would be planted in the mitigation area: forested, shrub, emergent, and open water (Figure 7). These general classes would include eight wetland plant associations (or planting zones) typical of freshwater wetlands and forested uplands in the northern Puget Sound basin (Figure 8). These plant associations are groups of plants selected to mimic naturally occurring native plant groups that may be found within a wetland class. These planting groups were selected because they are adapted to the expected typical soil moisture regimes and they tolerate the range of moisture levels expected seasonally during dry or wet years. Plant species were also selected based on their value as food sources for wildlife.

The wetland plant associations would be planted to correspond to variations in topographic and hydrologic conditions to increase habitat diversity. For instance, in portions of the east basin, a relatively abrupt edge would be graded, between elevation 40 and 42 ft, which would provide forested wetland cover and overhanging vegetation adjacent to emergent areas. At the time of planting, minor variations in the plantings may occur to account for site-specific factors and the planting season. For example, if an area is planted in late spring or summer, container-grown versus live-stake material would be used. Similarly, during late fall, winter, or early spring plantings, a greater amount of bareroot and live-stake versus container-grown material would be planted.

All shrub and forested wetland zones would be seeded with grasses such as redtop, tufted hairgrass (*Deschampsia cespitosa*), red fescue (*Festuca rubra*), and mannagrass (*Glyceria* spp.). A small percentage of small-fruited bulrush (*Scirpus microcarpus*) would be seeded in the shrub wetlands



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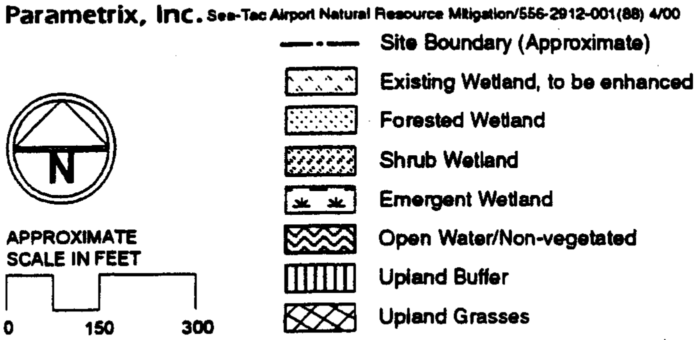
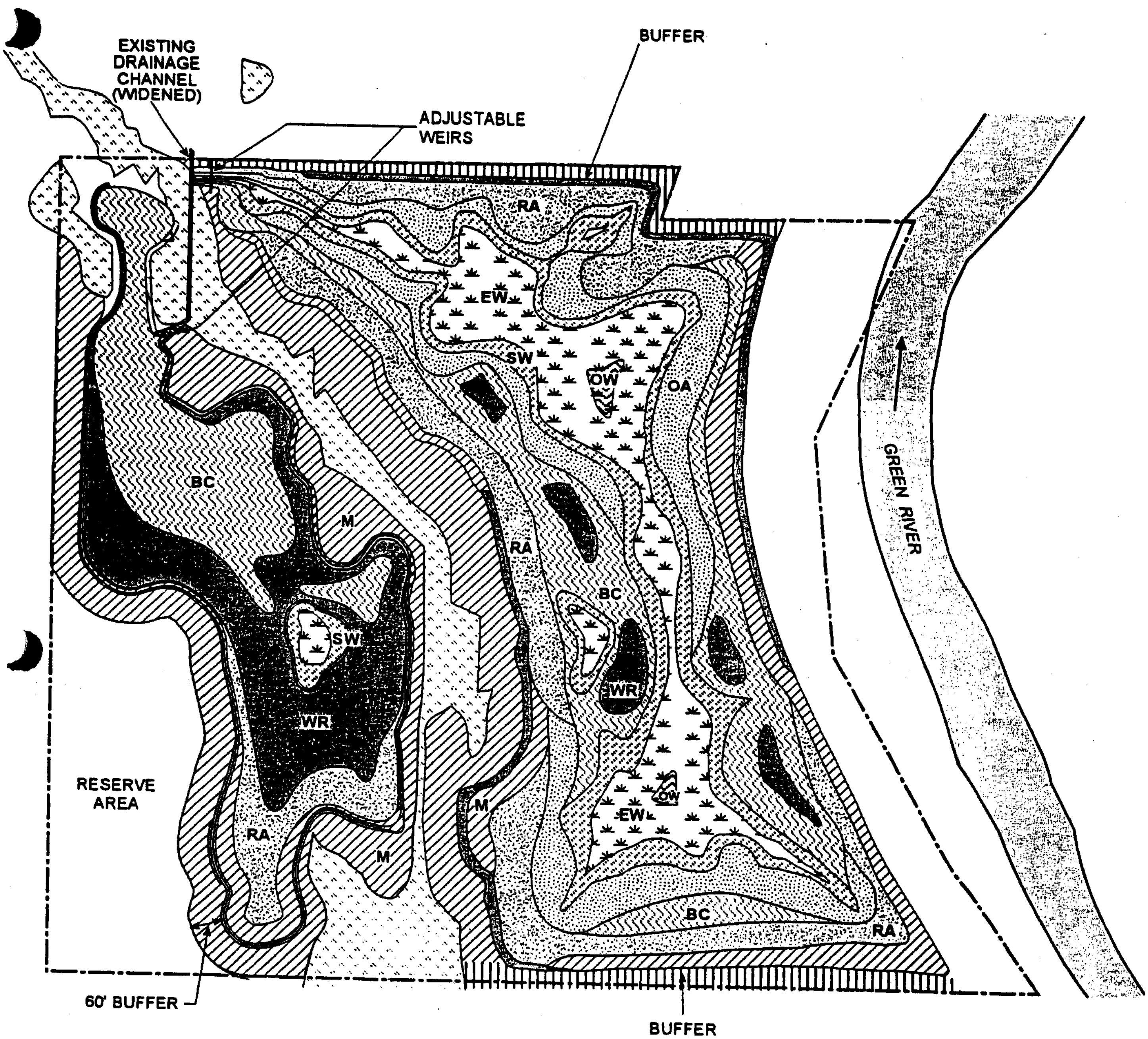


Figure 7
Proposed Wetland Classes and Buffer Vegetation Types for the Wetland Mitigation Site



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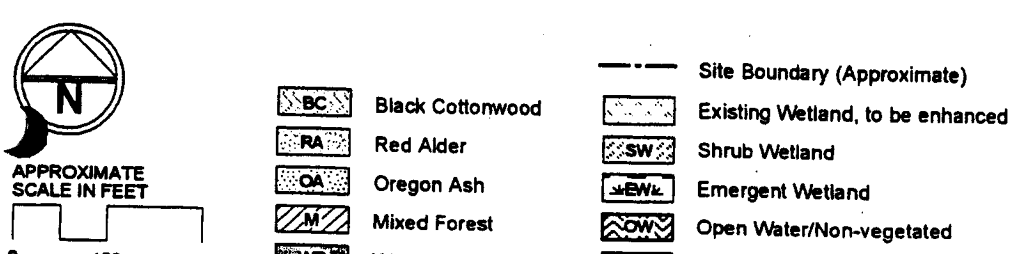

Figure 8
Proposed Plant Associations for the Wetland Mitigation Site

and the wetter portions of the forested wetlands (Table 3). It is expected that some small stands of the more shade-tolerant species, such as mannagrass and red fescue, would persist, after overstory establishment, and become part of the understory. Figure 9 depicts the expected growth pattern of the plantings as time progresses. It is anticipated that a mature forested wetland system will develop within 50 years.

It is anticipated that the majority of plant material for the wetland mitigation will be contract-grown by commercial nurseries. Nurseries must certify that plant material that is legally procured and propagated from Pacific Northwest sources. The Pacific Northwest region will be considered to be the region encompassing the Willamette Valley of Oregon, all of western Washington, and southwest British Columbia.

Table 3. Proposed seed mix for wetland and upland areas.

Scientific Name	Common Name	Indicator Status	Comments
Wetland			
Agrostis alba	Redtop	FAC	Species used would depend on the plant association and corresponding hydrologic regime. Not all listed species would be used in each plant association.
Carex obnupta	Slough sedge	OBL	
Deschampsia caespitosa	Tufted hairgrass	FACW	
Festuca rubra	Red fescue	FAC	
Glyceria spp.	Mannagrass	FACW+	
Scirpus microcarpus	Small-fruited bulrush	OBL	
Upland			
Low Grow mix	Barkley's perennial ryegrass	NA	This mix would be applied in the upland buffer area.
	Red fescue		
	Aurora hard fescue		

NA = Not applicable.

Phased Planting Approach

The planting plan for the site will likely include a phased planting approach. The site will be planted over several years. The phased planting approach will allow verification of assumptions regarding wetland hydrology, soil conditions, and the optimal plants for the environmental conditions present in the mitigation project. Phased planting provides an opportunity for adaptive management of the mitigation site, and allows modification of planting concepts as site hydrology develops. Given phased planting, monitoring will be extended to cover a minimum of 10 years from final plantings.

Weed Control

Invasive non-native species such as reed canarygrass and Himalayan blackberry can reduce successful establishment of desirable native plant species. A variety of weed control strategies are available to treat non-native species during the monitoring period.

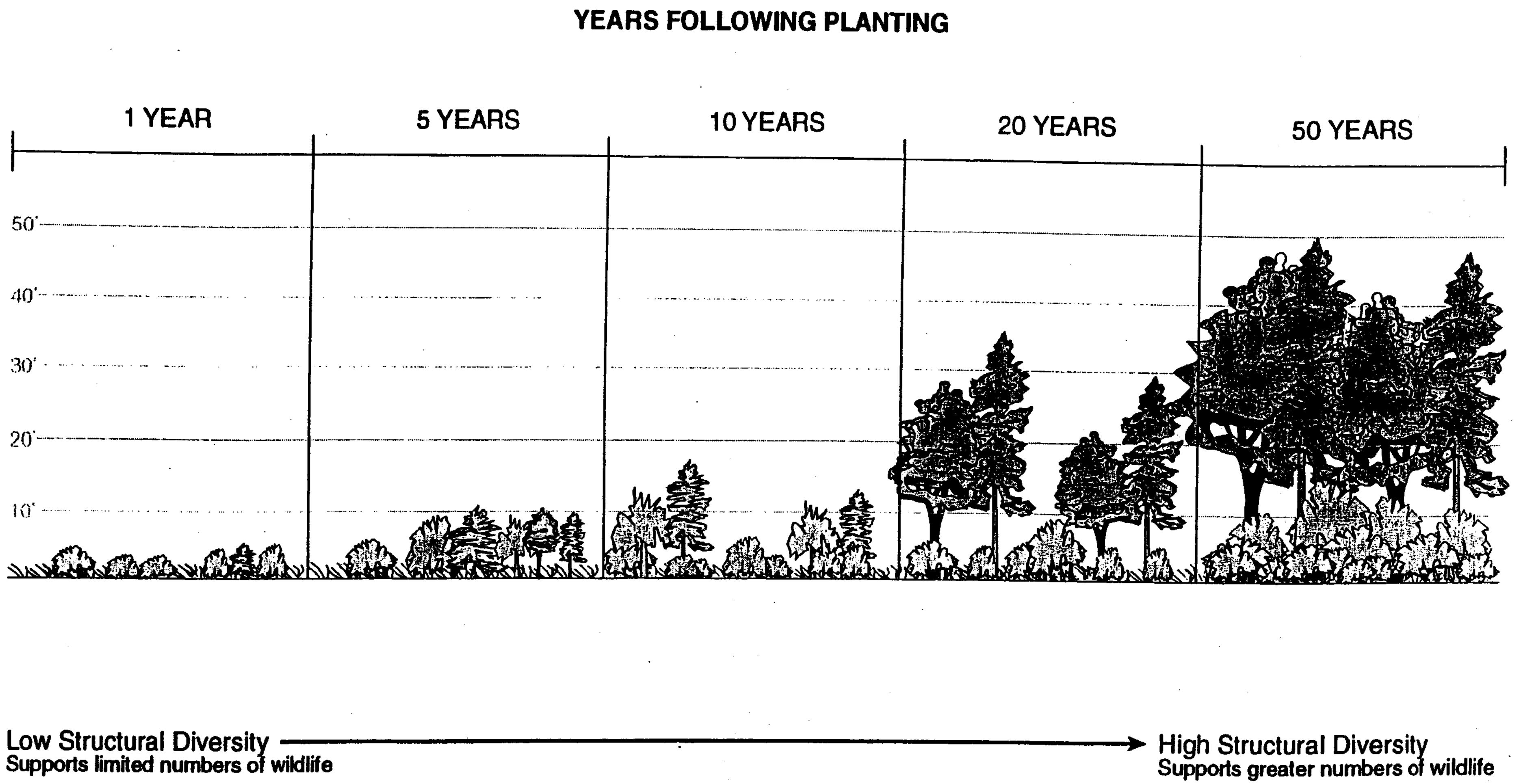

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Figure 9
Successional Changes in Forested Wetland Vegetation Following Planting

These will be used as necessary:

- Dense plantings of target species that competitively exclude non-native species
- Applications of EPA-approved herbicides by licensed applicators
- Application of sterile straw or other biodegradable mulch
- Installation of biodegradable weed barrier fabric
- Mechanical removal using mowers, line trimmers, or hand removal
- Thermal removal using flame or heated water

In addition, topsoil containing weed seed, roots, and rhizomes will be removed in order to establish appropriate wetland hydrology over much of this site. It is anticipated that reed canarygrass may be particularly problematic. Several methods for controlling reed canarygrass are currently proposed. However, there is no reliable prescriptive approach to fully eradicating this species. Therefore, a somewhat experimental approach may be taken, to increase understanding of this species as well as to control it.

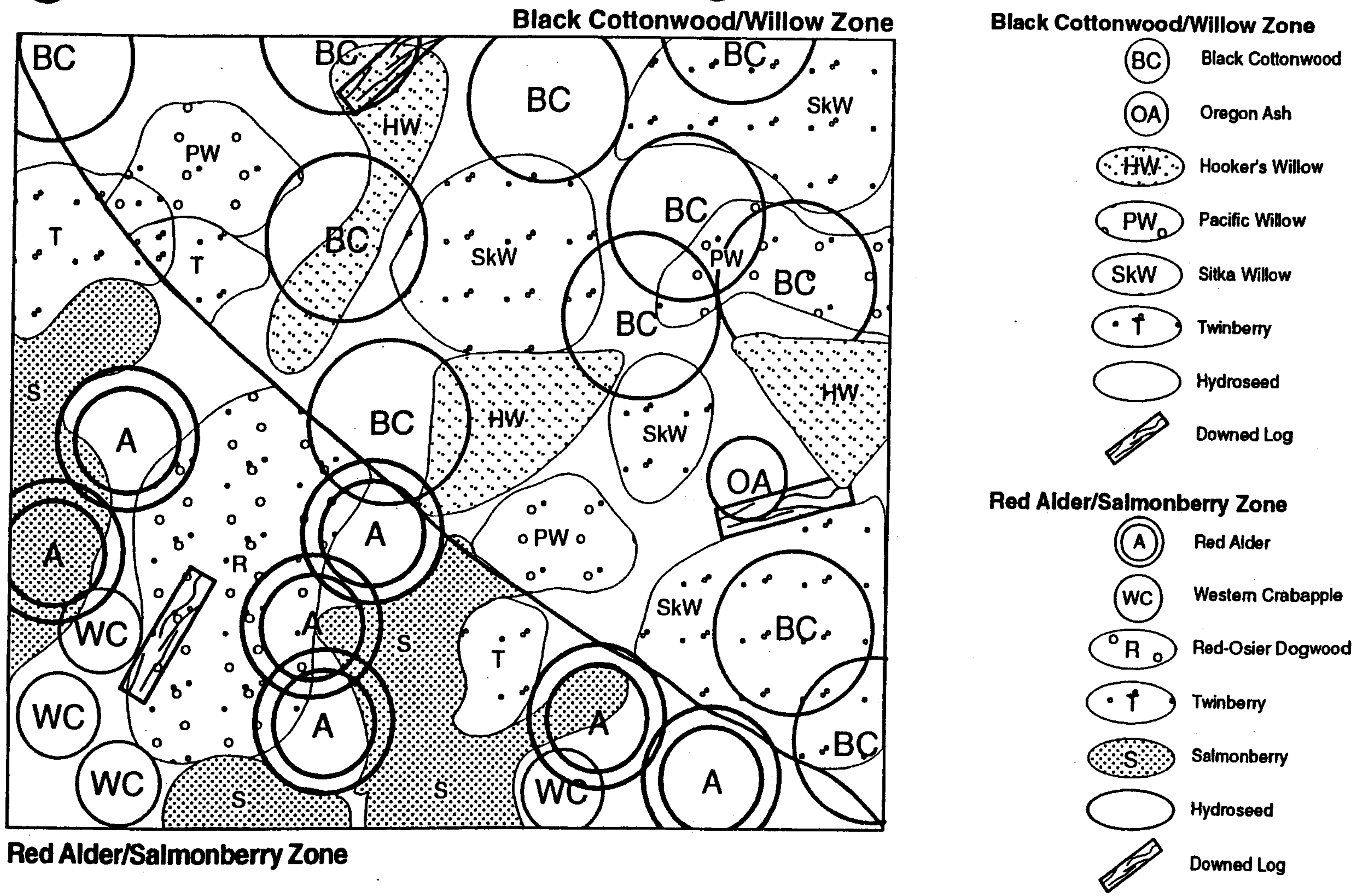
Existing vegetation, including reed canarygrass, could be removed from the site by application of approved herbicides, plowing, cultivating, and allowing the site to lie fallow. The project has been designed to anticipate some colonization of reed canarygrass by incorporating forested wetlands that ultimately will shade out this species. Competitive exclusion will be used by seeding areas with a fast-germinating cover crop. Competitive grass species such as tufted hairgrass sloughgrass (*Beckmannia syzigachne*), bentgrass, or red fescue may be used. Contingency actions could include repeated applications of herbicides, mowing, or use of weed barriers.

Black Cottonwood/Willow Association

The black cottonwood/willow association is characteristic of many floodplain forested wetlands in western Washington, including the Green River Valley. The plants within this association (Table 4 and Figure 10) are adapted to a large fluctuation in the water table and are tolerant of seasonally dry soils. This zone would be planted above elevation 42 ft.

Table 4. Proposed plant species for the black cottonwood/willow association.

Scientific Name	Common Name	Indicator Status[a]	Condition	Comments
Trees				
Fraxinus latifolia	Oregon ash	FACW	container	Trees would be planted at densities of at least 120 plants per acre.
Populus trichocarpa	Black cottonwood	FAC	container/ bareroot	
Salix lasiandra	Pacific willow	FACW+	bareroot/ live stake	
Shrubs				
Lonicera involucrata	Twinberry	FAC+	container	Approximately 35% to 50% would be planted at about five ft on center.
Salix hookeriana	Hooker's willow	FACW	bareroot/ live stake	
Salix sitchensis	Sitka willow	FACW	bareroot/ live stake	



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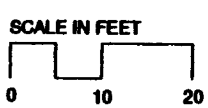

Figure 10
Typical Planting Plan for the Black Cottonwood and Red Alder Planting Zones

Red Alder/Salmonberry Association

The red alder/salmonberry association (Table 5, see Figure 10) commonly occurs on wet valley floors in seasonally flooded areas. This association would be planted above the 42 ft elevation where year-round soil saturation would not occur.

Table 5. Proposed plant species list for the red alder/salmonberry association.

Scientific Name	Common Name	Indicator Status	Condition	Comments
Trees				
Alnus rubra	Red alder	FAC	container	Trees would be planted at densities of at least 120 plants per acre
Pyrus fusca	Western crabapple	FACW	container	
Shrubs				
Cornus stolonifera	Red-osier dogwood	FACW	bareroot/ live stake	40% to 50% of the area would be planted with shrubs at an approximate spacing of five ft on center.
Lonicera involucrata	Twinberry	FAC+	container	
Rubus spectabilis	Salmonberry	FAC+	container/ bareroot	

Oregon Ash Association

The Oregon ash association is most commonly found in floodplains or associated with streams. This community would be planted in the wetter portions of the forest zone since most of the associated species are tolerant of soil saturation and inundation well into the spring. Oregon ash will comprise most of the plant cover, with minor components of salmonberry and willow (Table 6 and Figure 11).

Table 6. Proposed plant species list for the Oregon ash association.

Scientific Name	Common Name	Indicator Status	Condition	Comments
Trees				
Fraxinus latifolia	Oregon ash	FACW	container	Trees would be planted at densities of at least 150 per acres.
Salix lasiandra	Pacific willow	FACW+	bareroot/ live stake	
Populus trichocarpa	Black cottonwood	FAC	container/ bareroot	
Shrubs				
Rubus spectabilis	Salmonberry	FAC+	container/ bareroot	10% to 20% of the area would be planted with salmonberry at spacings of at least five ft on center.

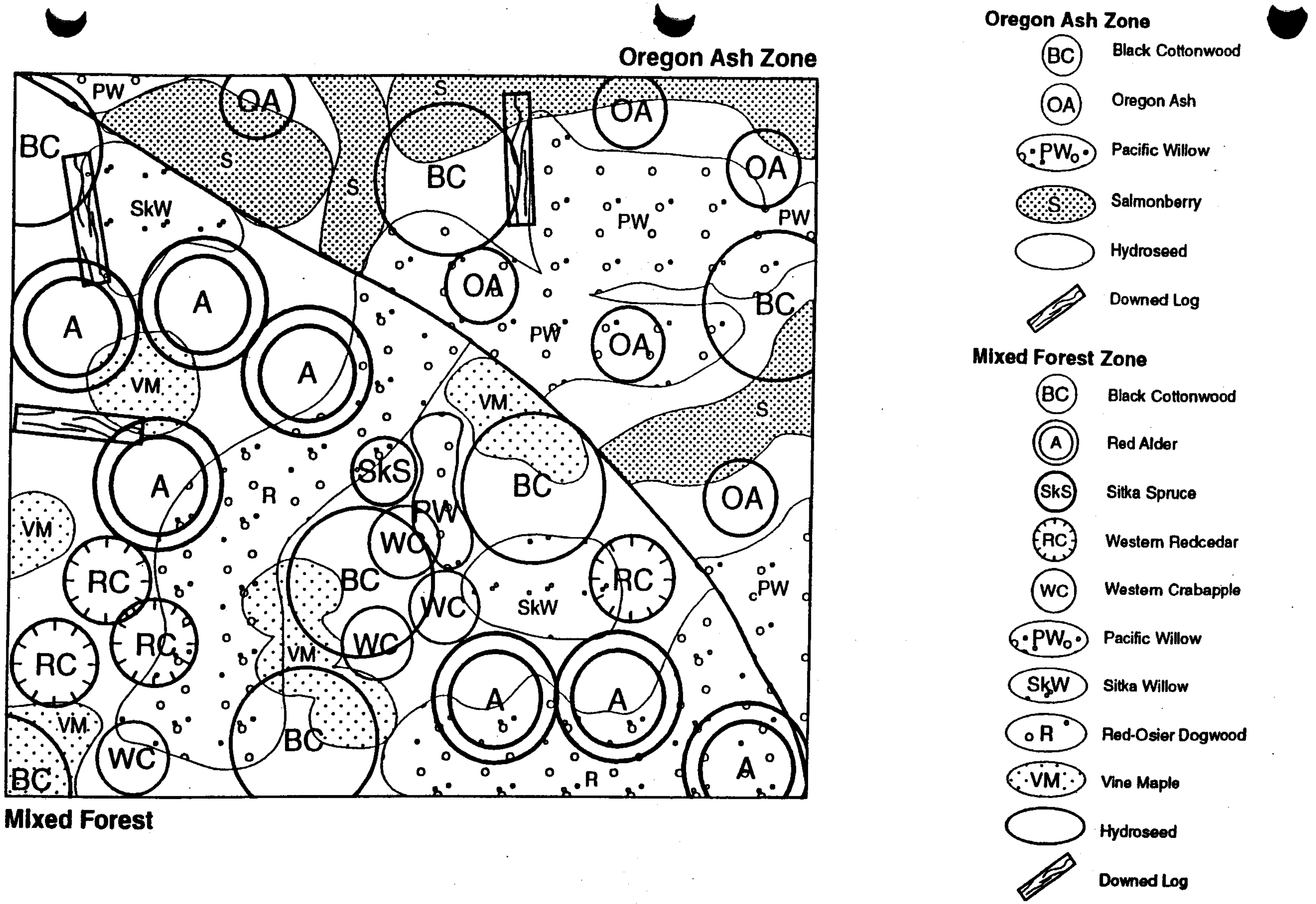

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Figure 11
Typical Planting Plan for the Oregon Ash and the Mixed Forest Planting Zone

Mixed Forest Association

The mixed forest association includes several coniferous and deciduous tree species as well as an understory shrub component. This association would be planted approximately between elevation 43 ft and 49 ft, because some of the tree species included are less tolerant of prolonged soil saturation (Table 7, see Figure 11).

Table 7. Proposed plant species list for the mixed forest association.

Scientific Name	Common Name	Indicator Status	Condition	Comments
Trees				
Alnus rubra	Red alder	FAC	container	Trees would be planted at densities of at least 120 per acre.
Picea sitchensis	Sitka spruce	FAC	container	
Populus trichocarpa	Black cottonwood	FAC	container/ bare root	
Pyrus fusca	Western crabapple	FACW	container	
Salix lasiandra	Pacific willow	FACW+	bareroot/ live stake	
Thuja plicata	Western redcedar	FAC	container	
Shrubs				
Acer circinatum	Vine maple	FAC-	container	40% to 50% of the area would be planted approximately five ft on center.
Cornus stolonifera	Red-osier dogwood	FACW	bareroot/ live stake	
Salix sitchensis	Sitka willow	FACW	bareroot/ live stake	

Western Redcedar Association

The western redcedar association includes deciduous as well as coniferous tree species and limited shrub species plantings (Table 8, Figure 12). Since several of the tree species within this association are less tolerant of prolonged soil saturation, it would be planted in the upper portions of the wetland between elevations 43 ft and 45 ft.

Wetland Enhancement

The wetland enhancement area will be located in the existing emergent wetland swale that bisects the site. This wetland area will be enhanced by planting a forested community composed of native tree and shrub species (Table 9). This forest association will be planted at the existing ground elevations, between elevations 45 ft and 49 ft.

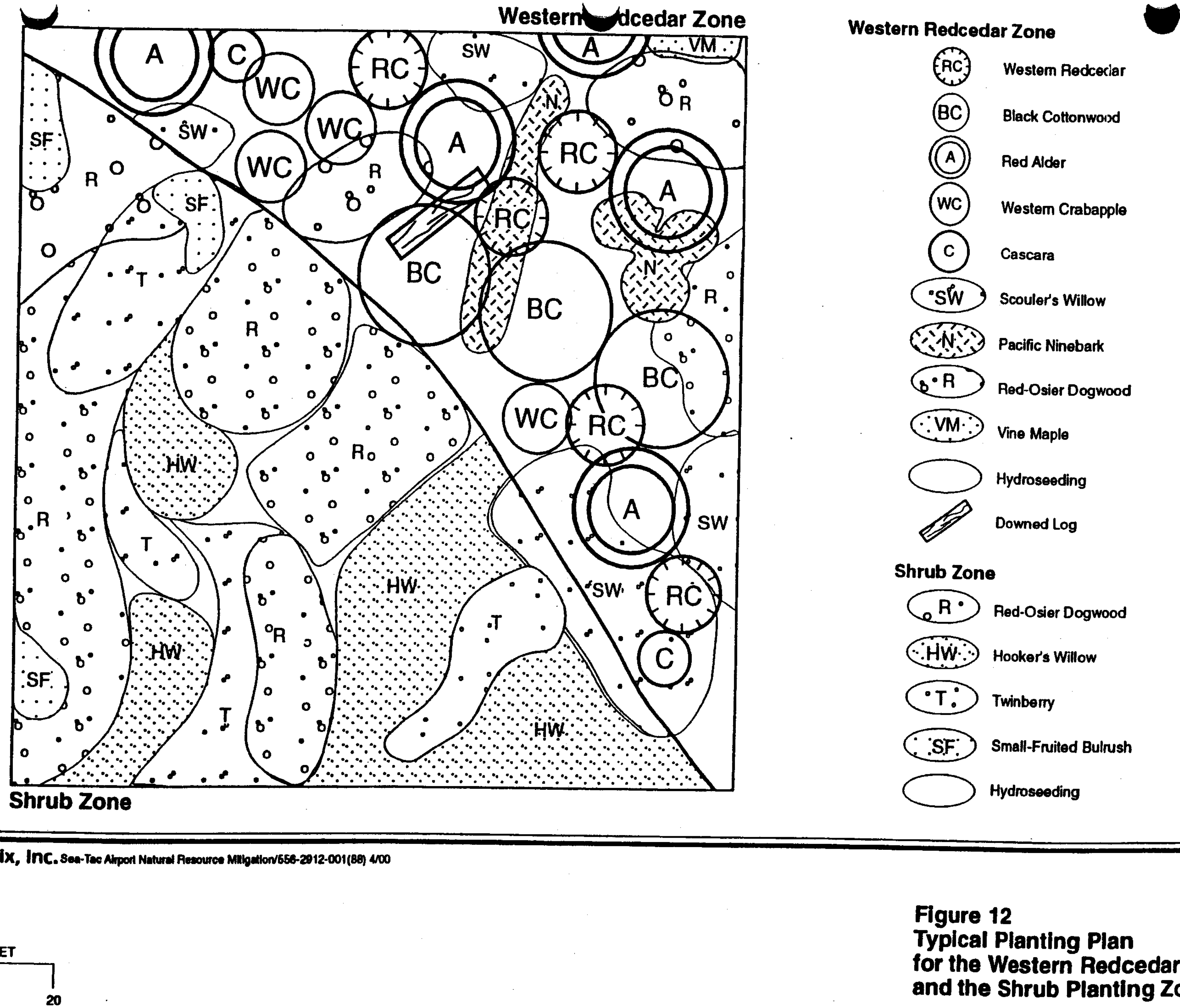

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Figure 12
Typical Planting Plan for the Western Redcedar and the Shrub Planting Zones

Table 8. **Proposed plant species list for the western redcedar association.**

Scientific Name	Common Name	Indicator Status	Condition	Comments
Trees				
Alnus rubra	Red alder	FAC	container	Planted at densities of at least 150/acre.
Populus trichocarpa	Black cottonwood	FAC	container/ bareroot	
Pyrus fusca	Western crabapple	FACW	container	
Rhamnus purshiana	Cascara	FAC-	container	
Thuja plicata	Western redcedar	FAC	container	
Shrubs				
Acer circinatum	Vine maple	FAC-	container	20% to 30% of the area would be planted approximately five ft on center.
Cornus stolonifera	Red-osier dogwood	FACW	bareroot/ live stake	
Physocarpus capitatus	Pacific ninebark	FACW-	container	
Salix scouleriana	Scouler's willow	FAC	bareroot/ live stake	

Table 9. **Proposed plant species list for the existing emergent wetland.**

Scientific Name	Common Name	Indicator Status	Condition	Comments
Trees				
Alnus rubra	Red alder	FAC	container	Trees would be planted at densities of at least 150 per acre.
Populus trichocarpa	Black cottonwood	FAC	container/ bareroot	
Pyrus fusca	Western crabapple	FACW	container	
Rhamnus purshiana	Cascara	FAC-	container	
Thuja plicata	Western redcedar	FAC	container	
Shrubs				
Cornus stolonifera	Red-osier dogwood	FACW	bareroot/ live stake	20% to 30% of the area would be planted approximately nine-ft on center.
Physocarpus capitatus	Pacific ninebark	FACW-	container	
Rubus spectablis	Salmonberry	FAC	container	
Salix scouleriana	Scouler's willow	FAC	bareroot/ live stake	

Planting Sequences

Planting of overstory trees and shrubs in forest and shrub plant associations would occur during the first fall or early spring season following site grading, when soil moisture is optimal. Trees would be at least three-year-old branched seedlings and at least 24 inches tall. Trees of varying sizes (between approximately 24 and 48 inches) would be planted to provide height diversity and simulate a more natural condition. Shrub understory species in the forested areas would be planted in patches to mimic their natural occurrence on approximately five-ft centers (see Figures 10 through 12). The shrub wetland zone would also be planted on five-ft centers (Table 10).

Table 10. Proposed plant species list for the shrub zone.

Scientific Name	Common Name	Indicator Status	Condition	Comments
Cornus stolonifera	Red-osier dogwood	FACW	bareroot / live stake	Shrubs would be planted in approximately 85% to 90% of the shrub zone at spacings ranging from five to eight ft on center.
Lonicera involucrata	Twinberry	FAC+	container	
Salix hookeriana	Hooker's willow	FACW-	bareroot / live stake	
Salix lasiandra	Pacific willow	FACW+	bareroot/ live stake	

A phased approach to planting may be implemented after the grading activities are complete. Phased planting allows for adaptive management of the site. For example, it would be possible to monitor site hydrology and potentially adjust the locations of the plant communities to suit the hydrologic regime. Plantings will be placed in the field by a qualified landscape designer, architect, or wetland biologist.

Emergent Planting Zone

Emergent wetlands would be planted with native emergent species common in the Green River Valley and the northern Puget Sound region. Since wetland hydrology is designed to create both seasonally and permanently flooded areas, plants that are tolerant of extended flooding and soil saturation would be established in these areas. These species would include water parsley (*Oenanthe sarmentosa*), narrow-leaf bur-reed, hardstem bulrush (*Scirpus acutis)*, and spike-rush (Table 11). The typical growth pattern for emergent marsh plants is in monotypic patches with some interspersion in open, less densely vegetated areas, and proposed planting would mimic this pattern (Figure 13). Planting shoots with rhizomes 18 inches on center in monotypic stands of varying size and seeding a mix of emergent species (see Table 10) in the areas between patches should achieve that result. Because ponding in emergent areas is expected well into the early summer, planting of emergent species would occur during the fall months when soils are becoming saturated–but before water levels reach their winter maximum.

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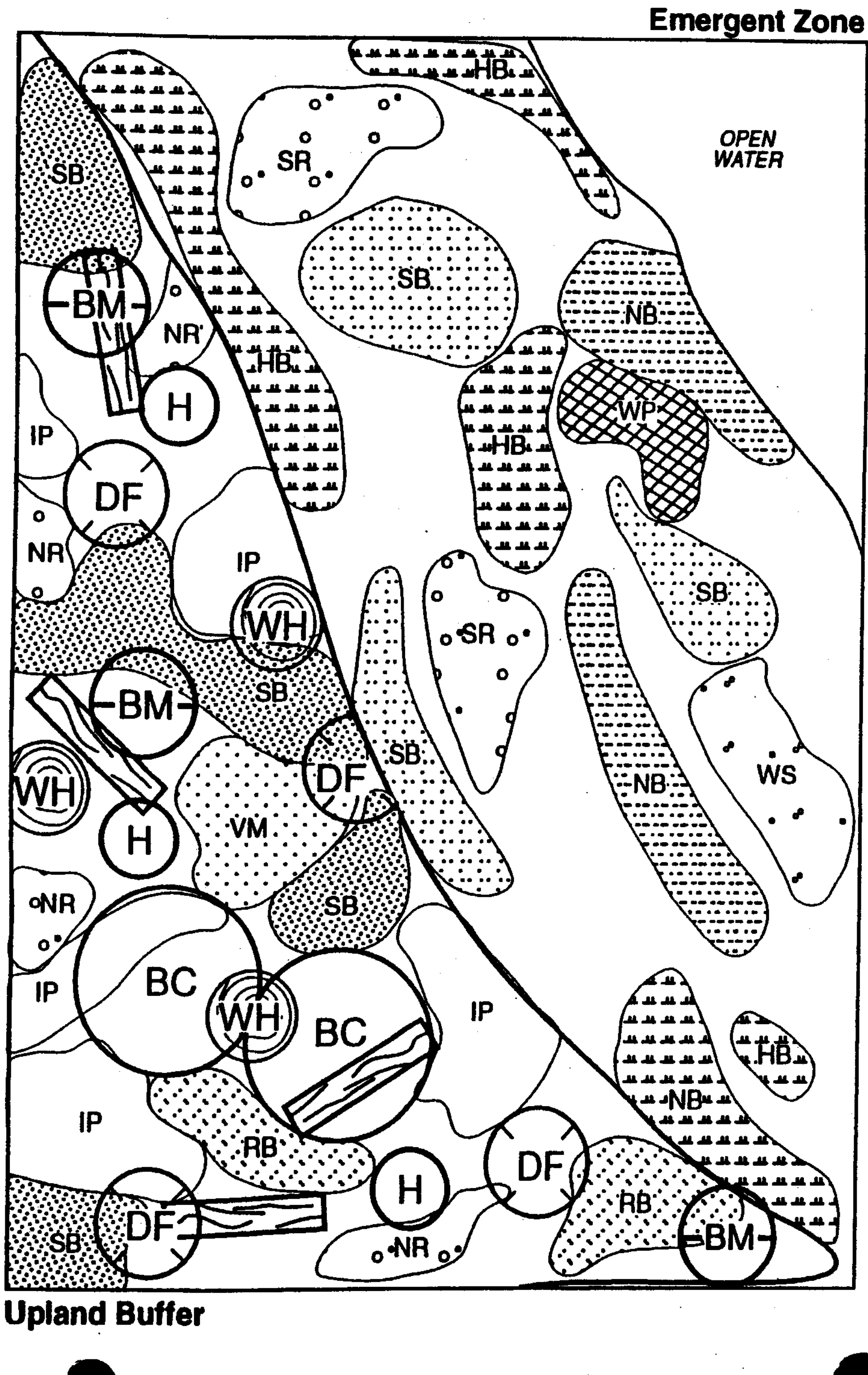

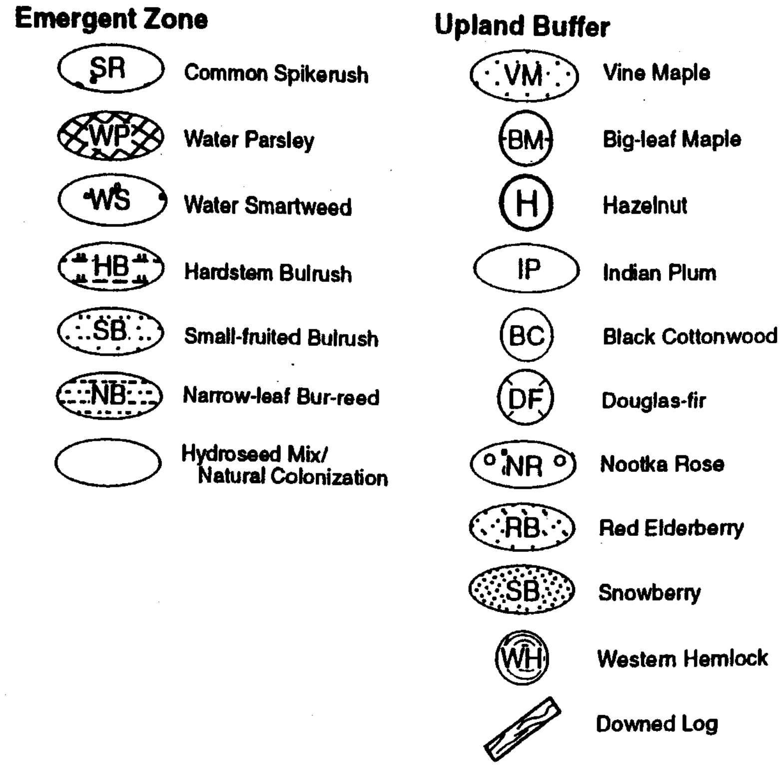

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Figure 13
Typical Planting Plan for the Emergent and the Upland Buffer Planti[illegible] Zones

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Table 11. Proposed species list for the emergent zone.

Scientific Name	Common Name	Indicator Status	Condition
Carex rostrata	Beaked sedge	OBL	plug
Eleocharis palustris	Common spike-rush	OBL	plug
Oenanthe sarmentosa	Water parsley	OBL	container
Polygonum amphibium	Water smartweed	OBL	container
Scirpus acutis	Hardstem bulrush	OBL	plug
Scirpus microcarpus	Small-fruited bulrush	OBL	seed
Sparganium emersum	Narrow-leaf bur-reed	OBL	plug

Upland Buffer

The mitigation site will be protected by a 60-ft buffer along its western boundary, and 50-ft buffers on the north and south. In addition, the existing wetland will be provided with 50 ft buffers on both its east and west sides to create an upland/wetland mosaic to increase habitat diversity. Nearly 35 acres of new wetland will be created and six acres of existing wetland will be enhanced. These mitigation areas will be protected by approximately 15 acres of upland buffer. The 15 acres of upland buffer will also provide habitat functions to a variety of wildlife species.

All vegetated upland areas disturbed during wetland construction would be seeded using low-growing grass species (see Table 3). Following seeding, forested buffers would be planted bordering the northern and southern boundaries of the mitigation wetland where the area is susceptible to potential disturbance. Trees and shrubs would be planted (Table 12, see Figure 13) at densities sufficient to attain the stem density performance standards for forested wetland habitat. As in the forested wetland areas, species that are less tolerant of direct sun would be placed approximately three years after initial plantings. A narrow strip of land to the east of the site, adjacent to the Green River, is proposed for trail construction by King County. Grassland would remain between the edge of the constructed mitigation wetland and the King County property boundary.

Table 12. Proposed plant species list for the upland buffer.

Scientific Name	Common Name	Indicator Status	Condition	Comments
Trees				
Acer macrophyllum	Big-leaf maple	FACU	container	At least 120 trees per acre would be planted in the upland buffer.
Populus trichocarpa	Black cottonwood	FAC	container/ bareroot	
Pseudotsuga menziesii	Douglas fir	FACU	container	
Tsuga heterophylla	Western hemlock	FACU	container	
Thuja plicata	Western redcedar	FAC	container	
Shrubs				
Acer circinatum	Vine maple	FAC	container	30% to 40% of the area planted five to six ft on center.
Corylus cornuta	Hazelnut	FACU	container	
Oemleria cerasiformis	Indian plum	FACU	container	
Rosa nutkana	Nootka rose	FAC	container	
Symphoricarpos albus	Snowberry	FACU	container	
Sambucus racemosa	Red elderberry	UPL	container	

IMPLEMENTATION

The following section describes the general implementation sequence for the Auburn site.

Pre-Construction Meeting

Oversight during construction of the wetland mitigation will be required to ensure that the contractors follow the plans and specifications. Prior to any site work, a pre-construction meeting will be held with the Port, general contractors, engineers, landscape contractors, landscape architects, and biologists to make certain that aspects of the project are properly implemented. Both a civil engineer and wetland ecologist will be available for on-site inspections and approvals of all work.

Dewatering

Due to the seasonally high water table on the site, it will likely be necessary to lower the groundwater level during excavation and grading activities. All aspects of the contractor's dewatering plan and grading sequence will be discussed during pre-construction meetings.

Excavation and Grading

Prior to any excavation, the extent of all grading activities will be surveyed by a professional surveyor and staked in the field. Approximately 440,000 cy of soil will be excavated to form the new wetland basins. The majority of the excavated material will be transported off-site for re-use or disposal (at an approved upland location). The contractor as well as the approved fill disposal site would be required to obtain all appropriate permits. Part of the excavated soil will be blended with composted organic matter and replaced as topsoil after new site grades are established. The topsoil blending operation will require temporary stockpiling and processing in either an on-site or off-site staging area.

Erosion Control

Generally, construction of the wetland basin will not be prone to off-site migration of sediments. In areas where there is potential for fine sediments reaching the Green River and adjacent properties, a variety of erosion control measures will be employed. Staging areas and existing wetlands will be protected with silt fence installed around the perimeter. Stockpiled soil left in place for more than three weeks will be stabilized with an approved native hydroseed mixture, tarp, or appropriate Best Management Practice. In addition, a native erosion control grass seed mixture will be used to stabilize the soil in the graded portions of the site until native vegetation can be installed. The desired outcome from this strategy is to choose a grass mixture that rapidly establishes cover to stabilize the soil while not competing with the installed plant material.

To reduce vehicles/equipment tracking mud onto paved roads, the site entrance roads will be stabilized using a pad constructed of quarry spalls or vehicles and/or their tires will be washed and or brushed prior to leaving the site.

Irrigation

After all grading activities have been completed an irrigation system will be installed throughout the site. Water for the irrigation system would be pumped to the site from the City of Auburn water supply system. Irrigation will ensure that the newly planted vegetation receives water during dry periods of the year to promote healthy vigorous growth. The irrigation system will remain in place until the plants become established, which is anticipated to take two to five years.

Planting

All planting zones will be staked in the field according to the proposed plant associations and site hydrology. Because of variations in grading and soil conditions, it is difficult to predict exactly what the site hydrology will be after grading is complete. Therefore, it is expected that plant locations and species will slightly vary from the landscape plan. Because planting locations will be field located according to site hydrology, there will be ongoing coordination between landscape architects, wetland biologists, and landscape contractors to identify proper planting locations and methodologies. Due to the large number of plants needed to cover the entire site, planting will occur in phases. Also, plantings for the later phases can be better matched to the newly established site hydrology while evaluating the performance of the initial plantings.

To prevent herbivory, exclusionary devises may be installed around the mitigation plantings to frighten or deter wildlife species from grazing on the plant material. Depending upon the type of community, the level of exclusionary devises may vary from putting plastic collars around shrub and tree stems to wire mesh around emergent planting zones.

After all plants are installed, a four-inch layer of mulch will be placed around the base of the shrub or tree species to retain water, provide organic matter, and reduce competition with other plant material.

Fence Installation

Because one of the purposes of this mitigation site is to provide habitat for wildlife species, the perimeter of the site may be fenced to limit human access and prevent domestic animals from disturbing the breeding, migrating, and foraging wildlife species using the site. The fence may be either permanent or temporary depending on the performance of the wetland community and the future land use development of the surrounding properties. It is anticipated that the boundary fence will be constructed out of chain-link material for durability.

MONITORING PLAN

The mitigation site will be monitored for a 10-year period, with monitoring focusing on collecting the physical and ecological data necessary to determine whether performance standards for the mitigation site are being achieved. Monitoring reports will summarize the ecological condition of the wetland, and the degree of compliance with performance standards; as necessary, contingency actions will be recommended. The first phase of monitoring will be to complete an as-built report, as described below.

As-Built Report

An as-built wetland report that describes the mitigation as constructed and planted will be prepared to define the baseline conditions for measuring progress toward the defined goals and final performance standards. The as-built report will also establish all sampling locations for future monitoring activity. Any significant deviations from the construction plan will be noted, and the significance of these deviations evaluated and coordinated with the ACOE. A detailed wetland map will be prepared from field surveys and will include the following information:

- Topography at one-ft intervals
- Locations of major plant community boundaries
- Locations of surface water
- Locations of vegetation transects, photograph points, groundwater wells, staff gages, and other sampling points

The as-built report will summarize the existing wetland condition once construction is completed by describing the aerial extent of the wetland (and each vegetation zone planted) relative to mitigation goals, the hydrologic condition of each wetland planting area, and the relationship between each planting zone and observed soil moisture. These wetland features will then be compared to those established as design criteria for the wetland.

10-Year Monitoring Plan

Using the as-built report of baseline conditions, monitoring activities will focus on the collection of vegetation, hydrology, and wildlife data to evaluate wetland function and compliance with the permit conditions. Monitoring will also include photographic documentation of site features and the development of habitat on-site.

Vegetation monitoring will be performed to determine how plant communities are developing on the site. Data describing plant species composition, density, and cover will be collected along permanent vegetation transects or within plots. Walk-through surveys will be made to estimate annual shoot growth, survival rates, and vegetation structure. Photographs can provide qualitative documentation of plant community development on the site and in the buffer over time. Therefore, photographs will be taken along transects and at appropriate viewpoints to show extent and rate of plant height and cover. Aerial photographs and/or ground-based mapping will be undertaken to determine whether in-kind replacement ratios are being met.

Hydrologic data will be collected to evaluate the duration and amount of flooding or soil saturation using staff gages and field observations. Staff gages will be read monthly for the first three years after construction is complete, and three times per year thereafter. Permanent wells will be installed to measure groundwater depths. Wells will be placed at the existing central wetland and at representative sites in newly constructed forested, scrub-shrub, and emergent plant communities. Water depths will be read monthly for the first three years after construction is complete, and three times per year thereafter.

Habitat structure and wildlife use of the mitigation site will be monitored to evaluate whether performance standards are being met. Surveys will be conducted four times per year to record wildlife species and activities on-site.

Monitoring data will also be used to analyze the overall success of the mitigation project, including recommendations for future designs, reporting of plant growth under various hydrologic regimes, and other general observations relevant to mitigation design and implementation. Most monitoring activities will be completed along the permanent transects and fixed points established and marked during the as-built survey; however, as determined in the field, additional monitoring may be needed to document unique conditions not present at pre-established sampling locations. All monitoring will use standard ecological techniques to sample, measure, or describe vegetation, hydrologic, and wildlife habitat conditions. These techniques include walk-through surveys, line-intercept sampling along, plot sampling, and wetland delineation.

At the end of the 10-year monitoring period, the determination can be made whether the created wetland area is larger than the mitigation requirement. If more than the required wetland area has been created, the additional wetland acreage could be considered as mitigation for future permit actions in coordination with resource agencies that have permit authority.

Any deviations from design parameters will be noted and analyzed, including the anticipated significance of any deviations from the eventual development of a functioning wetland system relative to performance goals.

SITE PROTECTION

The Port and the City of Auburn are currently negotiating the terms of site protection. Several alternatives are being considered; however, both entities would agree to protect the site in perpetuity.

MAINTENANCE AND CONTINGENCY PLAN

The mitigation wetland has been designed to achieve the final performance standards without significant ongoing maintenance. Proposed plant communities are adapted to the designed hydrologic regime and floodplain location. Supplemental irrigation during the first two seasons following planting may be used to enhance plant establishment and reduce the risk of mortality due to transplant shock. This maintenance activity will depend on rainfall.

To achieve relatively rapid overstory development and structural diversity, trees will be planted closer together than would occur in natural, mature stands. At the end of the 10-year monitoring period, some deciduous trees could be cut or girdled and left as woody debris for wildlife habitat. This management activity will allow the remaining trees adequate space to reach full size, while providing additional microhabitat for small plants and animals in the downed or standing woody debris.

If plant species exhibit greater than 30 percent mortality within the first two years these species may be replaced with species of similar form and function if deemed appropriate by a qualified professional.

Since reed canarygrass is present in adjacent wetland areas, and this undesirable species could invade the wetland through seed dispersal, maintenance actions may be required to control its spread. These actions could include periodic mowing, treatment with EPA-approved herbicide, and/or reseeding with native wetland grasses. Extensive, long-term control of reed canarygrass is not anticipated since dense stands should not develop under shrub or forest canopies, and emergent wetlands will be too wet for this species to out-compete other wetland plants.

In establishing native plant communities at wetland mitigation sites, the presence of invasive non-native species such as reed canarygrass and Himalayan blackberry, threaten successful establishment of cover by native wetland species. A variety of weed control strategies are available to treat non-native species and these weed control strategies may be used throughout the project. Steps in weed control may take any of the following forms:

- Dense plantings of target species that competitively exclude non-native species
- Applications of EPA-approved herbicides, as necessary
- Use of mulch in the form of sterile straw or other biodegradable mulch
- Installation of biodegradable weed barrier cloth
- Mechanical removal of weeds by using weed whackers, hoeing, or hand-removal

Vegetation at newly planted mitigation sites can be vulnerable to browse by Canada geese, deer, voles, beaver and other wildlife species. In order to avoid significant loss of planted species, a number of contingency measures may be necessary. Collars may be installed around woody species or netting may be constructed over some plantings. A combination of cayenne pepper and pruning wax applied to woody stems has been an effective deterrent to herbivory. These and other contingency measures may be employed on a case-by-case basis.

PROJECT CHANGES

Since issuance of the SEPA Environmental Checklist (August 1998) for the Auburn Wetland Mitigation project, additional wetlands were identified at STIA (see the January 2000 SEPA Addendum). This has resulted in the need to increase the size of the mitigation area which in turn has affected other aspects of the proposal. Table 13 identifies the changes in the project since issuance of the environmental checklist (August 1998).

Another project change relates to the truck haul routes that will potentially be affected by road development on S. 277th Street. The routing of trucks is defined up to the nearest interchange for SR 167 (Valley Freeway). With S. 277th Street available, truck traffic would access SR 167 from S. 277th Street, with access from the site to Auburn Way North most likely through 49th Street NE. In 1999, the construction of S. 277th Street was completed connecting to the east across the Green River and it is proposed that site truck traffic be directed from 49th Street NE north to S. 277th Street via either the "D" Street or "G" Street rights-of-way. While the cities of Kent and Auburn have stated that they would prefer that there be no truck hauling on the new roadway section east of Auburn Way North, S. 277th Street would provide the most direct and flexible access for trucks to the street network.

Table 13. Summary of project changes.

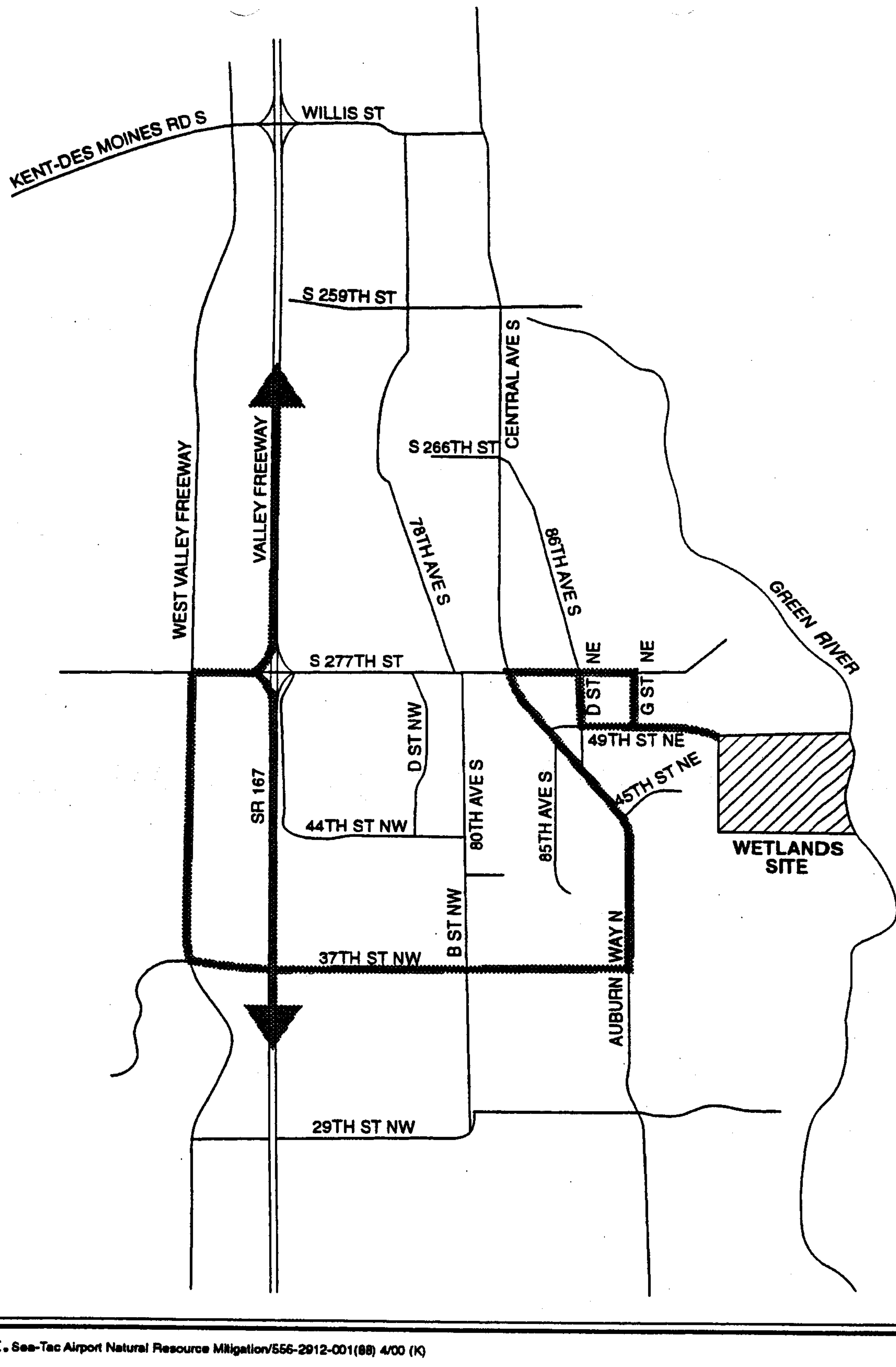
	Original Proposal (1998)	Revised Proposal (2000)
Total Wetland Area Created and Enhanced	30 acres	>40 acres
- Forested Wetland	23 acres	26 acres
- Shrub Wetland	2 acres	3.4 acres
- Emergent Wetland	4.5 acres	5.17 acres
- Open Water	0.5 acres	<0.5 acre
- Enhancement of Existing Wetlands	0 acre	6 acres
Excavation	370,000 yds^3	440,000 yds^3
Temporary Soil Stockpile	40,000 yds^3	40,000-50,000 yds^3
Replacement Soil Required	90,000 yds^3	105,000 yds^3
Construction Start Date	Summer 2000	Summer 2001
Construction Duration	One Summer Season	One or Two Summer Seasons
Planting Phasing	One to Two Years	Two to Three Years
Staging Area Size	12.9 acres	5 acres

Construction of the S. 277th Street grade separation project along this route (FAST Corridor project) will begin in 2001, and would result in this section of S. 277th Street (from Auburn Way North to SR 167) being closed for two years. The proposed detour would route all traffic to SR 167 via Auburn Way North, 37th Street NE, West Valley Highway and back to SR 167 at the S. 277th Street interchange. Figure 14 shows the proposed truck route from the project site to the S. 277th Street interchange with SR 167, with hauling occurring during closure of S. 277th Street for the FAST Corridor project construction. This represents the worst case truck route for the project access to SR 167.

PROJECT IMPACTS AND MITIGATION

Generally, there are no changes in the types of impacts that would be generated by the project since the impacts were initially disclosed in the 1998 SEPA Environmental Checklist. The main change is potentially in the magnitude or duration of some impacts. For example, the amount of material to be excavated has increased from 370,000 yds^3 to 440,000 yds^3. Of this material, approximately 400,000 yds^3 will be removed from the site (versus 330,000 yds^3 in the original proposal). Therefore, this has changed the transportation analysis. This issue is discussed below.

The construction of the new wetland in Auburn would involve the removal of up to 400,000 yds^3 of soil from the site (some excavated material would be stockpiled and reused on the site thus the difference between the amount excavated and the amount removed off-site). For the purposes of the transportation analysis a "worst case" scenario was assumed, that the excavation work occurs in one season. If the excavation work is not completed over one season, then haul truck impacts would be



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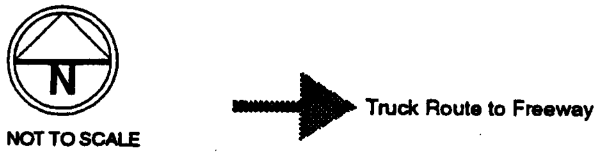

Figure 14
Port of Seattle
Auburn Wetland
Truck Traffic Routes

spread over two seasons. This would reduce the necessary number of daily truck trips (the magnitude of the impact per day would decrease, but the duration would increase). The assumptions in the analysis of truck haul trips are as follows:

- Approximately 400,000 cy of material would be removed from the site
- Ten-week hauling period available after site dewatering is achieved
- Hauling is prohibited during PM peak period (4-6 PM weekdays) reducing hauling hours to six hours per day
- Twenty two cubic yards per truck+dolly combination

Using these parameters, there would be an estimated 18,180 truckloads of excavated material to remove from the site, and thus 18,180 truck round trips. To accommodate the removal of the excavated material in a 10-week, five-days per week window of excavation, 50 days of material hauling would be necessary at 364 truckloads per day. Over six hauling hours per day, this would equate to 61 truck trips per hour. This is an increase of approximately 20 truck trips per hour over the original proposal.

Discussions with Auburn's traffic engineer indicated that there is existing congestion along both Auburn Way North and S. 277th Street during the peak periods, however, off-peak operation is manageable for truck movements (personal communication Stephen Mullen City of Auburn Traffic Engineer). Therefore, hauling from the site would be timed to avoid the worst traffic period (the PM peak hour period). Although increased truck traffic can be accommodated on the roadways, truck hauling from the site could increase congestion, particularly at intersections and for truck turning movements to and from the project site.

Mitigation for the impact of truck trips (congestion and delay) on roadway operations include potentially extending the hauling hours throughout the day (while continuing to avoid the PM peak period), such as hauling in the evening after 6PM or on weekends. This would reduce the number of truck movements each hour along the hauling routes, however the total number of truck trips would remain the same for the project. To mitigate for congestion caused by trucks entering and leaving the site, flaggers should be provided during hauling periods. In particular, flaggers should be used at the following locations: (1) on 49th Street NE at either D Street or G Street and (2) on S. 277th Street at D Street and/or G Street.

The increased level of truck traffic may also impact the condition of the pavement on the haul route roads resulting in the possible creation of potholes, pavement buckling, or differential settling. There has also been some concern expressed by the cities of Kent and Auburn over trucks using the new section of S. 277th Street. Any truck damage to the existing roadways would require repair based on a comparison of the roadway conditions before and after hauling. Mitigation may involve actual roadwork such as paving or compensatory payments to local jurisdictions.

SEPA REVIEW

The Port of Seattle has reviewed this proposal and determined that it is a minor revision that is within the scope of the projects described in the Master Plan Update. The proposed revisions do not change the analysis of significant impacts provided in the *Final Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport* (Port of Seattle, May 1997) and the *SEPA Environmental Checklist for the Port of Seattle Master Plan Improvements Wetland Mitigation Project* (Port of Seattle, August 1998).

Date Addendum Issued: May 5, 2000

SEPA Lead Agency: Port of Seattle (POS File No. 00-07)

SEPA Responsible Official:

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Michael Feldman
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U.S. Department
of Transportation

**Federal Aviation
Administration**

Northwest Mountain Region
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August 9, 2001

Colonel Ralph Graves, P.E.
District Engineer
U.S. Army Corps of Engineers
Seattle District Office
P.O. Box 3755
Seattle, WA 98124-3766

Dear Colonel Graves:

This is our final follow-up letter to you providing information addressing the issues raised in our May 22nd meeting and your April 30th Memorandum for Record. We apologize for the delay in completing our review and getting our responses to you; however, we believe that the issues needed to be thoroughly addressed given the significance of Seattle-Tacoma International Airport's third runway project to the region. In the course of our review we decided we should validate the data and analyses contained in the Final Environmental Impact Statement (FEIS) and Final Supplemental Environmental Impact Statement (SEIS), through the preparation of a written environmental re-evaluation. This process has now been completed in accordance with our prescribed procedures. As a result, we have concluded that the project continues to conform to the analysis presented in the FEIS/SEIS and the Record of Decision issued on July 3, 1997.

There are actually two written reevaluations, as well as a new Record of Decision. The first re-evaluation considers changes in forecast aviation activity levels and changes to the master plan update projects. It assesses the environmental consequences of the changes on noise and land use, air quality, and surface traffic. It identifies no significant change in the impacts reported previously. The second re-evaluation reviews the new biological information that has arisen in the last four years, including information on wetlands, endangered and candidate species, commercially managed fish species, and migratory birds. It also determines there is no significant changed environmental impact.

Your Memorandum for Record asks specifically about potential changed air quality impacts. In addition to the review described in the written re-evaluation, we have obtained a commitment from the Port of Seattle to annually demonstrate compliance with de-minimis threshold levels. This commitment will be a condition of grants for the master plan update improvements.

As a result of these written re-evaluations, we have concluded that the recent MPU project modifications and the new information concerning environmental impacts do not warrant preparation of a new SEIS. The enclosed Record of Decision, to which the re-evaluations are appended, describes the analyses and conclusions. We hope this information addresses your questions and concerns with respect to these issues. If you have any further questions, do not hesitate to contact our office.

Sincerely,

Lowell H. Johnson
Manager, Airports Division
Northwest Mountain Region

cc:
Muffy Walker, COE Regulatory Branch
bcc:
ANM-610
SEA-ADO

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

NORTHWEST MOUNTAIN REGION

RECORD OF DECISION

ENVIRONMENTAL REEVALUATION FOR

MASTER PLAN UPDATE DEVELOPMENT ACTIONS

SEA-TAC INTERNATIONAL AIRPORT

AUGUST 8, 2001

INTRODUCTION AND BACKGROUND

Four years ago, on July 3, 1997, I signed a Record of Decision (ROD) approving Federal Aviation Administration (FAA) actions providing support for various Master Plan Update (MPU) development actions proposed by the Port of Seattle (POS), including a controversial third runway project. The 1997 ROD relied upon a Final Environmental Impact Statement (FEIS) approved by the FAA on February 1, 1996, and a Supplemental EIS (SEIS) approved by the FAA on May 13, 1997. The instant year-2001 ROD makes the determination that it is not necessary to further supplement the 1996 and 1997 EIS documents at this time, to account for subsequent refinements to the MPU projects and new information relating to environmental impacts of these projects.

It is not uncommon during airport design and development, in the period between initial FAA approval of federal actions supporting airport projects and the completion of those projects, for new environmental information to come to the attention of the FAA. Likewise, it is not uncommon for an airport sponsor to propose and make design refinements to previously-approved projects as those projects proceed towards the construction phase. This is particularly true when the airport development plan involves multiple separate projects proposed to be completed in several stages over a lengthy period of time.

At 40 CFR Part 1500, the Council on Environmental Quality (CEQ) has promulgated regulations for implementing the procedural provisions of the National Environmental Policy Act. Section 1501.9(c)(1) provides that an agency shall prepare supplements to final environmental impact statements if:

> (i) The agency makes substantial changes to the proposed action that are relevant to environmental concerns; or
>
> (ii) There are significant new circumstances or information relevant to environmental concerns and bearing upon the proposed action or its impacts.

The FAA Northwest Mountain Region Airports Division has prepared and signed two environmental reevaluations[1]. The ROD Appendices A and B address the issue of whether the previous environmental analyses, pertinent to ongoing discretionary federal actions concerning the POS MPU projects, must now be supplemented based upon new information concerning these projects or recent modifications to these projects.

The Appendix A reevaluation examines the validity of the FSEIS in light of increased airport activity levels and MPU project refinements that have occurred in the 4 years since issuance of the 1997 FSEIS and ROD.

Appendix A discusses increased airport activity levels that have occurred and have been forecast since the 1997 FSEIS forecasts, noting that the environmental consequences of these activity levels have the potential to affect aircraft noise and land use, air quality, and surface traffic conditions. While reporting that since 1997 airport operations have been somewhat greater than forecast in the FSEIS, Appendix A concludes: 1) that the noise mitigation commitments in the ROD would fully mitigate any noise impacts exceeding those forecast in the FSEIS, 2) that the MPU projects will continue to comply with the de-minimus thresholds of the Clean Air Act conformity regulations, as stated in the FSEIS, and 3) that the increased passenger levels will not significantly degrade surface traffic conditions to an extent undisclosed in the FSEIS.

Appendix A also discusses various refinements to the MPU projects that have been identified over the last 4 years. When considering the overall context and intensity of these refinements, it is concluded that none of these modifications are expected to cause significant adverse impacts, either individually or in combination.

The Appendix B reevaluation discusses new biological information that has arisen in the 4 years since issuance of the 1997 FSEIS and ROD, including new information on wetlands, endangered and candidate species, commercially managed fish species, and migratory birds.

With regard to wetlands, Appendix B concludes that despite an increase in the acreage of wetlands now known to be

[1] Re-Evaluation of Airport Activity and Changes to the Master Plan Update at Seattle-Tacoma International Airport, dated July 2001, attached as Appendix "A"; and Re-Evaluation of Impacts to Biological Conditions from the Master Plan Update Improvements at Seattle-Tacoma International Airport, dated July 2001, attached as exhibit "B."

affected, the functions and values of the affected wetlands are the same as those analyzed and evaluated in the FEIS and FSEIS, with no additional or unrecognized biological functions identified.

With regard to the Endangered Species Act (ESA), Appendix B addresses the fact that on March 24, 1999, and November 1, 1999, the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Services (USFWS), [the Services], respectively listed the Puget Sound Chinook salmon and the Puget Sound bull trout as threatened species under the ESA. Critical habitat for the Puget Sound Chinook salmon was designated in February 2000.

On May 22, 2001, following a year-long consultation process, the USFWS issued a biological opinion (BO) concluding that the MPU development actions are not likely to jeopardize the continued existence of the bull trout, bald eagle or marbled murrelet. On May 31, 2001, the NMFS issued a letter concurring with the BA conclusions that the MPU development actions are not likely to adversely affect the Puget Sound Chinook salmon or result in the destruction or adverse modification of its critical habitat. Under ESA Section 7, and its implementing regulations, the FAA's formal consultation with the Services was concluded at the issuance of these two documents.

Appendix B starts with the premise that these new listings of threatened fish species by the Services represent determinations of the species' legal status, and do not by themselves constitute significant new information requiring preparation of another SEIS. The written reevaluation notes that the 1996 and 1997 EIS and SEIS specifically considered the effects of the project upon fisheries and aquatic resources in the project vicinity, including anadromous fish. The reevaluation specifically relies upon the expertise of the Services, and, likewise, concludes that the MPU development actions are not likely to jeopardize the continued existence of newly ESA-protected fish species or result in the destruction or adverse modification of their designated critical habitat. The reevaluation documents the fact that the MPU projects' environmental effects resulting from the ESA listings are neither significant nor uncertain, as compared with the impacts evaluated in 1996 and 1997.

With regard to the bald eagle, the USFWS's BO and Appendix B agree with the FEIS and FSEIS assessment that the MPU projects are not expected to adversely affect this threatened species. For the Marbled Murrelet, the BO found insignificant effects, given the absence of nearby critical habitat, a conclusion similar to that reached in the FEIS and FSEIS, where it was found that the murrelet is not likely to occur in the project area.

With regard to coho salmon, an ESA-candidate species, Appendix B concludes that, while there may be temporary adverse affects on coho during MPU construction, long-term benefits to coho are expected as a result of in-basin mitigation efforts. Appendix B notes that these effects are consistent with the effects from potential construction and operational activities described in the FEIS and FSEIS for similar fish species.

With regard to commercially managed fish species and their essential fish habitat protected by the Magnuson-Stevens Act, as amended by the Sustainable Fisheries Act, Appendix B concludes that construction and operation of the MPU projects would have no effect upon Coastal Pelagic Fisheries or West Coast Groundfish, and that, even though these projects may adversely affect coho essential fish habitat over the short term, over the long term they would have an overall beneficial affect. These effects are likewise consistent with the effects from potential construction and operational activities described in the FEIS and FSEIS for other fish species.

With regard to species protected under the Migratory Bird Treaty Act, Appendix B notes that project impacts upon bird species were thoroughly discussed in the FEIS and FSEIS, and concludes that new information in this area is consistent with the FEIS and FSEIS findings that the MPU projects would not have a significant adverse effect upon migratory birds. Neither the legal status of these species under federal law nor their biological status has changed over the last 4 years.

DECISION AND ORDER

Given the project modifications and new information discussed in Appendices A and B, the decision choices available for the FAA are either to refrain from further FAA actions, pending preparation of a SEIS, or to continue with those actions without preparing another SEIS.

Having thoroughly reviewed the Appendix A and B reevaluation documents, along with pertinent portions of the documents they reference, I have concluded that the recent MPU project modifications and the new information concerning environmental impacts do not affect the quality of the human environment in a significant manner or to a significant extent not already considered. I have, therefore, concluded that there is no significant new information warranting preparation of new SEIS.

I have further determined that the certification prescribed by 49 U.S.C. § 44502(b), that the projects approved in the July 3, 1997, ROD are reasonably necessary for use in air commerce, along with the subsidiary orders and determinations therein, will neither be reconsidered, nor their effectiveness stayed, for further environmental review.

Therefore, under the authority delegated to me by the Administrator of the FAA, I find that the preparation of another SEIS is not warranted at this time, and I direct that the FAA continue to implement the agency actions/approvals specified in Section III of the 1997 ROD, without further NEPA documentation or supplementation.

L. Andriesen

Lawrence B. Andriesen
Regional Administrator
Northwest Mountain Region
Federal Aviation Administration

8-8-01

Date

RIGHT OF APPEAL

This decision constitutes the Federal approval for the actions identified above and any subsequent actions approving Federal funding for the Port of Seattle. Today's decision is made pursuant to 49 U.S.C. Subtitle VII, Parts A and B, and constitutes a Final Order of the Administrator, subject to review by the courts of appeals of the United States in accordance with the provisions of 49 U.S.C. § 46110.

APPENDIX A

RE-EVALUATION OF AIRPORT ACTIVITY AND CHANGES TO THE MASTER PLAN UPDATE

AT

SEATTLE-TACOMA INTERNATIONAL AIRPORT

July 20, 2001

RE-EVALUATION OF AIRPORT ACTIVITY AND

CHANGES TO THE MASTER PLAN UPDATE

AT SEATTLE-TACOMA INTERNATIONAL AIRPORT

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I. BACKGROUND AND NEED FOR RE-EVALUATION

On May 13, 1997, the FAA approved the *Final Supplemental Environmental Impact Statement (Final Supplemental EIS) for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport.* The SEIS supplemented the Final Environmental Impact Statement dated February 9, 1996 (FEIS). A Record of Decision (ROD) was subsequently signed on July 3, 1997, providing final approval for those FAA actions necessary to support the proposed Master Plan Update projects. The Master Plan environmental documents describe four needs at the Airport and the corresponding actions necessary to satisfy those needs: 1) a third runway (a new 8500-foot dependent air carrier runway), 2) a 600-foot southerly extension of existing Runway 16L/34R, 3) expanded runway safety areas for Runways 16R and 16L, and 4) certain terminal and landside improvements scheduled to be completed through the year 2010.

FAA Order 5050.4A Paragraph 102 establishes time limitations for environmental impact statements. Among other provisions, subparagraph 102b states with respect to Final EIS's:

> If major steps toward implementation of the proposed action (such as the start of construction, substantial acquisition, or relocation activities) have not commenced within 3 years from the date of approval of the final statement, a written reevaluation of the adequacy, accuracy and validity of the final statement shall be prepared. If there have been significant changes in the proposed action, the affected environment, anticipated impacts, or proposed mitigation measures, a new or supplemental environmental impact statement shall be prepared and circulated.

A Written Reevaluation is not required if "major steps toward implementation of the proposed action" have occurred. Steps considered "major" under Order 5050.4A "Airport Environmental Handbook" include start of construction, substantial acquisition, or relocation activities. The FAA has reviewed the actions taken by the Port of Seattle (Port), the owner and operator of the Airport, to implement the projects included within the approvals in the Final Supplemental EIS and the ROD. The following summarize those actions:

A. Steps Toward Implementation Since July 3, 1997.

Between July 3, 1997 and June 1, 2001, the Port has acquired about 240 acres of land to implement the Third Runway and associated projects (including Taxiway C, connecting taxiways, taxiway filets), at a total cost of $143 million; 319 residential units have been demolished and 34 moved off-site, and all occupants of 483 residences have been relocated to other dwellings. The cost of demolition and relocation for the runway since July 3, 1997 total $3.7 million. Approximately 95% of the property to be acquired for the project has been acquired and about 3 million cubic yards of earth fill material has been acquired and deposited at the Airport for the Third Runway embankment at a cost of $48 million. This fill constitutes approximately 20% of the total fill required for the runway. Of these amounts, approximately $46.7 million was funded by FAA grants.

Virtually all of these steps would be of little or no value to the Port, or to the national air transportation system, if the runway and associated projects are not completed and operational.

In addition, construction on the following elements of the terminal and landside projects have been initiated: the southern expansion of the main parking garage; expansion of the main terminal, improvements to the main garage and garage access, expansion of the A Concourse, completion of the new North Employee Parking Lot, completion of aircraft parking hardstands in the cargo area, infrastructure in anticipation of other planned improvements, etc. The cost of this construction between July 3, 1997 and the date of this document is approximately $365,000,000.

In total, the Port has expended about $498 million of the total $2.6 billion Master Plan Update projects. The Port has acquired almost all of the land required for the project at substantial cost, has cleared the land and relocated the residents. The Port has moved approximately 20% of the total fill needed for the runway and has already constructed elements of the airfield improvements that will serve the new runway. Such steps toward implementation are "major" and sufficient under Paragraph 102b to make a Written Reevaluation unnecessary.

B. Need for Written Reevaluation

Paragraph 103 of FAA Order 5050.4A states:

> "In addition to the requirement for a written reevaluation due to circumstances arising under paragraph 102, the responsible official should exercise judgment on when a written reevaluation is appropriate in other circumstances to evaluate the continued validity of an environmental document. The preparation of a new EIS, FONSI, or supplement is not necessary when it can be documented that: the proposed action conforms to plans or projects for which a prior EIS or FONSI has been filed; the data and analysis contained in the previous EIS or FONSI are still substantially valid; and that all pertinent conditions and requirements of the prior approval have been or will be met in the current action."

The FAA has continued to monitor the progress of the Port of Seattle development through regular interactions at levels ranging from monthly coordination meetings, site visits, and project specific coordination, to reviews of materials submitted by the Port of Seattle. The FAA has reviewed the data, analysis and conditions presented in the FEIS and FSEIS and found them to remain substantially valid. Further, changes in proposed development projects at Sea-Tac conform to the Master Plan Update, upon which the Final EIS and FSEIS were prepared. Further, the Port has continued to meet all pertinent conditions and requirements noted in the FAA's ROD.

The FAA concludes that under the standards of paragraph 103 of Order 5050.4A, a Written Reevaluation is not required.

Upon gaining access to acquired lands where previous requests for access had been denied, the Port identified additional wetlands that would be affected by the proposed project. While the number of wetlands affected has increased over that which was presented in the Final EIS and FSEIS, the conclusions regarding the impact of the project on wetland resources remains substantially valid. As is documented in the FAA's re-evaluation concerning biological issues, the wetland impact analysis presented in the Final EIS and FSEIS remain substantially valid.

Nevertheless, the FAA has prepared this Written Reevaluation. The FAA is aware that the Master Plan Update projects are highly controversial in some communities near the Airport. Although the City of SeaTac, in which the Airport is located, has accepted the Master Plan Update projects, certain other units of government near the Airport have not, and continue to oppose these projects. In light of this controversy, the FAA has elected to prepare this document.

* * *

It is important to note that the Council of Environmental Quality's (CEQ) "NEPA's Forty Most Asked Questions" response to question 32 contains further clarification on NEPA's intent relative to Supplements to old EISs:

> "As a rule of thumb, if the proposal has not yet been implemented, or if the EIS concerns an ongoing program, EISs that are more than 5 years old should be carefully reexamined to determine if the criteria in Section 1502.9 compel preparation of an EIS supplement.
>
> If an agency has made a substantial change in a proposed action that is relevant to environmental concerns, or if there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts, a supplemental EIS must be prepared for an old EIS so that the agency has the best possible information to make any necessary substantive changes in its decisions regarding the proposal. Section 1502.9(c)."

This Written Reevaluation has been prepared because more than three years have elapsed since the Final Supplemental EIS was approved, per FAA Order 5050.4A, but not more than the five years noted by CEQ. This Reevaluation evaluates the current validity of the Final EIS and Final SEIS in light of subsequent events and current conditions, all as provided in Order 5050.4A.

II. ISSUES RELATING TO CONTINUED VALIDITY OF FINAL SUPPLEMENTAL EIS

The FAA has re-evaluated the adequacy, accuracy and validity of the FEIS/SEIS. The question in this document is whether any new information significantly affects the analysis of environmental impacts of the projects. With the passage of time, it is to be expected that some of the data in an EIS will not match subsequent actual experience exactly, and that new information will become available. That is true with respect to the FEIS/SEIS. However, the questions are whether the new information or changes in the project would significantly change the kind or extent of environmental impacts, and whether new or different mitigation of environmental impacts would be required. If the environmental impacts of the projects would not be significantly different in light of new information, there is no reason to undertake a supplemental EIS.

The FAA has re-evaluated the validity of the Final Supplemental EIS in light of the following events and circumstances that have occurred since the Final Supplemental EIS was issued in May 1997:

A. Variance between actual activity levels at the Airport and the levels forecast in the Final Supplemental EIS. In addition, the implications of the 2000 Terminal Area Forecast (TAF) were considered;

B. Modifications to the Master Plan Update projects; and

C. Information regarding cumulative impacts.

The FAA has reviewed each of these issues to determine whether it would require a new or supplemental EIS.

A. Activity Levels

A primary reason that the FAA prepared the 1997 Supplemental EIS was the rapid growth in air travel demand that had been experienced at Sea-Tac Airport during the 1990s. As a result, the FAA examined how actual activity at the Airport has occurred in comparison with the Master Plan Update forecasts, as well as more recent forecasts prepared by the agency.

1. Background and Current Situation

a) Master Plan Update Activity Levels

The Final Supplemental EIS used the following forecasts of future activity at the Airport for 2000, 2005, and 2010:

TABLE 1

COMPARISON OF FSEIS DO-NOTHING TO "WITH PROJECT" ACTIVITY LEVELS

Primary Forecast

	Total Passengers		Total Operations	
Year	Do Nothing	With Project	Do-Nothing	With Project
2000	27,400,000	27,400,000	409,000	409,000
2005	31,400,000	31,400,000	445,000	445,000
2010	35,800,000	35,800,000	460,000	474,000

Source: Final Supplemental EIS, Page 2-14

Contingency Forecasts (Final Supplemental EIS Appendix D)

	Total Passengers		Total Operations	
Year	Case 1	Case 3	Case 1	Case 3
2010	35,800,000	35,800,000	474,000	521,400
2020	44,600,000	49,060,000	532,000	585,200

Appendix D, Final Supplemental EIS, With Project activity.

The Final Supplemental EIS Appendix D also contained supplemental estimates of environmental impacts for purposes of considering the environmental consequences of a contingency forecast. That Appendix recited the difficulty of making reliable forecasts for future years, particularly for distant years. It is particularly difficult to assign a specific activity level to particular future years. Although an airport may be expected to reach particular forecast levels eventually, it is difficult to predict the precise year in which that will occur. As a result, FAA's guidance on performing forecasts (as will be noted in the following section) suggests that airport planning focus on future activity levels rather than particular future years.

In light of the fact that a Supplemental EIS was being prepared because activity had varied over earlier predictions, and that activity is difficult to accurately predict, the appendix was prepared to contain a "what if" the new forecasts were also less than actual. Three cases were examined. Case 1 reflected the Supplemental EIS forecasts, with a linear extrapolation through 2020. Case 2 reflected a 10% increase in each respective year over the Supplemental EIS forecasts. Case 3 was the same as Case 2, but in the case of the Do-Nothing, assumed that the terminal and landside facilities could not accommodate the passenger demand beyond 2010.

b) Recent Actual Levels and the FAA's Terminal Area Forecast (TAF)

Since the Final Supplemental EIS, the Airport has experienced operations that are somewhat greater than expected in the primary forecasts. For 2000, the Airport handled 446,066 operations, the operations total expected by the Final Supplemental EIS to initially occur in 2005. Passenger enplanements, however, have not grown as fast as operations. In 2000, the Airport accommodated 28.4 million passengers. The Final Supplemental EIS enplanements forecasts are generally consistent with the actual experience at the Airport in the intervening years, as the FSEIS evaluated 27.4 Million annual passengers (MAP) versus actual of 28.4 MAP. The difference between the growth rate for the number of passengers and aircraft operations appears as a result of how the airlines are responding to the growth in passenger demand – by providing more frequent service with smaller aircraft.

The FAA has continued to issue annual updates of its Terminal Area Forecasts (TAF), as was acknowledged in the Final EIS and Final Supplemental EIS. The TAF is prepared using different methods than the Master Plan Update forecasts, and the Final Supplemental EIS explains why the Master Plan Update forecasts were considered by the FAA to be more appropriate than the TAF for purposes of that environmental impact analysis. The Master Plan Update Final Supplemental EIS forecasts relied more heavily on actual local conditions, whereas the TAF relied more heavily on national trends, with the result that the Master Plan Update forecasts were somewhat lower than the TAF forecasts.

In preparing this evaluation, the FAA considered the most recent actual activity levels as well as the most recent (2000) Terminal Area Forecast. These are as follows:

Year	Total Passengers	Aircraft Operations
1999 Actual	27,700,000	434,425
2000 Actual	28,400,000	446,066
TAF 2005	33,805,000	485,740
TAF 2010	39,746,000	529,060
TAF 2015	45,687,000	572,400

Actual: Port of Seattle, TAF Downloaded from the Internet on 1-13-01

When considering the need to supplement the FSEIS, the FAA has compared the year 2000 TAF with the 1996 TAF that formed the basis for determining the need to prepare the FSEIS. This comparison shows:

Year	2000 TAF Total Passengers	2000 TAF Aircraft Operations	1996 TAF Total Passengers	1996 TAF Aircraft Operations
1999 Actual	27,700,000	434,425		
2000	28,400,000	446,066	27,840,000	433,474
TAF 2005	33,805,000	485,740	32,580,000	468,053
TAF 2010	39,746,000	529,060	37,900,000	528,205
TAF 2015	45,687,000	572,400	NA	NA

For the year 2010, the two TAFs are less than 0.2% different (855 operations) from an aircraft operations perspective and less than 5% from a total passenger perspective. In 2005, the passenger difference is less than in 2010, while the operations differ by 3.8%. These differences are very small, particularly in the most distant future (2010), the FAA finds that there is not a significant difference between the two TAF forecasts.

During the preparation of this re-evaluation document, the FAA began internal coordination of the 2001 TAF. As part of the initial review, the FAA Washington DC office distributed national information to its local offices and seeks feedback. The initial data set for Sea-Tac indicates that the 2001 TAF will likely use lower growth rates (2000 TAF used 1.8% whereas the 2001 TAF may use 1.58%) than were used in the 2000 TAF. As a result, the TAF projection of 572,400 annual operations in 2015 may be lowered to 562,500 in the 2001 TAF. The 2001 TAF would reflect the slower economic conditions now affecting the country.

The FAA has reviewed the Final Supplemental EIS explanations of the differences between its forecasts and the TAF and has concluded that the same conditions continue to exist. The TAF is a useful guide to projected airport activity, but is not adjusted to the specific conditions at the Airport. The FAA continues to consider the local forecasts more specifically applicable to the Airport for environmental impact analysis purposes.

Further, the 2000 TAF was prepared in mid 2000, based on conditions preceding that period. Since that time, national and local economic conditions have begun to slow. As a result, activity at Sea-Tac has also begun to slow such that growth in aircraft operations and passenger activity has declined and leveled-off. During the first five months of 2001, air travel activity has been less than 2000. Even accounting for the effect of the February 28, 2001 earthquake in Seattle, which for a short period severely affected the control tower and ability to process arriving and departing operations, total passengers and operations are less than the comparable periods in 2000.

As was noted in the FSEIS, the quantity of air travel demand is based on population, per capita income, and the cost of air travel. Both the cost of air travel and per capita income have been affected by recent economic conditions – the cost of fuel has increased substantially and the availability of discretionary income has decreased.

FAA believes that it is reasonable to use locally developed forecasts for purposes of environmental evaluations of specific local improvements. As has not been uncommon in the past, airport activity has been known to grow in a fashion that graphs as stairs – growing and then leveling off for a period before additional growth. Therefore, the FAA does not place any additional weight on the 2000 TAF in comparison to the 1996 FSEIS forecasts; particularly since the 1996 TAF (upon which the need to prepare the FSEIS is based) and 2000 TAF are very similar, as noted earlier. However, to aid in understanding the probable environmental consequences of these forecasts, this written re-evaluation discusses (in "2. Environmental Consequences") the probable impact of the 2000 TAF.

c) Other Issues

Table 2 contrasts the current (2000) TAF with the Master Plan forecast as well as the contingency analysis presented in Appendix D of the Final Supplemental EIS. While the FAA's terminal area forecast is greater than was considered in evaluating the Master Plan forecast, it is lower than the contingency analysis presented in Appendix D through 2005. Post 2005, the TAF is slightly greater than the contingency forecast.

As **Table 2** shows, the difference in aircraft operations between the 2000 TAF and the Master Plan Update forecast is less than the difference between the Appendix D comparison against the forecast; the TAF activity level is embraced generally by the Case 3 analysis.

After comparing the two activity level projections, several issues were considered:

- FAA Guidance on Forecast Comparisons
- Capability of the existing airfield
- Activity and Capacity with the Third Runway
- Forecasting beyond a 10 year period

TABLE 2
Comparison of TAF, Master Plan and Final Supplemental EIS Contingency Forecasts

Year	*2000 TAF*	*Master Plan Update Forecast*	*Contingency FSEIS Appendix D Case 1*	**TAF compared to Forecast (Case 1)**	*Contingency FSEIS Appendix D Case 3*	**TAF compared to Contingency Forecast (Case 3)**
2000	442,420	409,000	409,000	33,420	449,900	-7,480
2005	485,740	445,000	445,000	40,740	489,500	-3,760
2010	529,060	474,000	474,000	55,060	521,400	7,660
2015	572,400	NA	503,000	69,400	553,300	19,100
2020	NA	NA	532,000	NA	585,200	NA

The following briefly summarize these issues

FAA Guidance on Forecast Comparisons: The FAA has issued guidance concerning forecast comparisons in only two specific areas. For purpose of environmental analysis, the FAA requires revisions to some environmental analysis if actual or new forecast activity levels are more than a certain percentage different from those relied upon for the initial analysis. For instance, if an airport's forecast is 10% or more different than the TAF, documentation is required to reconcile the difference or a supplemental analysis is performed.[1] The previous text documents the FAA's consideration of the 2000 TAF relative to activity evaluated in the FSEIS.

For Part 150 Noise Compatibility Planning purposes, the FAA uses a 15% difference in actual activity relative to modeled conditions to justify the need to perform an updated noise analysis. The FAA has chosen for noise purposes the 15% rule, as this level of activity ensures that any change in noise is less than the 1.5 DNL (Day-Night Average Sound Level) threshold of significance used by the FAA.[2]

The 2000 TAF operations level is about 11% greater than the Case 1 forecast for 2010 (the level considered in Chapter 5 of the FSEIS) and 14% greater than the 2015 Case 1 extrapolation. The 2000 TAF is less than 4% greater than the condition evaluated in Appendix D (Case 3) for 2015. While the TAF projection is slightly greater than the 10% FAA guide, the FAA has considered the differences, as documented in this re-evaluation. First, the 2000 TAF for operations is 0.2% greater than the 1996 TAF that led to the development of the FSEIS. Second, actual condition in late 2000 and early 2001 are producing lower airport operations than occurred in 2000. As the 2000 TAF was prepared when national economic conditions were better than the current conditions producing less air travel demand, it is likely that the next TAF will reflect lower air travel projections that are more in line with the 1996 TAF and/or FSEIS forecast.[3] Finally, the FSEIS considered a contingency forecast which is within the 10% FAA guidance range. For these reasons, the FAA believes that the difference between the 2000 TAF and the FSEIS forecasts does not warrant further environmental review.

Capacity of Existing Airfield: In preparing the forecasts for the Final Supplemental EIS, future demand was first identified. To consider the level of activity associated with the Do-Nothing (without the Third Runway), the operating capability of the existing airfield was assessed. The operating capability of the existing airfield was based on the 1992 Flight Plan Study EIS that found that the maximum *theoretical* capacity of the existing airfield is 460,000 operations, assuming that operations are extended into the late evening and early morning and that greater levels of delay would be experienced. Overlaying the delay curve relative to then current delay conditions, the Final Supplemental EIS re-validated the estimate of the existing airfield operating capability at 460,000 annual operations; it also noted that

> "To calculate an extreme capacity of the existing airfield at Sea-Tac, this hourly capacity could be multiplied by the number of hours in a day, and days in the year. Theoretically, 481,800 operations would be accommodated, reflecting that air travel demand is typically concentrated into a 16 hour period (6 am to 9 p.m.) based on today's fleet mix and passenger demand profile." Page II-9

1/ FAA Order 5100.38A Change1 provides guidance for approval of aviation forecasts. Paragraph 428(a) indicates that "FAA should review sponsor forecasts to ensure they are realistic and provide an adequate justification for the airport planning and development. The study should include data supporting the forecasts, including information that can be used as a basis to update the Terminal Area Forecast (TAF). When the forecast is different from the TAF (differences of 10 percent and more, or any difference that affects timing and/or cost of development in the NPIAS/ALP) differences must be resolved with APO-110 and/or the sponsor. If the variance does not result in such change, then the FAA may accept the forecast without further coordination."

2/ A 15% increase in activity relative to a base condition would produce less than 1.0 dBA change in noise. The 15% change is noted in the FAA Part 150 Checklist for Noise Exposure Maps (NEM III.B.). This change in sound is based on the mathematical equation 10*Log (new activity/old activity).

3/ Based on the lower growth rate expected to be included in the 2001 TAF, it is likely that the 2001 TAF for Sea-Tac will be within the 10% difference criteria used by the FAA.

When considering the consequences of not adding a Third Parallel runway, the FAA must consider how the air transportation system at Sea-Tac and in the region would evolve to accommodate the anticipated increases in air travel demand. If the Third Runway were not completed at Sea-Tac, it is reasonable to assume that the FAA would take actions (such as air traffic instrument procedures and possibly actions involving the locations of navigation aids), to enable more landings to occur during poor weather. While the only prudent alternative to addressing the total poor weather problem is the development of the Third Runway; other technological improvements, as documented in the Final EIS and FSEIS, could be implemented that would increase the poor weather capability in a limited extent. For purposes of this evaluation, only those actions that would occur without the Third Runway were considered.

The Third Runway would increase arrival processing capability, which during good weather (VFR1) is 60 arrivals an hour, by 20% during VFR2, 40% during IFR1, and 60% during IFR2/4 (Table I-3 FEIS). It is reasonable to assume that without the Third Runway, actions such as the Localizer Directional Aid (LDA) approach would be instituted. An LDA would improve the ability to land during VFR2 conditions at Sea-Tac but would not affect landings during IFR conditions; the net benefit would be an increase of about 6.5% on an annual basis from an LDA. In addition, other technological improvements may occur toward the forecast horizon of 2010 that would also incrementally increase the number of hourly landings during poor weather. Technologies that may be available in later years, coupled with LDA, could increase the overall operating capability of the existing two runway system at Sea-Tac from the 460,000 predicted in the FEIS/FSEIS to in excess of 500,000 operations. Together these actions would be expected to increase the operating capability of the two runway system. Precisely how much higher than 500,000 would depend on the aircraft fleet mix at the time, technology, and weather conditions in any respective year.[4/]

<u>*Activity and Capacity With the Third Runway*</u>: Because actual activity levels for 2000 will exceed the Final Supplemental EIS forecast activity levels for 2000, the FAA has considered whether forecast levels for 2010 are also too low. The FAA must determine whether such higher growth rates will continue through 2010 and require an adjustment of the 2010 "With Project" forecast. If so, the difference between the *with* and *without* levels could be larger than forecast in the Final Supplemental EIS with a resulting difference in some categories of environmental impacts.

The Master Plan Update forecast demand to reach 35.8 million annual passengers and 474,000 annual aircraft operations by 2010, the end of the planning horizon. Appendix D's contingency forecasts examined conditions beyond 2010 for three conditions. Case 1 examined a linear interpolation from 2010 conditions to predict

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4/ In June 2001, the FAA issued "Airport Capacity Benchmark Report 2001" which characterized Sea-Tac's existing delay conditions as "while only about 1% of all flights at Seattle are delayed more than 15 minutes from their estimated flight plan arrival time, the airport operator emphasizes that almost a third of airline flights arrive more than 15 minutes later than scheduled." The reference to 1% of flights delayed more than 15 minutes is reference to the OpsNet data that quantifies the number of flights that are delayed more than 15 minutes during any one of four operating phases. FAA Washington DC has readily noted that the FAA does not maintain delay data in a way that clearly quantifies delay associated with specific conditions. As a result, existing operational capability is often assessed using OpsNet data, as well as the Airline Service Quality Performance (ASQP). ASQP data for Sea-Tac indicates that 33.3% of arrivals arrived more than 15 minutes late. When conducting planning for airport improvements, simulation data, such as that used by the Capacity Enhancement Plan are used. Simulation models enable the quantification of average delay per aircraft operation, and enable the identification of conditions that led to delay.

conditions in 2020. Case 2 and 3 then examined activity levels and environmental conditions, if activity were 10% greater than the Case 1 conditions.

The Final Supplemental EIS recites the difficulty of making long-range airport activity forecasts.[5] The factors that made precise forecasts for 2010 and 2020 difficult in the Final Supplemental EIS still affect forecasting. After review of the actual activity levels since 1997, the TAFs for the intervening years (including the 2000 TAF), and the factors affecting operations at the Airport, the FAA has concluded that a new forecasting effort would be unlikely to provide a new forecast that would materially change the environmental impact analysis of the Final Supplemental EIS. The environmental consequences of these differences are considered in a following section.

As is shown in **Table 2**, the Case 3 activity levels for 2010 is within 4% of the 2000 TAF (TAF is 529,060 operations versus Case 3 at 521,400). The TAF is 11% greater than the Master Plan forecast of 474,000. While the passenger levels are much more closely related, the annual aircraft operations differs primarily due to assumptions concerning commuter aircraft operations. Based on a review of the two activity projections, and difficulty in predicting how the commuter markets will evolve, the FAA has determined that the differences alone do not warrant conducting additional environmental review.

Support from Area Airports: The Final EIS, which preceded the Final Supplemental EIS and remains the basic environmental document analyzing the impacts of the projects, also recognized that other airports in the region might begin to serve commercial air travel demand. The FEIS states:

> It is recognized that commercial air service at an existing airport in the Region could be initiated at any time. It is likely that such air service would be by a charter or niche carrier (cargo, low-cost, etc.). However such activity would not materially affect the demand at Sea-Tac and the resulting facility needs. Low-cost operators have historically initiated new service at an airport with 30 or less aircraft operations. As such, this would represent less than 3 percent of Sea-Tac's current daily aircraft operations – and would likely amount to less than 1 million enplanements a year (10 percent of Sea-Tac's enplaned passengers). FEIS, Page II-9

The FAA is aware that carriers have from time to time investigated initiating commercial air carrier service from Boeing Field or Paine Field, and is also aware that on occasion certain operations have been relocated to Boeing Field to avoid restrictions at Sea-Tac Airport. It is therefore likely, as the Final EIS recognizes, that if the Third Runway is not built and demand for air travel in the region continues to grow, that not only would air traffic control instrument procedure actions be undertaken to satisfy demand, but some portion of that demand would be served by one or more other airports.

An examination of the Master Plan's for both Boeing Field and Paine Field indicate that both airports anticipate commercial passenger service in the future. The Master Plan underway for Boeing Field includes 9,000 passenger aircraft operations accommodating 77,000 passengers in 2010 and growing to 10,200 operations in 2015 with 89,300 passengers. The Paine Field forecasts examined several scenarios, ranging from 176,000 passengers in 2009 to 1,014,000 passengers. By 2014, Paine Field estimated a range of 192,000 passengers to 1,106,000 passengers. The forecast adopted for use in the Paine Field Master Plan was the low end of the range with

5/ See Final Supplemental EIS, p. D-1 – D-3

176,000 annual passengers and 10,100 annual operations in 2009 or 192,000 passengers and 11,000 operations in 2014. Thus, within the planning horizon, it is possible that as many as 19,100 annual passenger aircraft operations could be accommodated at existing airports within the region.

Based on the anticipated strong growth in air travel demand, Sea-Tac's role as the sole commercial passenger service airport, and a probable limitation in the operating capability of Sea-Tac, it is reasonable to assume that the airlines will continue to serve the passenger demand. Such service could realistically include continued evolution of the demand profile at Sea-Tac to accommodate greater levels of passenger and aircraft activity coupled with initiation of limited passenger service at one of the region's existing airports. The Final EIS and Final Supplemental EIS anticipated this probability as noted.

Forecasting Conditions Beyond a 10-year period Remains Uncertain: The Final Supplemental EIS contained a detailed description of the difficulties with preparing forecasts of aviation activity. Since the issuance of the Final Supplemental EIS, the FAA has issued its TAF each of the three years, and in each year the forecasts have been changed to reflect the most recent conditions affecting the aviation industry. Since the issuance of the 2000 TAF, aviation activity across the country increased initially, but began to flatten off as a result of several conditions, including a slowing of the national economy, increased congestion in the aviation system, and increases in fuel cost which caused an increase in the cost of air travel. Because these conditions began in the latter part of the second quarter of 2000, it is uncertain as to their effects on actual activity levels and on future TAFs.

* * *

The FAA has reviewed the new (2000) TAF and the actual activity at the Airport since 1997 to determine whether this new information is sufficient to require a new EIS or another supplemental EIS. The FAA has considered the statement in Order 5050.4A that "a supplement is not required if the only change is the development of additional data, provided such data are not in conflict with the environmental document." Paragraph 104b. A new or supplemental EIS will be required only if "the contents of the original document are no longer applicable, adequate, accurate or valid."

Therefore, the FAA's review focused on two issues: (i) whether the forecasts in the Final Supplemental EIS are still substantially valid, and (ii) whether the data and analyses of environmental impacts are still substantially valid. If the FAA determines that a new set of forecasts either would not produce substantially different numbers for either of the forecast years, or that any differences in forecasts would not substantially affect the analysis of environmental impacts, a new or supplemental EIS is not required.

2. Environmental Consequences

Because activity levels at Sea-Tac have increased faster than was considered in the Final Supplemental EIS, and because of the discussion in the preceding section, the FAA considered the environmental consequence of an additional scenario. In considering these issues, the FAA focused on the difference in activity levels that would be accommodated with the proposed projects versus the activity that would be accommodated without the projects.

As was noted in the preceding section, the only new forecast that has been prepared for Sea-Tac is the FAA's Terminal Area Forecast. Therefore, for purposes of this re-evaluation the 2000 TAF is being used to define the With Project condition.

TABLE 3

COMPARISON OF TAF-BASED DO-NOTHING TO "WITH PROJECT" ACTIVITY LEVELS

	Total Passengers		Total Operations	
Year	Do Nothing	With Project (TAF)	Do-Nothing	With Project (TAF)
2000	27,400,000	27,400,000	420,700	420,700
2005	33,805,000	33,805,000	485,740	485,740
2010	39,746,000	39,746,000	500,000	529,060

Source: FAA, based on issues documented in this re-evaluation
Note: The 2010 Do-Nothing condition assumes that demand is continued to be served in the region, with the significant portion being accommodated at Sea-Tac Airport in accord with the theory articulated by Dr. Richard DeNeufville as documented in the FEIS page II-10.

Comparing the data shown in **Table 3** for the With Project to the Do-Nothing, indicates that Sea-Tac (and possibly an existing airport in the region) would likely continue to accommodate the passenger demand. However, Sea-Tac Airport would likely not be able to accommodate the 2010 air traffic demand (operations). The Final Supplemental EIS noted that in 2010 Sea-Tac could not accommodate about 14,000 annual aircraft operations (474,000 operations with project and 460,000 without project) but could accommodate the entire passenger demand, through spreading the peak and increasing load factors/aircraft sizes.

Using the TAF data and current operating conditions, Sea-Tac would likely continue to not be capable of accommodating about 29,060 annual aircraft operations in 2010. Approximately 19,100 of these operations could occur within the region at airports such as King County International Airport or Snohomish County Airport (Boeing Field and Paine Field respectively), leaving about 9,940 operations not accommodated. Similar to the evaluation performed for the Final Supplemental EIS, it is reasonable to assume that the passenger demand could continue to be accommodated through increased load factors and spreading of the off-hour peaks.

This re-evaluation considered the environmental consequences of the TAF. Three primary environmental factors are affected by the level of activity at Sea-Tac Airport: a) aircraft noise and land use, b) air quality, and c) surface traffic conditions. The following briefly summarize how current activity levels would affect these factors.

a) <u>Noise and Land Use</u>

Noise impacts depend to a considerable degree on operations levels. The FAA has considered whether the potential differences in activity levels described above may produce significant difference in noise impacts of the Master Plan Update projects. The FAA has considered both whether the noise analysis in the Final Supplemental

EIS is still substantially valid, and whether the mitigation program required by the Final Supplemental EIS is sufficient to mitigate impacts of the projects even if the potential differences in activity levels occur.

As is noted earlier, the higher activity projections of the TAF are less than the 15% threshold used by FAR Part 150 to develop official noise exposure maps for an airport. Based on FAR Part 150 guidance, no additional noise exposure analysis would be required and the contours prepared for the FSEIS would remain valid. This 15% rule used by the FAA was established because a 15% change in activity would increase aircraft noise exposure by 1.0 DNL, which is less than the 1.5 significance threshold used by the FAA in its NEPA evaluations.

Further, the Final Supplemental EIS contains an analysis of noise impacts for operations levels considerably higher than those in the main text of the Final Supplemental EIS. Appendix D assumed a 10% greater growth rate than the main text, and calculated noise impacts for 521,400 operations in 2010. In 2010, the Final Supplemental EIS shows the following population affected by DNL 65 or greater noise:

2010 Without Project	11,940
2010 With Project	13,220
2010 Case 3 contingency w/ project	15,340 (Appendix D Table D-2)

The difference in impacted population between the two cases (main text and contingency case 3) is 2,120 people.

The Port has recently updated its noise exposure contours through the Part 150 Study process and found that noise has not decreased as rapidly as was anticipated in the FSEIS. The Part 150 Study showed, however, that substantial reductions are still anticipated, as noisier aircraft (MD80 and F-28) are transitioned out of the fleet at Sea-Tac. Therefore, while the exact magnitude of total people affected by aircraft noise today is greater, substantial decreases in the future are still anticipated. More importantly, the comparison of *With Project* to *Without Project* would remain the same and mitigation is required in the FSEIS/ROD.

The population and housing units affected by 521,400 operations are already covered by the Port's noise mitigation commitments to the FAA in the Final Supplemental EIS. The noise mitigation program was designed to cover noise impacts exceeding those projected in the Final Supplemental EIS, should they occur.

> Following commencement of operations on the new runway, but prior to the year 2010, the POS [Port] and the FAA will undertake a further supplemental evaluation of noise and land use impacts anticipated after the year 2010. . . . Following completion of that evaluation, if significant additional adverse environmental impacts are found, the Port of Seattle will be required to adopt further noise and land use mitigation measures designed to minimize any significant adverse affects [sic] found in that evaluation. ROD, 21

The FAA found that such additional mitigation is feasible. The FAA further determined that "even if the maximum additional adverse environmental effects estimated in Appendix D should occur, it would still make the decisions set forth in this ROD and would approve the projects, subject to the special condition with respect to additional mitigation." ROD, 22

The FAA considers the mitigation commitments of the Port sufficient, in light of the ROD, to mitigate all of the impacts of any such higher growth.

It is important to note that in response to the FSEIS and the PSRC Expert Panel review of noise conditions at Sea-Tac, the Port undertook an unprecedented Part 150 Study for the purpose of collecting data to improve the credibility of the noise modeling process. Airport operational data and noise measurements were taken over a 12-month period. Based on this data, improvements in the accuracy of the noise modeling process were identified and incorporated into the Part 150 Noise Study contours. While these changes in the noise exposure contour process change the characterization of noise conditions for each existing and future condition, it would not significantly change the comparison of the With Project and Do-Nothing condition. Based on the Part 150 noise contours, which are larger than the EIS contours, the mitigation would continue to be necessary upon commissioning the runway as was described and depicted in the FSEIS. It is likely that additional homes along the northwest corner of the existing noise remedy program boundary would require sound insulation; these properties are included in the ROD mitigation commitment for insulation.

It is also important to note that had the noise model calibration data been available at the time that the EIS was prepared, that data would have been reflected in the FEIS/FSEIS noise contours. FAA EIS guidance does not require the collection of such data, and at the time of the analysis neither the FAA nor the airport operator expected that actual annual data would differ from the default information imbedded in the noise model. See Attachment A, page A-4 for further discussion of the changes made during the Part 150 to the modeling data. However, in response to public input, the Port conducted the Part 150 (a study which as was expected by the EIS) to address these public concerns. The Port is in the process of updating the noise exposure maps to reflect this new information. The FEIS and FSEIS acknowledged that the Port would undertake an update of its Part 150. In addition, the FSEIS deferred refinement of the approach transition area acquisition to the Part 150 Study. Because of these issues, and the ROD requirement to update the contours upon commissioning the runway and to mitigate any now unforeseen impacts, the FAA believes that the Part 150 Study contours do not make the EIS contours invalid.

As noted earlier, the FAA is requiring the Port to develop a new noise analysis upon commissioning the runway and to identify mitigation based on actual operational characteristics. In light of this commitment, the FAA believes that developing additional noise contours at this time in response to the 2000 TAF is unwarranted and could be misleading, because of the changing conditions that can not be predicted at this time.

b) <u>Air Quality</u>

In preparing this Re-evaluation the FAA must consider whether the finding made under the conformity provision of the Clean Air Act remains substantially valid. The ROD concluded that the projects would not exceed the de-minimis thresholds for general conformity, and would conform to the Washington State Air Quality Implementation Plan. In evaluating emission in the FSEIS, emissions were categorized as operating, which included the operation of airport sources upon completion of projects, and construction, the emissions associated with the construction activity. As that analysis showed, the primary project-related emissions occur during construction. With the project changes discussed above, the project will not exceed de minimis thresholds or cause any significant air impacts that were not fully discussed in the SEIS.

Relative to the operating emissions, one of the primary considerations in evaluating air quality and conformity with the SIP is differences in the level of activity between the With Project and that of the Do-Nothing. In preparing the FSEIS, in 2010 the With Project was found to accommodate 14,000 annual aircraft operations more than the Do-Nothing (with the project 474,000 annual aircraft operations, and 460,000 operation under the Do-Nothing). Because the higher level of activity with project is accommodated in a much more efficient manner, air emissions (particularly for nitrogen oxides) are less with project than without. Therefore, when considering the TAF activity, the differences between the With Project and Do-Nothing from an activity and efficiency perspective must be considered.

For evaluation purposes, the 2000 TAF projections of 529,000 annual operations for 2010 would reflect the With Project, or regional air travel demand. Under this scenario, a Do-Nothing scenario must be postulated. The FAA believes that with a higher demand, several scenarios might exist: 1) all of the demand could be accommodated at Sea-Tac, with an associated extreme delay condition (about 64 minutes of average arrival delay versus 13 minutes with project); or 2) some portion of demand could be accommodated at Sea-Tac, with the remaining accommodated at other airports in the region. While slight differences in air emissions could occur with either scenario, the differences would be minor, approximately equal to that already addressed in the FSEIS. As was noted in an earlier section, while higher levels of activity are predicted by the TAF (in comparison to the FSEIS), it is likely that the region (through Sea-Tac or another airport) would accommodate a growing portion of that demand. For operating emissions, it is believed that emission benefits will continue to be achieved with the implementation of the proposed Master Plan Update projects relative to the Do-Nothing/No Build, as air travel demand will continue to be accommodated within the Puget Sound Region.

As was discussed in Appendix B of the FSEIS (Conformity evaluation), construction emissions represent the potential to exceed the de-minimis threshold. As is noted in the Port's response to comments in the Clean Water Act Section 404 process, the Port has continued to monitor its compliance with its de-minimis commitments in the FSEIS and ROD. The Port has evaluated its annual construction emissions and shown that the de-minimis thresholds will not be exceeded. To further confirm this compliance, the FAA has obtained a written commitment from the Port to prepare annual submittals demonstrating its de-minimis compliance, and thus, has no new information that would indicate that the Port or the proposed projects would not meet the Clean Air Act conformity requirements. The FAA will make this annual submittal a requirement of the Port's grant agreements. Therefore, relative to all direct and indirect emissions, conformity would continue to be met in the 2010 period.

Conformity analysis through 2010 was sufficient for purposes of the SEIS and was accepted by the US Court of Appeals. It remains the appropriate timeframe for this Reevaluation. The conformity requirement is not a general regulatory provision, but is limited to ensuring that federal activities do not interfere with the effectiveness of state implementation plans. The Seattle region currently is in attainment for ozone, and subject to a maintenance plan that regulates air quality through 2010. The regional clean air agency (Puget Sound Clean Air Agency) is currently revising its emissions inventory for the maintenance plan and the Port anticipates that the emissions for Sea-Tac Airport will reflect current regional growth, airport growth and anticipated airport development. The FAA has concluded that the de-minimis threshold would not be exceeded through the foreseeable future and this determination is sufficient to satisfy the requirements of the Clean Air Act.

For the period after 2010, the State of Washington must revise the maintenance plan. The maintenance plan itself provides for revision: "Such a revised SIP will provide for an additional ten years of maintenance." 61 FR 50441. Under this statutory mandate, the federal, state and regional air quality agencies will review current emissions data, which will include emissions estimates based on Airport activity at that future time, and updated forecasts of future Airport activity for the period after 2010. The revised plan will have to include whatever measures are deemed appropriate by the air quality agencies to ensure continued compliance with national air quality standards. Because the Airport, with the Master Plan Update projects, is already included in the Metropolitan Transportation Plan, all of its projected activity in the air and on the ground must be accommodated in the updated plan. USEPA must approve the revised plan. The updated plan will not require reliance on the Port's written commitment to the FAA.

c) **Surface Traffic Conditions**

In examining the effect of higher levels of airport passengers on surface traffic conditions, a comparison was made against the Master Plan traffic levels for the year 2000 with the levels evaluated for the base condition for 1999/2000 for the ongoing Joint Transportation Study (JTS -- the study funded by the City of SeaTac and Port of Seattle for purposes of examining traffic conditions in the airport vicinity).

A comparison of traffic levels along six roadways was conducted as shown in **Table 4**: International Boulevard (SR 99), North Airport Expressway, Air Cargo Road, South 160th Street, South 170th Street and South 188th Street. The Master Plan Update Final Supplemental EIS found intersections along many of these roadways to be heavily traveled, and in many circumstances with poor levels of service (LOS D or worse).

A comparison of the more recent JTS data shows that the Master Plan Update Final EIS and Final Supplemental EIS used very conservative (high traffic levels) when assessing surface traffic conditions in comparison to what has actually occurred on these roadways.

Actual traffic levels were less on all roadway segments, with the exception of four segments: a) North Airport Expressway from SR 518 to the terminal; b) Air Cargo Road from S. 160th to Airport Expressway; c) Air Cargo Road from North Expressway to S. 170th, and d) South 170th Street from Air Cargo Road to North Expressway. All of these segments are in the same general vicinity, and appear to reflect the greater number of passengers using the on-airport roadway system. Further, while slightly greater actual traffic has occurred on these roads, the FEIS and FSEIS noted that traffic conditions were and would continue to be relatively good, except at Air Cargo Road and S. 170th. At Air Cargo Road/S. 170th, the Port and City of SeaTac have proposed a signalized intersection (as was noted in the FSEIS), independent of the Master Plan to resolve low levels of service. Therefore the carrying capacity of these roads is capable of accommodating the slightly higher traffic levels. It is important to note that surface traffic on off-airport roadways is consistently less than was predicted.

Therefore, despite the higher levels of actual airport activity, surface traffic conditions on area roadways have not worsened in proportion to the increase. Rather, the increases in airport activity have not produced commensurate increases in surface traffic levels. Because the existing conditions for most roadways were over predicted in the FSEIS, it is reasonable to assume that conditions that might be associated with a TAF level of future activity have already been accounted for in the evaluation prepared for the FSEIS. For the few roadways/intersections where actual traffic is greater than evaluated in the FSEIS, the slight differences would not have a material effect on traffic flow given the carrying capacity of the existing roads. Thus, it is reasonable to assume that the traffic conditions evaluated in the Final Supplemental EIS, by virtue of being conservative/over-predictive, have identified adequately actual traffic conditions and conditions associated with the 2000 TAF. Based on the surface traffic conditions, no further analysis would be warranted, as the traffic analysis in the FSEIS is substantially valid.

Table 4

Comparison of Actual to Projected Surface Traffic
(Average Daily Traffic Levels)

Roadway From/To	**Actual 1999/2000 JTS**	**FSEIS 2000 W/o project**	**FSEIS 2000 W/ Project**
International Boulevard/SR 99			
State Route 518 to S. 160th Street	33,000	43,600	42,900
S 160th Street to S 170th Street	27,500	36,600	35,500
S. 170th Street to S 176th Street	35,000	39,800	38,300
S 176th Street to S 180th Street	32,500	47,700	45,800
S 180th Street to S 188th Street	39,500	62,100	59,900
S 188th Street to S 192nd Street	37,000	53,600	51,500
Northern Airport Expressway			
State Route 518 to Terminal	58,100	56,100	55,400
Air Cargo Road			
S 154th Street to S 160th Street	9,700	12,100	12,400
S 160th Street to North Airport Expy	12,400	9,600	9,600
North Airport Expy to S 170th Street	13,500	12,500	12,400
South 160th Street			
Air Cargo Road to International Blvd	8,300	10,900	10,700
South 170th Street			
Air Cargo Road to North Airport Expy	12,500	12,600	12,300
North Airport Expy to International Bl	14,400	16,100	15,800
South 188th Street			
28th Ave S to International Blvd	24,500	28,700	27,200
International Blvd to Military Road	31,700	36,900	34,500

Source: Port of Seattle

B. Modifications to the Master Plan Update Project

As with any airport development project, refinements are made in the plan as projects move from planning documents to design and construction. In the case of the long-range Master Plan Update improvements, a number of refinements were identified subsequent to the preparation of the Final Supplemental EIS. These include:

- Revisions to the Concourse A expansion to enable an additional gate and to provide a six story office complex – this project also was modified such that the existing Delta Hangar was demolished, with a new hangar to accommodate Northwest Airlines.
- Implementation of a Hydrant Fueling System for the existing terminal and future terminals
- The Construction Only Temporary Interchange from SR 509, Modifications to the Third Runway Embankment and Retaining Wall, and Other Matters
- Expansion and improvements to the Industrial Waste System (IWS)
- Expansion of the South Electrical Substation;
- Expansion of the Main Terminal (North Esplanade) and Satellite Transit System (STS)
- Development of an Air Cargo Plan, which reinforced the Master Plan recommendations and recommended the development of a secure bridge from the existing north cargo area to the warehouse area north of SR 518 (warehousing recommended by the Master Plan);
- Refinements to the Auburn Wetland Mitigation Program;
- Temporary aircraft overnight parking on taxiways recommended by the Master Plan;
- Development of landscaping design standards

All of these projects were processed under the Washington State Environmental Policy Act (SEPA) as either Determinations of Non-Significance, Mitigated Determinations of Non-Significance or addendums to the Master Plan Update EIS. As a result, their impacts are either minor or have been mitigated. The FAA has reviewed these project SEPA documents, as noted in Attachment A to this re-evaluation, and determined that these projects are either a) design changes that are not significant or do not produce significant new information or environmental consequences, b) categorically excluded under the National Environmental Policy Act (per FAA Order 5050.4A, paragraph 23), or c) were adequately addressed in the Final EIS/Final Supplemental EIS. The cumulative effect of these projects, in combination with the Master Plan Update projects, are discussed in the following section.

C. Cumulative Impacts of Project Modifications and Changes in the Surrounding Environs

As would be expected, since publication of the Final EIS and SEIS, more detailed information has become available on other projects in the vicinity of the Airport. In response to comments concerning cumulative impacts, the Port has prepared a detailed review of cumulative impacts as documented in their response to public comments on the Clean Water Act Section 404 permit (See General Response GLR19). The FAA has reviewed that response and much of the underlying non-airport documentation and generally concurs with the Port's review. That response is included by reference and shows that while a clearer definition of the non-airport projects have been prepared, no significant cumulative impacts are expected to occur.

III. CONCLUSION

Consistent with the requirements of 40 CFR 1508.7 and 40 CFR 1502.9, the FAA has taken a systematic "hard look" at the new environmental information and planned changes in elements of the Master Plan Update. FAA Order 5050.4A, Paragraphs 102b and 103 were considered. Relative to Paragraph 102b, the FAA has reviewed the status of the project. As is shown in this re-evaluation, the project is substantially underway. Relative to paragraph 103, three considerations were made: a) proposed action conforms to the plans for project upon which the FEIS/FSEIS was prepared, b) the data and analysis in the FEIS/FSEIS remain substantially valid, and c) all pertinent conditions and requirements of the prior approval have been or will be met.

As is shown in this re-evaluation, the project changes conform to the project upon which the FEIS/FSEIS is based. Further the re-evaluation shows that the data and analysis in the FEIS/FSEIS is substantially valid. Finally, the FAA has reviewed the Port's actions since issuance of the ROD. The Port has either implemented or has plans to implement all of the conditions and requirements of the ROD (such as Best Management Practices, air emissions evaluations, conduct of the Part 150, continued sound insulation, and implementation of acquisition and relocation processes). The FAA has considered the significance of the new information that has been developed for these projects and evaluated the information for potential cumulative impacts with those impacts identified in the Port's Master Plan Update Final EIS, Final Supplemental EIS and supporting environmental documentation. In each case, and collectively, the new information and the effects of the projects are either not significant or are not substantially greater than what had been reported previously.

The FAA has concluded that major steps toward implementation of the Project have occurred. A second supplemental EIS would not show significantly different impacts of the Project.

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ATTACHMENT A

NEPA CONSIDERATION OF OTHER PORT PROJECTS

Since publication of the FEIS and SEIS, the Port has conducted refinements to elements of the Master Plan Update and identified additional projects that are necessary. This appendix presents the FAA's examination of the impact of these projects relative to the National Environmental Policy Act. In all cases, except where noted, the Port has completed an environmental review of the project per the requirements of the Washington State Environmental Policy Act (SEPA). As this appendix shows, none of these projects are expected to cause significant adverse impacts individually or in combination with the Master Plan Update projects.

1. South SeaTac Electrical Substation Upgrade

This project will expand the capacity of the existing South SeaTac Substation by constructing a new substation next to the existing one and installing approximately 1.2 miles of 115kV high transmission lines on segments of South 188th Street and 28th Avenue South. The Port completed a SEPA checklist and made a Determination of Non-Significance (DNS) for this project.

The proposed substation project will not affect airport activity (either aircraft or surface transportation) upon completion of the project. As a result operation of the project will have no impact on noise, land use compatibility, social impacts, induced socio-economic impact, air quality, DOT 4(f) lands, historic/architectural/archaeological and cultural resources, endangered species of flora and fauna, floodplains, coastal zone management and/or coastal barriers, wild and scenic rivers, farmland, light emissions, and solid waste.

The project will have a slight effect on water quality, biotic communities (plants and animals), wetlands, and energy supply and natural resources, and will generate short-term construction impacts. However, these impacts are not expected to be significant and are expected to be concentrated on airport lands. As is described in the Port's SEPA checklist supporting its determination of non-significance, two shrub and forested wetlands are located 50 feet south and 50 feet east of the proposed substation site. The wetlands south of the site contain both forested and emergent wetland habitats. Groundwater seepage into the wetlands during the wet season maintains the area as a wetland. The wetlands lack any distinct surface water inlet or outlet features. The wetlands are small in size, have been subjected to recent disturbance, and have limited biological diversity. No structures will be constructed within 65 feet of the wetlands, and measures to minimize erosion, and off-site sediment transport will be implemented. The project will have a benefit to the electrical capability of the airport, by providing redundancy, but will not generate measurable additional electrical consumption.

2. South Terminal Expansion (Concourse A and related projects)

Much of this project was analyzed under the Master Plan Update FEIS and FSEIS, as Table 2-7 of the FSEIS notes "Expansion of Concourse A including expansion of Main Terminal at A". Changes to the terminal expansion proposal were discussed in the Port of Seattle's July 19, 1999 *South Terminal Expansion SEPA Checklist*, and considered in a Mitigated DNS dated July 19, 1999. The project will be constructed on a previously developed portion of airport property and is expected to include the following elements: Concourse A Extension, Office Tower Building, tenant supporting space, South Ground Transportation Lot, Remain Overnight Aircraft Parking, apron paving, demolition of existing Delta Airlines hanger and construction of a new Northwest Airlines hanger on the site, Northwest

Airlines flight kitchen, aircraft lavatory dump station replacement, and construction staging area. The project changes do not substantially alter the Master Plan EIS analysis of potential environmental impacts.

3. Expansion of the Main Terminal (North Esplanade) and Satellite Transit System (STS)

This proposal was analyzed in the May 13, 1997 Master Plan Final Supplemental EIS, as is noted in Table 2-7 as "Overhaul and/or replacement of the STS". The upgrade entails relocation of the existing north security checkpoint, construction of a new vertical circulation core, improvements to the satellite transit system, interior remodeling, and extension of the north end of the main terminal by approximately 75 feet. Project modifications are discussed in the August 23, 1999 SEPA Addendum. The modifications do not substantially alter the analysis of significant impacts described in the Master Plan FSEIS.

4. Upgrade and Expansion of Industrial Wastewater System (IWS) Lagoon #3

This proposal is to clean, line, expand and upgrade an existing wastewater system lagoon. The expanded lagoon will provide greater industrial wastewater storage capacity prior to treatment in the Port's Industrial Wastewater System Treatment Plant and allow for controlled discharge to the King County Metro Sewer line. The proposal received a SEPA Determination of Non-Significance on December 22, 1999. The Final EIS noted that the Port was preparing a Stormwater Management Plan for the airport, for which this was a recommendation of that study.

This project will occur adjacent to (but not in) the northern arms of Wetland 28 (the Northwest Ponds) and wetland IWSA/IWSB (north of the pond). Buffer impacts resulting from the project would be reviewed by the appropriate regulatory agencies and may require mitigation such as buffer averaging or replacement. Other than these impacts, the project would provide water quality benefits and, other than short-term construction impacts, would have no adverse impacts.

5. Aircraft Hydrant Fueling System (AHFS)

The AHFS proposal is to install a Jet A underground fuel line concurrent with the planned improvements to Concourse A. The AHFS would provide single source fuel delivery of Jet A fuel at the airport and a common infrastructure that would be used by all airlines. The AHFS would replace the current fueling operations (primarily truck deliveries) for most commercial passenger aircraft at the Airport. The Port issued a SEPA DNS for the project on October 6, 2000.

The Master Plan Update and FEIS/FSEIS noted that the Port was considering addressing the existing hydrant fueling system, but that no decision had been reached concerning that project. However, it noted that as new terminal facilities are built, such as Concourse A and the North Terminal, they would have hydrant fueling.

6. North Electrical Substation

The North Electrical Substation received a SEPA Determination of Non-Significance on June 2, 2000. This DNS was amended on March 6, 2001 to reflect minor project changes. As currently envisioned, the project involves upgrading and expanding the existing Bow Lake Substation, replacing the North SeaTac Substation with a smaller facility (the North Main Service Point) and installing an 1,800-foot, 12.5 kV underground cable system between the Bow Lake Substation and the new North Main Service Point.

The Bow Lake Substation will be rebuilt on property owned by Puget Sound Energy ("PSE"). The North Main Service Point will consist of switch-gear enclosed in a 25-foot by 60-foot building that is 15 feet tall. The building will be enclosed by a 50-foot by 100-foot fence. The North Main Service Point will be located just east of the south entrance to the Airport parking garage between the entrance booth and the northbound Airport circulation road. The proposed 12.5 kV cable system will extend along the north side of South 176th St., across International Boulevard and onto Airport property.

No wetlands or water bodies are impacted in the construction of this facility. Stormwater collected at the North Main Service Point will flow either into the Port's stormwater collection system or industrial waste system. Catch basins for both systems are located in the area.

7. Temporary Aircraft Parking-Taxiway Stubs

On October 25, 2000 the Port issued a SEPA Determination of Non-Significance to allow use of some existing Taxiways for aircraft parking until the taxiways are needed for the Third Runway. No maintenance or de-icing activities will occur to aircraft parked on the taxiways, and no impacts to aquatic resources are expected to occur from this activity. The development of the pavement to support the aircraft parking was considered in the Final EIS and FSEIS.

8. The Construction Only Temporary Interchange from SR 509, Modifications to the Third Runway Embankment and Retaining Wall, and Other Matters

In January 2000, the Port issued "*Addendum To Final Environmental Impact Statement and Final Supplemental Environmental Impact Statement For Proposed Master Plan Updat: Development Actions at Seattle-Tacoma International Airport*" under SEPA. This Addendum addressed new information relating to: (a) wetlands and other aquatic resources that would be affected by the planned new runway and other improvements at Seattle-Tacoma International Airport; and (b) potential impacts of temporary construction-related interchanges on SR 518 and SR 509 to be used by trucks delivering fill material to the planned new runway site. This Addendum was prepared by the Port to report the Port's assessment of the new information and its determination that the existing environmental analyses under the Washington State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA) remain adequate. This conclusion was based on the Port's findings that the newly discovered areas of adverse impacts to wetlands and other aquatic resources, and the potential impacts of the temporary construction interchanges, either were not environmentally significant, in light of project changes and mitigation measures, or were adequately covered by the analyses of wetland impacts in the 1996 FEIS and 1997 FSEIS.

This Re-evaluation discusses the consequences of the project relative to wetland impacts and shows that based on the FEIS/FSEIS the FAA believes that there is not the need to supplement the FSEIS. As the temporary construction interchanges were addressed in the FSEIS, and slight changes occurred in the design of the project element that do not create adverse effects, the FAA finds that there is no need to supplement the EIS based on that project.

9. Refinements to the Auburn Mitigation Program

On May 5, 2000, the Port of Seattle issued a SEPA addendum to the FEIS/FSEIS and to the August 1998 SEPA checklist for the Auburn Wetland Mitigation Project. The purpose of the addendum was to analyze the consequences to the mitigation of wetlands for the Master Plan Update projects. The addendum accounted for an increase in the wetland mitigation size and advanced the design of the mitigation site from a conceptual plan to a 60% design. As noted in the Addendum, the project design and increase in mitigation size did not "substantially change the analysis of significant impacts described in" the FEIS/FSEIS. Based on the FAA's review of the Addendum relative to NEPA, the analysis of the Auburn Mitigation site in the FEIS/FSEIS remains valid.

10. Part 150 Noise Compatibility Plan

In late 2000, the Port of Seattle completed its commitment to update its Part 150 Noise Compatibility Plan as noted in the Final Supplemental EIS and ROD, and formally submitted the Plan to the FAA in mid 2001. The scope of this study was undertaken to respond to comments raised during the Puget Sound Regional Council (PSRC) Expert Panel on Noise as well as comments received during preparation of the FEIS/FSEIS concerning the use of computer driven noise exposure contours. As a result, the Port commissioned the Part 150 Study to collect 12 months of airport operational and associated noise measurements for use in improving the accuracy of the FAA's Integrated Noise Model at Sea-Tac Airport.

The Part 150 study resulted in the preparation of two primary products:

- **Noise Exposure Maps**: The Port updated its existing (2000), 2005 and 2010 noise exposure maps for Sea-Tac after completing an extensive measurement program to validate the model's accuracy. **Table 5** shows that the contours prepared for the Part 150 Study are larger than those prepared for the EIS. This difference is attributed to:
  - A full year of aircraft noise and aircraft operational performance data was collected and used to calibrate the noise model specific to Sea-Tac Airport. A comparison was made between the departure climb profiles actually used at Sea-Tac with that provided in INM Version 5.2. The comparison showed that Stage 3 narrow body aircraft (for their representative stage length) actually climb slower than the INM was predicting. To more accurately represent the departure climb performance, the Part 150 contours used profiles associated with heavier aircraft (aircraft operating to a longer stage length). The departure climb stage length adjustment is the primary reason that the noise exposure contours are larger than was predicted in the FSEIS;
  - A new version of the Integrated Noise Model (the computer model used to evaluate aircraft noise – Version 5.2a was used in the Part 150 Study, while Version 4.11 was used in the EIS) became available after the FAA issued the ROD; and
  - The EIS fleet mix assumed a different fleet mix (aircraft types) versus what is actually occurring, such as Alaska Airlines' planned discontinued use of F-28's.
- **Noise Compatibility Plan**: The Port has submitted to the FAA's its recommended Plan that expands upon the operational and land use recommendations reflected in the Final Supplemental EIS.

The Noise Compatibility Plan continues to reflect the Port's commitment to mitigate noise impacts within the designated noise contours, which is consistent with its commitment in the Final EIS.

Because the conduct of the study was recognized and directed, to some degree, by the FSEIS, the FAA believes that the conclusions do not warrant the preparation of an additional supplemental EIS. The ROD commitment to develop new noise exposure contours once the runway has been commissioned provides the maximum assurance that any project-related impacts will have been mitigated by 2010.

The Port issued a SEPA Determination of Non-Significance for the Part 150 Noise Compatibility Plan on October 20, 2000. The Plan is part of the Port's Noise Remedy program, the goal of which is to reduce aircraft and ground noise at the Airport, reduce noise impacts on the greater Seattle area, and encourage land uses that are compatible with anticipated aircraft noise exposure. The Plan recommends conducting additional studies including a siting study for the Ground Run-up Enclosure, a siting study for noise walls, recommended changes to runway use and flight tracks, acquisition of mobile home parks, sound insulation of schools, and compatible land use planning by local communities.

Table 5
Comparison of Noise Impacts
Final Supplemental EIS versus the Part 150 (population)

	65-70 DNL	70-75 DNL	75+ DNL	65+ DNL
Final Supplemental EIS				
Existing (1996)	26,230	5,570	0	31,800
2000	10,330	950	30	11,310
2005	9,640	700	100	10,440
2010	11,960	1,070	190	13,220
2000 Part 150				
Existing (1998)	30,600	7,100	0	37,700
2005	10,140	2,560	0	11,700
2010	14,960	360	0	15,320

11. Development of Landscaping Standards

Section IV.24 "Aesthetics and Urban Design" of the FEIS contains a discussion of the conceptual landscaping envisioned in the Master Plan Update for the airport. Subsequent to the Master Plan Update, the Port prepared landscape design standards that represent minimum requirements and provide a clear and concise set of regulations to be use for all exterior development at Sea-Tac. These standards are consistent with the Master Plan and will improve the aesthetic quality of future airport facilities. Based on a SEPA checklist, the Port rendered a DNS for the standards in August 1999. Based on the FAA's consideration of the SEPA checklist, the landscaping standards do not create any significant adverse environmental consequence and the analysis in the FEIS/FSEIS remains valid.

12. Air Cargo Development Plan (ACDP)

In 1999, the Port of Seattle completed an air cargo development plan that refined elements of the Master Plan Update relative to the north cargo area. To comply with SEPA, the Port prepared a programmatic evaluation of the project, but at this time does not have any specific construction plans. The ACDP is a 10-year development plan for facilities and actions recommended to meet the needs of existing air cargo customers at Sea-Tac Airport. Master Plan Update elements included in the ACDP are: purchasing of airport leases to allow redevelopment in the north cargo area, constructing four aircraft hardstands in the north cargo area, constructing freight warehousing in the north cargo area, preparing a site development plan for property north of SR 518 (the "L-shaped parcel"), and redeveloping Port building 313 for air cargo, constructing mail processing and transfer facilities. Items not included in the Master Plan Update include: constructing a non-public bridge across SR 518 (adjacent to the existing 24th Ave. S. bridge), and constructing a ground support equipment storage area. Development of the L-shaped parcel north of SR518 could increase impervious surface because the parcel is currently undeveloped. In addition, preliminary information indicates the presence of wetlands on the site. At the time that the Port pursues development of these non-Master Plan Update projects, the FAA will consider what, if any, additional NEPA evaluations are required.

13. North End Development Project

The North End Development Project (NEDP) is in the initial planning stages by the Port and would cover primarily the area north of the existing main terminal. It is the FAA's understanding from Port briefings, that the project builds on and includes the Master Plan Update improvements to construct a North Unit Terminal (which is currently being called the North End Terminal). The Port continues to define the elements of this project, and as a result, the FAA has not been presented with a plan for review and/or approval. Thus, consideration by the FAA of the NEDP relative to NEPA is not ripe. When the FAA has been presented with a plan for review and approval, the FAA will conduct the appropriate NEPA evaluation.

14. Water System Improvements

The Port proposes to construct water system improvements, including a two-million gallon reservoir, expansion of an existing booster pump station, and other improvements to the fire and domestic water distribution systems at Airport. The reservoir will be constructed on Port-owned land on Host Road, west of the Washington Memorial Cemetery on the east side of the Airport. This location is about 350 feet south of the existing water tower. Construction of the reservoir will involve relocating utilities and the east west portion of Host Road to a point approximately 100 feet north of the new reservoir.

15. Miscellaneous Airport Projects

The following projects are at various stages of the design and planning process. At this time, it is not possible to identify the impacts of the project or to determine, for those projects that were included in the Master Plan Update, how their final design/plan would alter conditions identified in the EIS. These projects include:

- **SASA (South Aviation Support Area):** A final design for the facility has not been completed and the Port is continuing to work on the amount of each proposed use. There are no new environmental documents for SASA. Final evaluations of the SASA facility will take into account the SR509/South Access project and the buffering of Des Moines Creek.
- **TRACON (Terminal Approach Control)**: The Master Plan Update FEIS and FSEIS evaluated this project as being located at the base of the new air traffic control tower that is under construction. Since the completion of that study, the FAA has determined that a site on-airport is not necessary and is conducting a siting evaluation, which is investigating a 19-acre potential site at 8th Ave. and 160th Street. The FAA will prepare all requisite environmental analysis for the final site.
- **ASDE (Airport Surface Detection Equipment)**: The Master Plan Update EIS evaluated placing the ASDE on top of the air traffic control tower. Since that time, the FAA has learned that there are performance issues associated with locating this type of radar close to buildings. The FAA is currently conducting a siting study for this facility, which to date has determined that the location on top of the new tower could pose visibility issues. Upon selection of a final site, it is expected that the Port will conduct an additional SEPA review, and the FAA will complete any requisite NEPA documentation.
- **Airport Surveillance Radar (ASR-9):** To complete the Third Runway requires the relocation of the existing ASR-9, which is presently located west of the existing runway system. Relocation of the ASR-9 was considered in the FEIS/FSEIS through the review of nine possible sites. The FAA has selected Site 3, at Eighth Place (170th Avenue) and Eighth Avenue South. The radar antenna will be elevated at the site by 160 feet. This will be

accomplished with a 160-ft non-standard tower, or by a standard 45-ft tower placed on fill. The site consists of about 1.1 acres and would have two access points, with the main access being from Eighth Place. On March 15, 2001, the FAA (Seattle NAS Implementation Center) issued a re-evaluation of this project per the FEIS/FSEIS. This project was included in the Biological Assessment (BA) prepared for the Services, and upon which the Services rendered an opinion/concurrence as documented. No wetland impacts would occur. Based on the evaluation of Site 3, the FAA determined in its re-evaluation titled "Re-Evaluation Seattle-Tacoma International Airport Master Plan Update Environmental Impact Statement, Relocation of Airport Surveillance Radar-9" that the project consequences noted in the FEIS/FSEIS remain valid.

- **Approach Lighting with Sequential Flashers (ALSF) for 16L:** Installation of the ALSF-2 on Runway 16L was included in the Master Plan Update FEIS/FSEIS. The Port of Seattle (POS) conducted field investigations for wetlands in the area between March 1998 and October 2000 as access to individual parcels was obtained during the POS property acquisition phase. This field investigation determined that approximately 10 acres of wetland in three distinct locations were present north of Runway 16L.

The typical ALSF-2 structures consist of lights mounted upon individual towers set into the ground and secured with stabilizing cable guy lines. Because the location of the ASLF-2 is fixed in relation to the landing threshold of the runway, the standard design would have required placement of several tower foundations and stabilizing guy line anchors within the wetlands. To avoid disturbance to the wetlands a span-arch frame was designed to provide a mounting platform for the ALSF-2 lights in their proper location while avoiding the installation of tower foundations or guy line anchors in the wetland areas. The foundations for the span-arch will be located outside the wetlands on their north and south borders. The span-arch will be fabricated off-site, assembled on-site and set into place in a single piece spanning the wetland areas. The remainder of the ALSF-2 lights required in locations outside the wetlands will be installed upon individual towers.

APPENDIX B

RE-EVALUATION OF IMPACTS TO BIOLOGICAL CONDITIONS FROM THE MASTER PLAN UPDATE IMPROVEMENTS AT SEATTLE-TACOMA INTERNATIONAL AIRPORT

JULY 20, 2001

RE-EVALUATION OF IMPACTS TO
BIOLOGICAL CONDITIONS

FROM THE MASTER PLAN UPDATE IMPROVEMENTS

AT SEATTLE-TACOMA INTERNATIONAL AIRPORT

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RE-EVALUATION OF IMPACTS TO ENDANGERED SPECIES OF FLORA AND FAUNA FROM THE MASTER PLAN UPDATE IMPROVEMENTS AT SEATTLE-TACOMA INTERNATIONAL AIRPORT

I. INTRODUCTION AND SUMMARY

Since the publication of the Final Supplemental EIS (FSEIS) in May of 1997, and the issuance of the Record of Decision on July 3, 1997, the National Marine Fisheries Service (NMFS) and United States Fish and Wildlife Service (FWS) have listed as threatened or endangered, two species of fish that are known to exist in streams and other waters in the Puget Sound that have the potential to be affected by actions at Seattle-Tacoma International Airport. The purpose of this Re-evaluation is to document the FAA's consideration of the new information concerning biological conditions in the area of Seattle-Tacoma International Airport (Sea-Tac Airport) relative to the FAA's duties under the National Environmental Policy Act (NEPA). In addition, this document identifies additional new wetlands affected by the project, as well as Migratory Bird Treaty Act issues.

The Fish and Wildlife Service (FWS), a division of the Department of Interior, and the National Marine Fisheries Service (NMFS) in the Department of Commerce, share responsibility for administration of the Endangered Species Act (ESA). Generally, NMFS possesses ESA jurisdiction over species that spend a majority of their lives in marine environments (e.g., anadromous salmonids), while FWS is responsible for terrestrial and freshwater species and migratory birds. NMFS also administers interpretation of the Magnuson-Stevens Fishery Conservation and Management Act, including Amendment 14 provisions for Essential Fish Habitat.

A species may be classified for protection as "endangered" when it is in danger of extinction within the foreseeable future throughout all or a significant portion of its range. A "threatened" classification is provided to those animals and plants likely to become endangered within the foreseeable future throughout all or a signification portion of their ranges. A "species" includes:

- any species or subspecies of fish, wildlife, or plant
- any variety of plant; and
- any distinct population segment of any vertebrate species that interbreeds when mature.

Excluded is any species of the Class Insecta determined by the Secretary to constitute a pest whose protection under the provisions of the ESA would present an overwhelming and overriding risk to humans. In applying the definition of "species" to anadromous salmonids, NMFS considers a group of salmonid populations to constitute a species for purposes of listing if such populations are (a) reproductively isolated from other conspecific populations; and (b) if such populations represent an important component of the evolutionary legacy of the biological species. NMFS defines its listing unit as an "evolutionarily significant unit" or "ESU."

Once a species or critical habitat has been proposed for inclusion on a list of endangered or threatened species, a notice is published in the Federal Register. The public is offered an opportunity to comment, and the rule is finalized or withdrawn. Species and critical habitat are listed as threatened or endangered on the basis of the "best scientific and commercial data available" considering biological status, threats to existence, and probable recovery. FWS and NMFS (the Services) maintain a list of "candidate" species that are under review for potential listing.

Since issuance of the FSEIS and Record of Decision, additional wetlands were found on the property acquired for the third runway embankment. Two Puget Sound fish species and critical habitat were listed as threatened and essential fish habitat was designated. Chapter 2 of this report summarizes the contents of the FSEIS on these issues, as well as identifies new information that has arisen.

The FSEIS and Record of Decision identified that the Master Plan Update projects would require the fill of 12.23 acres of wetland. The evaluation of wetlands conducted for the FSEIS was based on restricted access to the properties that were to be acquired. The FAA's EIS contractor had requested access to these properties in order to delineate the wetlands, but was not granted access until acquisition was initiated and in some cases complete. Upon access to the properties, additional wetland acreage was identified, such that the project would require the filling of 18.37 acres. While the quantity of wetlands increased, the nature of the impacts is the same and no new environmental consequences were identified.

The Final EIS and FSEIS considered the effect of the Master Plan Update projects at Sea-Tac on the marbled murrelet (*Brachyamphus marmoratus*), which were not found present in the action area. In 1995, a Biological Assessment was prepared for bald eagle and peregrine falcon that determined that the Master Plan Update projects may affect, but were not likely to adversely affect these species. Consultation was initiated in 1995 with FWS who concurred with the determination on December 6, 1995. FWS and NMFS have listed several new species that may occur in the vicinity of Sea-Tac Airport, including the threatened Coastal/Puget Sound bull trout (*Salvelinus confluentus*), and threatened Puget Sound chinook salmon (*Oncorhynchus tshawytscha*). Section 7 of the ESA requires federal agencies to ensure that their actions do not jeopardize the continued existence of endangered or threatened species, or adversely modify their critical habitat.

In April 2000, the FAA re-initiated consultation with the FWS and initiated consultation with NMFS concerning the impacts of Master Plan Update projects over which FAA possesses discretionary involvement or control. In accordance with section 7, the FAA, on behalf of itself and the U.S. Army Corps of Engineers (USACE) prepared a Biological Assessment (BA) for the proposed Master Plan Update action. [1] The BA for the Master Plan Update projects determined that the Master Plan Update actions over which the action agencies possess discretionary involvement or control may affect, but are not likely to adversely affect bald eagles, bull trout and chinook salmon. The BA further determined that under the range of anticipated conditions,

[1] In accordance with applicable regulations, the FAA assumed the role of lead federal agency for purposes of conducting ESA and Magnuson-Stevens Act consultation and designated the Port of Seattle as its non-federal representative for purposes of conducting these consultations. See 50 C.F.R. §§ 402.07-08 and 600.920(b)-(c).

the proposed action would have no effect on marbled murrelets; however, under unlikely circumstance, the proposed action may affect, but would not likely adversely affect this species. In accordance with section 7, the BA was submitted to the Services in June 2000. Supplements to the BA were submitted in November and December 2000 respectively to update the BA with further stormwater analysis information. On May 24, 2001, FWS issued a biological opinion finding in support of the conclusions of the BO. In its conclusions, FWS states:

> "After reviewing the current status of the bull trout, bald eagle, and marbled murrelet, the environmental baseline for the action area, the effects of the proposed MPUI, and the cumulative effects, **it is the FWS's biological opinion** that the MPUI, as proposed, **is not likely to jeopardize the continued existence of the bull trout, bald eagle or marbled murrelet.** We reached this conclusion on the basis that the proposed action is not likely to adversely affect these species, as discussed in the Effects section of this opinion.
>
> No critical habitat has been designated for the bull trout or bald eagle. Therefore, none will be affected for these species. Critical habitat has been designated for the marbled murrelet. However, the project does not occur within designated critical habitat, therefore none will be affected for this species."

On May 31, 2001, NMFS concurred with the BA's conclusions that the proposed action was not likely to adversely affect chinook salmon or its critical habitat. In its concurrence letter, NMFS states:

> "Effects of STIA projects were evaluated in terms of water quality, hydrology and habitat alterations for various locations within the action area. At several of these locations, chinook salmon do not occur. At other locations chinook occur seasonally or rarely. Consequently, the effects determinations are generally insignificant or discountable (Table 2).

TABLE 2. Summary of STIA Project Effects to Puget Sound Chinook Salmon

LOCATION	Fish Present	Water Quality	Hydrology	Habitat Alterations
Miller Creek	NO	Insignificant	Insignificant	Insignificant
Walker Creek	NO	Insignificant	Insignificant	Insignificant
Des Moines Creek	NO	Insignificant	Insignificant	Insignificant
Gilliam Creek	Rarely	Discountable	Discountable	Discountable
Green River (Mitigation site)	YES	Discountable	Discountable	Beneficial
Miller Creek Estuary	Seasonally	Insignificant	Insignificant	Insignificant
Des Moines Creek Estuary	Seasonally	Insignificant	Insignificant	Insignificant
Midway Sewer Outfall	Adults	Insignificant	Discountable	Discountable

> After reviewing the current status of the Puget Sound chinook salmon, the environmental baseline for the action area, and the effects of the proposed STIA actions, the **NMFS concludes that these actions may affect but are not likely to adversely affect Puget Sound Chinook or their designated habitat.**"

The Final EIS and the FSEIS disclosed the presence of these species in area streams. Those documents further disclosed the consequences of the project on these species. The biological opinion and concurrence issued by the Services does not contradict these earlier findings.

In addition to the recent listings of various species under the ESA, NMFS recently established requirements under the Magnuson-Stevens Fishery Conservation and Management Act for federal action agencies to consult over activities that may adversely effect designated Essential Fish Habitat (EFH). NMFS designated EFH for coastal pelagic fisheries and Pacific groundfish species, as well as several Pacific salmon species. In accordance with the MSA, the FAA, on behalf of itself and the USACE, prepared an EFH assessment in June 2000 analyzing the impacts of proposed Master Plan Update actions on designated EFH for pelagic fish species and determined that the Master Plan Update projects were not likely to adversely affect designated EFH. In September 2000, NMFS designated EFH for several species of salmon, including chinook, coho, pink, and chum salmon. In March, 2001, the FAA, on behalf of itself and the Corps, prepared a supplemental EFH analysis and determined that the Master Plan Update projects would have no effect on chinook or pink salmon EFH. The analysis further determined the proposed action may adversely affect coho salmon EFH in the short-term, but was not likely to adversely effect coho salmon EFH in the long-term.

Chinook and pink salmon have not been documented to occur in the Miller or Des Moines Creek basins upstream of their discharge with Puget Sound; therefore, construction and operations of the project will have no adverse effect on freshwater EFH of chinook or pink salmon in the Miller Creek or Des Moines Creek basins. Coho salmon are present within central and lower reaches of Miller, Walker, and Des Moines creeks and may be present in several areas where direct impacts could occur from construction of habitat improvements (e.g., installation of large woody debris, removal of rock weirs), and/or water quality alteration from turbidity, suspended sediment, or stormwater chemistry. When the potential effects of the proposed Master Plan Update improvements on the EFH of coho salmon in the project area were considered relative to the proposed conservation measures, the action agencies determined that the proposed action "may adversely effect" coho EFH in the short-term, but will be unlikely to adversely affect coho salmon EFH for the long-term and will actually prove beneficial to this species. On May 31, 2001, NMFS concurred with the EFH assessment for pelagic and groundfish species and noted "Information submitted by FAA in the BA is sufficient for NMFS to conclude that the effects of the proposed actions are transient, local, and of low intensity and are not likely to adversely affect EFH in the long-term." These findings are consistent with the 1996 Final EIS and 1997 FSEIS.

II. EXISTING NEPA DOCUMENTS

Several documents were prepared by or under the FAA's direction to comply with the National Environmental Policy Act (NEPA). These documents, which are herein incorporated by reference include:

- *Record of Decision for the Proposed Master Plan Update Development Actions at Sea-Tac International Airport*, July 3, 1997
- *Final Supplemental Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*, May 1997
- *Final Environmental Impact Statement for the Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*, February 1996

The following sections briefly summarize the contents of these documents relative to wetlands and threatened and endangered species.

A. 1996 FINAL ENVIRONMENTAL IMPACT STATEMENT (FEIS)

The 1996 Final EIS examined threatened and endangered species of flora and fauna, as well as plants and animals (including fisheries) in the airport area, and identified the effects of the project on conditions at that time.

(1) Threatened and Endangered Species of Flora and Fauna

The Final EIS noted the potential for use of the area of the proposed Master Plan Update alternatives by bald eagle, peregrine falcon, marbled murrelet, pileated woodpecker, and great blue heron, as well as several federal candidate species that were listed by the Services as of June 1994. Federal candidate species at that time that could potentially occur in the airport area were: bull trout, black tern, mountain quail, northern red-legged frog, northwestern pond turtle, and spotted frog. A BA was prepared in April 1995 for all federally listed, proposed, and candidate species, in consultation with the FWS Service, as was provided in the Final EIS in Appendix K (volume 3). The BA found that marbled murrelets were unlikely to be affected, as "appropriate habitat for these species does not exist" in the action area. On December 6, 1995, FWS concurred with the "not likely to adversely affect" finding made in the April 1995 BA. Based on that analysis, no significant impacts on threatened and endangered species were expected as a result of the proposed Master Plan Update.

(2) Biotic Communities (Plants and Animals)

The endangered species section of an EIS addresses the specific species of flora and fauna that are listed by the Services as threatened or endangered. A section entitled "Biotic Communities" or "Plants and Animals" is then prepared to disclose the project effects on species that are not threatened or endangered. When considering plants and animals, consideration was given to vegetation, wildlife, and fish and aquatic resources.

Approximately 40 percent of the study area considered by the analysis is occupied by Sea-Tac Airport and is characterized by frequently mowed grassland bisected by service roads and taxiways. This area provides little wildlife habitat value. Wildlife habitat surrounding the airfield consists of fragmented habitat, which is composed of forest, shrub, and grassland with scattered wetlands. These areas are subject to a variety of airport-related disturbances as well as increasing residential, commercial, and industrial development. The following paragraphs briefly summarize the findings of the Final EIS:

Vegetation: No rare plants, high-quality native wetlands, or high-quality native plant communities listed by the Washington Department of Natural Heritage Information System are located in the study area. Upland vegetative communities consist of grassland, shrub, deciduous forest, coniferous forest, and mixed deciduous/coniferous forest. Eight habitat types were distinguished: grassland, managed lawn, pasture, row crop, mixed shrub, coniferous forest, deciduous forest, mixed forest, mixed vegetation classes, and wetland. Seven streams were identified: Miller, Walker, and Des Moines creeks (including two un-named tributaries), Gilliam Creek, and the Green/Duwamish River.[2]

The primary effect on vegetation communities from the projects is construction that will result in the direct removal of vegetation. Loss of plant communities that offer limited habitat value, such as managed grassland, result in less of an adverse effect than loss of more complex vegetation associations, such as mature forests, wetlands and riparian zones.

Wildlife: Wildlife habitat within the Airport vicinity has been highly modified through urbanization and residential development. Much of the study area is protected from human and domestic animal intrusion through restricted access and fencing. Vegetation communities provide habitat for several species of terrestrial and aquatic wildlife. Wildlife diversity is generally related to the structure and plant species composition within these vegetative communities. When considering habitat value from a regional perspective, the relatively undisturbed vegetation communities in the area offer valuable habitat for wildlife.

Construction activities associated with the project would result in the displacement of wildlife species. Highly mobile animals such as large mammals and birds are able to move away from disturbances into nearby habitats. It is generally assumed, however, that these habitats are at or near carrying capacity and these animals would be required to compete for already limited resources. Less mobile animals such as small mammals, amphibians, reptiles, young animals, and nesting birds, would most likely perish during construction. Disturbance caused by construction activities may have an adverse impact on wildlife by disrupting feeding and nesting activities. Clearing and grading activities in the South Borrow Area, adjacent to the large forested tract that encompasses Des Moines Creek Park could have an impact on breeding wildlife. This habitat is used extensively by neotropical migrant and resident songbirds for breeding. Significant noise disturbance, especially in this relatively undisturbed area of the site, could cause birds to abandon their nests.

Construction activities could have adverse effects on wildlife populations in aquatic habitats. The Final EIS estimated that approximately 10 acres of wetland loss would occur as a result of filling and grading. A variety of small mammals and amphibians would be directly impacted by this loss because they rely on these areas for foraging, breeding, and over wintering habitat. Because of their limited mobility, these taxa would likely perish during construction activities. Many of the aquatic habitats have been previously degraded by activities such as construction, fuel spills, and refuse dumping. Exposing soil and removing vegetation could result in an increase in sediments and other non-point pollutants entering adjacent wetlands, contributing to further degradation of aquatic habitat. Many amphibian species are sensitive to pollutants, and water quality in aquatic habitats on the site may be a limiting factor for some of these species.

The conversion of one habitat type to another, such as forested tracts to managed grassland, can have a profound effect on the complement of wildlife species using an area. Loss of forested parcels in the study area would further stress those species dependent on forested habitats because these species would be displaced to similar habitats elsewhere. Increasing urbanization over the past 15 years has fragmented existing forested tracts and greatly reduced the area of forest habitat available for wildlife. The effects of habitat fragmentation on wildlife have been well documented for birds, but recent studies have been conducted with other taxa. In general, the number of species using a particular habitat decreases as the distance between patches of habitat increases (i.e., fragmentation of habitats typically results in loss of species). Studies with birds have shown that smaller patches of habitat, with proportionately more edge, may be associated with increased predation and nest parasitism.

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[2] Communication with Sandra Norwood, Washington Natural Heritage Program, Division of Land and Water Conservation. January, 1995.

The long-term effect of conversion of one successional habitat to another is a shift in the local carrying capacity. Species such as American robin, European starling, house sparrow, raccoon, opossum, and deer mouse that utilize grasslands and more urbanized habitats would likely increase after construction of the proposed Master Plan Update, and species that utilize older, more complex successional stages would experience population decreases due to habitat loss.

Fisheries and Aquatic Resources: Although urbanization has significantly altered channel morphology and fish habitat, Miller, Walker, and Des Moines Creeks continue to support populations of resident and anadromous fish and associated aquatic biota. Historically, Miller and Des Moines Creek basins supported large runs of coho salmon (*Oncorhynchus kisutch*) and perhaps small runs of chum salmon (*O. keta*).[3] Presently, both basins support only small runs of coho salmon, which appear to be maintained by annual releases of hatchery-reared fingerlings raised by the Des Moines Salmon Chapter of Trout Unlimited. Washington Department of Fish and Wildlife (WDFW) has not conducted any spawner surveys in either Miller or Des Moines Creeks since 1985; no spawning coho were observed in the 1985 survey.[4] The Des Moines Salmon Chapter of Trout Unlimited reported about 91 fish in a recent coho spawner survey conducted on Miller Creek.[5] There is no known chum salmon, Puget Sound pink salmon, or steelhead trout use of either creek system.[6,7] Barriers to upstream fish passage appear to limit salmon in Miller Creek to the area below the culvert at 1st Avenue S. (about 2.8 miles) and in Des Moines Creek to the area below S. 200th Street (about 2.5 miles).

In addition to anadromous fish, both Miller and Des Moines Creeks support resident populations of cutthroat trout (*O. clarki*) and pumpkinseed sunfish (*Lepomis gibbosus*).[8] Des Moines Creek also supports resident populations of rainbow trout (*O. mykiss*), bluegill (*Lepomis macrochirus*), black bullhead (*Ictalurus melas*), and largemouth bass (*Micropterus salmoides*). In addition, Miller, Walker, and Des Moines Creeks likely support small populations of native nongame fishes, including sculpin (*Cottus* sp.), and other nongame fishes introduced to the area. Electrofishing conducted in Des Moines Creek in four reaches (one downstream and three upstream of S. 200th Street) captured five rainbow trout, 13 bluegill, 17 black bullhead, and two largemouth bass.[9] Bluegill, bullhead, and largemouth bass appear to be restricted to the Northwest Ponds, Bow Lake and slower water habitats at the Tyee Valley Golf Course. In a recent (October 1994) electrofishing survey at seven locations on Des Moines Creek between Marine View Drive and S. 200th Street, a total of 50 salmonids were captured, including 48 cutthroat trout ranging from about 3 to 13 inches and two juvenile coho salmon.[10] Lengths of juvenile coho were not reported. Cutthroat trout were captured at all seven locations, but juvenile coho were captured only at the most downstream station. In addition, 14 pumpkinseed sunfish were captured, ranging from about 1.5 to 2.5 inches. The source of pumpkinseed sunfish, which were caught at six of the seven sampling locations, is likely Bow Lake and the Northwest Ponds upstream of S. 200th Street. Although no comprehensive population studies

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[3] *Catalog of Washington Streams and Salmon Utilization*. Williams, R.W., R.M Laramie, and J.J. Ames. Washington Department of Fisheries. 1975.

[4] Personal communication by EIS consultant with Joe Robel, Fisheries Biologist, Washington Department of Fish and Wildlife. August 8, 1994.

[5] Personal communication by EIS consultant with Allen Miller, Restoration Coordinator, Des Moines Salmon Chapter of Trout Unlimited. July 18, 1994.

[6] Personal communication by EIS consultant with Joe Robel, Fisheries Biologist, Washington Department of Fish and Wildlife. August 8, 1994.

[7] Personal communication by EIS consutlant with Phil Schneider, Fisheries Biologist, Washington Department of Fish and Wildlife. August 18, 1994.

[8] Personal communication by EIS consultant with Alan Johnson, Aquatic Scientist, Aquatic Resource Consultants, November 12, 1994.

[9] *South Aviation Support Area Final EIS*. Port of Seattle. 1994.

[10] Personal communication by EIS consultant with Alan Johnson, Aquatic Scientist, Aquatic Resource Consultant, August 18, 1994.

have been conducted on either creek, recent electrofishing surveys conducted on Des Moines Creek and limited observations made on Miller Creek suggested that these creeks support relatively small populations of salmonid and nongame fish species.

Potential construction impacts on fish and aquatic biota would be both short- and long-term in nature. If not effectively mitigated, erosion of exposed surfaces at construction sites could contribute to temporary increases in total suspended solids and sedimentation in Miller and Des Moines Creeks. As stated in the Final EIS: "Potential long-term impacts on fish and aquatic biota would result from planned fill activities." The Final EIS estimated that about 3,700 feet of Miller Creek and its tributaries would be realigned and relocated, including about 980 feet of Miller Creek and 440 feet of the tributary south of Lora Lake. This entire 980-foot section of Miller Creek is adjacent to the Vacca Farms and has a ditch-like character with a sandy bottom. About 200 feet of Des Moines Creek tributary 0377, a Class 3 intermittent stream, would require relocation to complete the extension of Runway 34R. The development of the South Aviation Support Area would require relocation of 2,200 feet of open channel of tributary 0377, a Class 3 intermittent segment of Des Moines Creek.

As stated in the Final EIS (IV.16-10) "Potential operational impacts on fishery and aquatic resources could also include adverse effects on water quality and water quantity (i.e., hydrology). Reduced groundwater recharge and reduced base flows could occur in Miller and Des Moines Creeks as a result of the proposed Master Plan Update alternatives. All new runway length options would result in increased impervious surface area, contributing to reduced groundwater recharge and possibly reduced base flows in the creeks. Reduced base flows, if significant, could adversely affect stream temperature and dissolved oxygen levels. Exceedingly high temperatures (above 70°F) and low dissolved oxygen (below 6 mg/L) could be lethal or have other adverse effects (e.g., reduced growth) on salmonids and other aquatic biota. It is unlikely that base flow reductions that could be caused by the "With Project" alternatives would contribute to lethal temperatures or dissolved oxygen levels because possible reductions would not be significant and reductions would be offset by mitigation.

B. FINAL SUPPLEMENTAL ENVIRONMENTAL IMPACT STATEMENT (FSEIS)

In May 1997, the Federal Aviation Administration (FAA) issued a FSEIS for the Master Plan projects based on new information that had arisen upon completion of the Final EIS in February 1996 and beginning their preparation of a record of decision. New information included new airport activity information, leading to a new phasing plan for the projects, as well as new information concerning the wetland effects of the Master Plan projects. Issues addressed in the FSEIS included: forecasts of aviation demand, impact of the forecasts on project purpose and need, impact of the forecasts on alternatives, updated affected environment, and the environmental consequences of this new information. The environmental disciplines that were affected by the new information included: surface traffic conditions, air quality, noise impacts, construction impacts, biotic communities, wetlands and floodplains, land use-related impacts, etc.

Relative to wetlands, floodplains, and biotic communities, the FSEIS noted:

> "Since the issuance of the Final EIS, information concerning two key areas has been produced:

- Submission of the wetland fill Joint Aquatic Resource Permit Application (JARPA) Section 404 permit application to the U.S. Army Corps of Engineers and further definition of wetland mitigation and Miller Creek relocation mitigation; and
- Survey of raptors in the area of the third runway.

In December 1996, the Port submitted an application to the Army Corps of Engineers for a permit to fill wetlands at Sea-Tac Airport associated with the Master Plan Update improvements in compliance with the Clean Water Act, Section 404. The 404-permit application submitted to the Corps of Engineers includes a completed Joint Aquatic Resources Project Application (JARPA) form, in a report entitled 'JARPA Application for Proposed Improvements at Seattle-Tacoma International Airport' dated December 1996."

The Final EIS noted that about 10.4 acres of wetland would be filled in order to complete the proposed improvements. Between issuance of the Final EIS and preparation of the FSEIS, the Port refined its evaluation of the projects affecting wetlands. Relative to the Final EIS, the FSEIS included identification of about 2 additional acres of wetland impacts, documented the review of in-basin mitigation options, and further defined plans for development of a wetland mitigation site in Auburn.

As is noted throughout the Final EIS and FSEIS, airports have a responsibility for instituting wildlife protection measures if wildlife hazards exist at or in the vicinity of an airport. Because of actual wildlife hazard issues arising from bird strikes, the Port cannot commit to maintaining sites on or near the Airport as wetland habitat mitigation in perpetuity. If a wetland site were to become a safety concern because of its attraction to wildlife, particularly birds, and jeopardize aircraft safety, the Port would be compelled to remove the hazard, including flora and/or fauna. To mitigate for the unavoidable impacts to wetlands, the Port proposes to create new wetlands on a 47-acre site of an approximately 69-acre parcel located within the city limits of Auburn, Washington. Wetland mitigation at the Airport, within the watersheds where the impacts may occur, is not feasible for three reasons: (1) most of the area surrounding the Airport is developed, and not enough available land exists in the watershed to create compensatory mitigation wetlands without relocation of additional business and residences; (2) we have taken the position that "wildlife attractions" within 10,000 ft of the edge of any active runway is not recommended; and (3) wildlife control activities in wetlands near the airport would conflict with wetland habitat mitigation goals. However, the hydrologic functions the wetlands perform would be replaced at the airport site with the proposed storm water management facilities, and relocation of the drainage channels, and relocation of affected portions of Miller Creek.

In addition, the Port performed a follow-up review of the west side of the airfield to determine if raptors (such as the red-tailed hawk) were nesting in the area. This survey indicated that no nesting occurs, but that raptors forage in the airport area.

III. NEW BIOLOGICAL INFORMATION THAT HAS ARISEN SINCE ISSUANCE OF THE FINAL SUPPLEMENTAL EIS AND RECORD OF DECISION

Since the issuance of the Record of Decision, the Federal Aviation Administration and the Port of Seattle have considered the following natural resource-related issues:

- Additional wetlands identified subsequent to access to the acquisition area
- Possible effects of the project on newly listed species of threatened and endangered species and designated critical habitat
- Effects to bird species protected under the Migratory Bird Species Act
- Possible effects of the project on Essential Fish Habitat

The following sections describe the new information that has been identified.

A. WETLANDS

The analysis of wetland impacts in the 1996 Final EIS and 1997 FSEIS was based on wetland delineations that have been revised recently as the Port has acquired, and gained access to, approximately 390 parcels of land where Master Plan Update improvements will be located. The FSEIS identified a total of 12.33 acres of wetlands that would be affected by Master Plan Update improvements. Of this total, 7.38 acres were identified as affected by the Runway (including embankment and borrow sources), 2.34 acres by the Runway Safety Areas, and 2.51 acres by terminal and landside improvements. In January 2000, the Port issued an addendum under the Washington State Environmental Policy Act (SEPA) entitled "*Addendum To Final Environmental Impact Statement and Final Supplemental Environmental Impact Statement For Proposed Master Plan Update Development Actions at Seattle-Tacoma International Airport*". This document is incorporated herein by reference.

Upon completion of the EIS process, the Port decided to proceed with the Airport improvements and received the approval of the FAA in its 1997 ROD. The Port then initiated acquisition of property. As land was acquired and on-the-ground wetland studies were conducted, the Port found that the project would affect more wetland area than previously identified in the 1997 FSEIS. Based on the refined identification of wetlands in the study area, a revised impact analysis was prepared. Under the revised wetland impact analysis, the wetland acreage affected by the project had increased from 12.23 acres to 18.37 acres. Of this revised total, 14.23 acres would be affected by the Third Runway Project Area, 1.10 acres by the Borrow Area and Haul Road, 0.12 acre by off-site mitigation, 0.14 acre by the Runway Safety Areas, and 2.78 acres by South Aviation Support Area (SASA) improvements. The refined analysis also identified 2.05 acres of wetlands that would be temporarily affected by construction activities and approximately 40 acres of wetlands that would be modified, primarily beneficially, as a result of wetland mitigation measures. Because the value of wetlands is determined more by their environmental function than their acreage, the revised wetland impact analysis summarized in the revised impact assessment report focuses on impacts to wetland functions rather than simply the affected acreage. **Table 1** compares by wetland the acreage impacts identified in the FSEIS with those identified upon access to the acquired properties.

While differences exist due to the changes in the quantity of wetlands now identifed, in general, the functions and values of the affected wetlands identified since the FSEIS are the same as wetlands identified in the Final EIS and FSEIS. The refined delineation identified additional affected wetlands but did not identify any additional or unrecognized biological functions in the area. Wildlife use of the study area and its associated wetlands is largely limited to species tolerant of disturbance. The study area is fragmented by urban development, which limits access to the area for most large mammals. Faunal diversity is frequently limited in wetlands because they are too small to meet habitat requirements for many wildlife populations. The high degree of urbanization within the area may limit the numbers and diversity of amphibians present.

The forested wetlands within the study area are predominantly slope wetlands and lack true aquatic habitat. The wildlife function of these wetlands is similar to that of forested upland areas with comparable vegetation communities. Small passerine birds use forested habitat in the study area for nesting and feeding. Forested areas are also used by small mammals for breeding and cover. Some amphibians may use portions of the wetlands for resting, foraging, and breeding.

The physical functions provided by the newly identified wetlands are of the same general quality and significance as those wetlands identified in the FSEIS. Hydrologic functions (flood storage, groundwater discharge, and storm water detention) that affect hydrologic and habitat conditions in both on-site and off-site locations (especially fish habitat in Miller and Des Moines creeks) are not different from the FSEIS evaluation.

B. THREATENED AND ENDANGERED SPECIES OF FLORA AND FAUNA

Since completion of the FSEIS and issuance of the Record of Decision, bull trout and chinook salmon, species that inhabit the vicinity of Sea-Tac International Airport, were federally listed as threatened. Critical habitat was subsequently designated for chinook salmon. In April 2000, FAA reinitiated consultation with the FWS and initiated consultation with NMFS. In June 2000, FAA submitted a BA to the Services which addressed the following species: threatened bald eagle (*Haliaeetus leucocephalus*), threatened marbled murrelet (*Brachyamphus marmoratus*) and marbled murrelet critical habitat, threatened Coastal/Puget Sound bull trout (*Salvelinus confluentus*), threatened Puget Sound chinook salmon (*Oncorhynchus tshawytscha*), and chinook critical habitat. The bald eagle, which was initially evaluated in the 1995 Biological Assessment, was re-evaluated in the June 2000 BA. In August 1999, the peregrine falcon was delisted, so no evaluation was required for the June 2000 BA.

Section 7 of the ESA, 16 U.S.C. §§ 1531 *et seq.*, requires federal agencies to ensure that their actions do not jeopardize the continued existence of listed species, or adversely modify their critical habitat. The effects of the project on these species were evaluated in the BA submitted to the Services in June 2000. The BA concluded that the proposed actions "may affect, but are not likely to adversely affect" the bald eagle, marbled murrelet and marbled murrelet critical habitat, Puget Sound chinook salmon and designated critical habitat, and coastal/Puget Sound bull trout. Based on information contained in the Biological Assessment, FWS rendered a biological opinion and NMFS issued a concurrence letter that concurred with the conclusions of the FAA's Biological Assessment. **Attachment A** to this report is a copy of the BO and concurrence letter from the Services.

The Biological Assessment "action area" for the proposed Master Plan Update projects was determined to be the area of the airport project construction and vicinity, where direct and indirect effects could reasonably be expected to occur (i.e., the aquatic habitat of Miller, Walker, and Des Moines creeks downstream of the airport and the associated nearshore estuaries, and the IWS Puget Sound outfall), as well as the Auburn wetland mitigation site and vicinity.

As noted in the Final EIS, bald eagles forage and perch in the "action area" and could be affected by loss of habitat and foraging opportunities. The construction and operation of the Master Plan Update projects is not expected to adversely affect local bald eagles. This report agrees with previous assessments, that the project "may affect," but is "not likely to adversely affect" bald eagles in the vicinity of Miller and Des Moines creeks. Because the nearest active bald eagle nest is beyond one-half mile of the Auburn wetland mitigation site, wetland construction activities associated with this site will have no effect on breeding bald eagles. Because wetland landscaping and construction mobilization activities could occur during the bald eagle wintering period, but more than 200 ft from the Green River, activities "may affect," but are "not likely to adversely affect" wintering eagles. Construction of the Auburn mitigation site is anticipated to provide habitat for waterfowl and wintering eagles. Thus, the overall determination for the Master Plan Update projects is "may affect", but is "not likely to adversely affect" bald eagle.

In its BO, FWS found the following with regard to the bald eagle:

- The proposed action is unlikely to result in significant impacts to bald eagles.
- Impacts are expected to be minor since no bald eagle nesting territories occur within the action area and no potential nest trees will be removed.
- Additionally, since no additional habitat is provided by the proposed airport facilities, flight paths of bald eagles over the airport are not anticipated to increase due to the proposed project.
- Runway 34R, which is the runway closest to Angle Lake, will be extended by 600 ft. Although there is a risk of collisions of bald eagles with airplanes due to the extension of this runway, the risk is anticipated to be minimal due to the few additional flights which will use this part of the runway over existing conditions.
- Although there is a risk of an air strike of a bald eagle at Sea-Tac, FWS does not believe that this risk is significantly increased as a result of the proposed action. In reaching this conclusion, FWS noted that no air strikes of bald eagles have been reported to date at Sea-Tac.
- The risk of airplane strikes of bald eagles from their use of thermals associated with the retaining wall is expected to be minimal.

The marbled murrelet is not likely to be present in the action area, but has been observed about 1.5 or more miles away. Based on the rarity of marbled murrelets in marine waters near the Airport, the distance between the Airport and Puget Sound, the water quality protection incorporated into the Master Plan Update, and the remote probability of an aircraft striking a marbled murrelet, it was determined in the BA that the project would have "no effect" on marbled murrelet or marbled murrelet critical habitat. In subsequent correspondence with FWS, FAA clarified that in some unlikely circumstances, the action may affect, but would not adversely affect this species.

In the BO, FWS found the following with regard to marbled murrelet:

- The proposed project is likely to result in insignificant impacts to marbled murrelets. Suitable marbled murrelet nesting habitat does not occur within the action area, including the off-site mitigation area.
- Although the proposed project may result in some short-term impacts to potential prey species (i.e., salmonids) that occur within Miller and Des Moines Creeks, salmonids are not known to form the primary diet of marbled murrelets.
- There is a potential for a long-term benefit to marbled murrelets should the proposed mitigation successfully enhance fish habitat and result in increased fish production within these creeks. However, as stated above, this benefit is likely to be minor as salmonids do not form the primary diet of the marbled murrelet.
- Impacts from air strikes are unlikely. The majority of marbled murrelet sightings and detections for nesting and foraging are north and south of the project area. Their travel paths are unlikely to cross the airport between nesting and foraging locations.

The Puget Sound chinook salmon was listed as a threatened species in March 1999, and a final rule designating critical habitat was issued in February 2000. Designated critical habitat includes all Puget Sound waters, estuaries, and freshwater habitats accessible to Puget Sound chinook salmon, including the Duwamish hydrologic units. Portions of Miller and Walker creeks fall within the strict definition of critical habitat, as no physical barriers restrict accessibility of this water body to chinook salmon. Based on NMFS' description of necessary habitat characteristics and the absence of data supporting any historic presence of chinook salmon upstream of the estuary, the BA concluded that Miller and Walker creeks do not constitute chinook critical habitat. Similarly, Des Moines Creek appears to lack suitable spawning habitat and historically has not been used by chinook salmon. The Green River, adjacent to the Auburn mitigation site, and the vicinity of the IWS Outfall in Puget Sound are critical habitat for chinook salmon.

NMFS concurred with the BA findings in its concurrence letter issued May 31, 2001. NMFS states:

- STIA projects will have temporary and long-term impacts to the aquatic habitat in Miller, Walker, and Des Moines Creeks.
- Less substantial impacts are expected to occur in Gilliam Creek, the estuaries of Miller and Des Moines Creeks, the outfall of the Midway Sewer District and in the Green River during construction of the offsite mitigation wetland. Potential impacts include changes in water quality, alterations to hydrologic conditions and alterations to wetland and stream habitats.
- Numerous conservation measures are proposed to reduce and minimize potential adverse impacts.
- Since there are no chinook salmon, or critical habitat for chinook salmon, in Miller, Walker or Des Moines Creeks, STIA projects in these watersheds will have no direct effects to threatened Puget Sound chinook. The only potential indirect effects will occur in the estuaries of Miller and Des Moines Creeks and are expected to be insignificant or discountable.
- Effects of STIA projects are also insignificant or discountable for Gilliam Creek, the Midway Sewer outfall and the Green River. Consequently, NLAA (not likely to adversely affect) is the appropriate determination for the project.

On November 1, 1999, bull trout was federally listed as a threatened species. Critical habitat for bull trout was deemed "not determinable" by the FWS due to inadequate understanding of the biological needs of the species. Because bull trout critical habitat has not been designated, the effects on such habitat are impossible to ascertain.

Relative to bull trout, the FWS BO found:

- The subpopulation of bull trout in Puget Sound, Miller and Des Moines Creek estuaries, and the Green River is likely composed of individuals from other spawning streams in the Coastal/Puget Sound DPS (distinct population segment). Bull trout spawning and rearing habitat are not known to be present in Puget Sound, Miller, Des Moines, Walker, and Gilliam Creek, or the mainstem Green River at this time. Therefore, bull trout spawning and rearing habitats are unlikely to be affected by the proposed project. Bull trout habitats that could be affected, therefore, are primarily foraging and migratory habitat.
- There are potential long-term and short-term direct and indirect effects to bull trout from the proposed project. These impacts include a potential reduction of forage species, exposure of bull trout to contaminants through surface water and consumption of contaminated forage species, and physical effects due to sediment. However, due to proposed water quality measures during construction, potential water quality improvements over baseline conditions, minimal exposure to potential contaminants, and the very low likelihood for bull trout to be present during construction or in proximity to the affected areas, FWS believes that the proposed impacts are not likely to be significant.

Indirect Effects:

Because project construction will not directly alter designated critical habitat for chinook salmon and bull trout species, the BA effects analysis focused on indirect effects of the action on these species as a result of impacts to their habitat. Relative to Coastal/Puget Sound bull trout and Puget Sound chinook salmon, the Biological Assessment examined:

- water quality impacts and mitigation,
- hydrologic impacts and mitigation, and
- aquatic habitat impacts and mitigation.

As a result of the analysis, the Services found that the project "may affect", but is "not likely to adversely affect" chinook salmon, chinook designated critical habitat, or bull trout. No impacts were identified in the BA, BO, or concurrence letter that had not been disclosed in the Final EIS or FSEIS.

Water Quality: Potential water quality impacts to Miller and Des Moines creeks resulting from construction and operation of the Master Plan projects and mitigation include construction-induced sedimentation, as well as sediment and erosion control practices that themselves may result in potential impacts (i.e., changes in stream temperature and pH, release of flocculation agents, and changes in low and peak flows). Potential water quality impacts include changes in stormwater quality and quantity associated with increased impervious surfaces, airport anti-icing and de-icing agent use, application of nutrients and pesticides to landscape management, and hydrology changes affecting Miller/Walker and Des Moines creeks. Upon completion of the projects, continued airport operations could affect water quality through discharge to adjacent creeks of conventional pollutants and chemicals used in ground and aircraft de-icing, and discharge of these same chemicals to the Puget Sound IWS. Overall, the projects will result in a greater volume of stormwater undergoing detention and treatment. Stormwater treatment will be accomplished through retrofitting (rebuilding) areas, as well as detaining and treating all stormwater associated with new impervious surfaces. An additional result of retrofitting will be reductions in copper and zinc currently discharged to Miller, Walker and Des Moines creeks. The concentrations of these pollutants i he creeks will either be unchanged from existing conditions or lower than stormwater currently discharged from areas lacking water quality treatment. Therefore, the proposed projects will not increase the exposure of chinook salmon or bull trout to copper or zinc in the estuaries of Miller or Des Moines creeks. Similarly, in the unlikely event that either adult chinook salmon or bull trout migrate into these creeks, their exposure to these chemicals after the project would be the same as current (baseline) conditions.

The effect of stormwater runoff on chinook designated critical habitat downstream of the Port discharge points was also assessed through toxicity testing of Miller Creek and Des Moines Creek downstream of the Airport outfalls. These tests demonstrated no toxicity to either flathead minnow or the invertebrate *Daphnia pulex*. In addition to stream samples, whole-effluent toxicity (WET) testing of Airport stormwater discharges was performed using these same test organisms. These tests demonstrated an absence of toxicity in samples consisting of 100 percent stormwater from Port discharges, reflective of future conditions after the projects are completed.

All identified water quality impacts will be mitigated by establishing and maintaining water quality treatment best management practices (BMPs). These BMPs not only protect listed species and designated critical habitat, but they also meet or exceed the requirements of the Washington State Department of Ecology's 1992 Stormwater Management Manual. Additionally, existing developed areas lacking BMPs consistent with the manual will be retrofitted by the Port with water quality treatment BMPs to further protect listed species and their habitat. The Master Plan Update projects will treat both new pollutant-generating impervious surface and existing impervious areas in a ratio of 1:1.89 (for each acre of new impervious surface, all new runoff will be treated and an additional 0.89-acre of existing impervious surface will be retrofitted). Additional measures to mitigate water quality impacts include source control and the operation and expansion of an IWS to treat stormwater runoff generated from high-use areas.

In addition to the proposed water quality BMPs, existing degraded wetlands in the Miller Creek and Des Moines Creek basins will be enhanced to: restore water quality functions, benefit water quality by eliminating existing pollution sources from agricultural land, increase settling and mechanical trapping of particulates, remove metals and other toxins that bind to particulates, reduce and bind metals in humic materials, biologically remove and uptake nutrients, and enhance the Miller Creek buffer.

Hydrologic Impacts: The Master Plan Update projects will increase impervious surface areas in the Miller and Des Moines Creek watersheds (by less than four percent), which could further increase stormwater runoff rates, volumes, and pollutant loads to the receiving streams, if unmitigated. Additionally, the filling of wetlands could affect stormwater storage, ground water recharge, and groundwater discharge, all of which could affect the hydrology of surface streams, if unmitigated.

Approximately 326.4 acre-feet of new stormwater detention storage will be needed to mitigate the impacts of increased stormwater runoff associated with the projects. The Port will construct stormwater conveyance, detention, and treatment facilities to manage runoff from both newly developed project areas and existing airport areas, as described below. The net result of flow controls for the Master Plan Update projects will be to reduce peak flows in Miller, Walker, and Des Moines creeks downstream of the airport discharges. These actions will enhance baseline hydrologic conditions in the streams and associated estuaries. The target flow regime will achieve the level of flow control required by regulations and reduce flows in the stream channels to a stable condition that reduces channel erosion and sedimentation in the creek estuaries.

The Port has developed mitigation plans for Miller and Des Moines Creek watersheds to compensate for any potential reduction in low flows in Miller, Walker and Des Moines creeks. The Port's mitigation plan for impacts to streamflow is to detain stormwater in detention ponds and vaults and manage its release to mitigate the low flow impacts of Airport improvements on Des Moines, Miller and Walker Creeks, without the use of additional sources of mitigation water.

Aquatic Habitat Impacts: Aquatic habitat impacts resulting from Master Plan Update improvements include short-term changes in water quality (from turbidity and suspended sediment), water quantity (from diverting flows in two Miller Creek segments), and habitat structures (from vegetation clearing, riparian regrading, and channel reconstruction—including the relocation of 980 ft of Miller Creek). Short-term changes include temporary construction impacts to 2.05 acres of wetlands. Long-term changes include the relocated Miller Creek channel, beneficial habitat features and native riparian vegetation throughout Miller and Des Moines creeks, enhanced riparian buffers, the permanent removal of poor-quality habitat structures and migration impediments, and the filling of 18.37 acres of wetlands.

Several on-site mitigation elements are proposed to compensate for the Master Plan Update improvements' potential impacts to stream, wetlands, and aquatic habitat. The mitigation will establish 67.01 acres of on-site wetland enhancement and stream buffer that will be restored and protected in perpetuity from future development. In-basin mitigation will be directed toward restoring all impacted wetland and stream functions, except avian habitat, and improving stream functions and potential fish habitat. In-basin mitigation also will be directed toward removing certain existing land use conditions (e.g., residential development) that degrade on-site wetland and aquatic habitat. The mitigation package also includes mitigation for wildlife habitat (bird and small mammals) that will be provided out-of-basin and will consist of creating a large, high quality wetland system in the city of Auburn at the mitigation site. Overall, the mitigation package will maintain or enhance critical habitat baseline conditions in the creeks and their estuaries.

C. CANDIDATE SPECIES

Consideration was also given by the FAA to species of fish present in the airport area that are candidates for listing as threatened or endangered. Under the ESA, candidate species are "taxa considered for possible addition to the List of Threatened Species". Joint NMFS and FWS regulations define a candidate species as any species being considered by FWS or NMFS for listing, but not yet the subject of a proposed rule. See 50 C.F.R. § 424.02.

Section 7 of the ESA does not require federal agencies to evaluate effects of agency actions on candidate species. No candidate species managed by FWS were identified as occurring in the project area. Puget Sound coho salmon (*Oncorhynchus kisutch*) was identified by NMFS as a candidate species occurring in the project vicinity, but it was not required to be evaluated in the Biological Assessment.

A status review of coho salmon was recently completed by NMFS in response to petitions seeking to list several Pacific Northwest populations as threatened or endangered. Despite recent stable trends in population abundance near historic levels, the status of the Puget Sound/Strait of Georgia ESU was determined to warrant further consideration for listing due to concerns over current genetic, environmental, and habitat conditions. Risk factors identified as potentially deleterious to Puget Sound coho salmon stocks included high harvest rates, extensive habitat degradation, unfavorable ocean conditions, and declines in adult size.

Hatchery supplementation in Puget Sound has been extensive. Coho salmon broodstock released into various Puget Sound basins between the early 1950s and 1981 were from the Green River and several other rivers to the north. Coho salmon in the Green River basin are a mixture of native and hatchery origin fish. Substantial releases of hatchery coho have occurred throughout the Green River basin since the early 1950s.

In addition to natural spawning that occurs in the basin, Trout Unlimited operates a small hatchery on Miller Creek from which volunteers scatter-plant coho juveniles throughout Miller, Walker, and Des Moines creeks. The egg sources for this hatchery are Green River hatchery stocks maintained by the State of Washington and the Muckleshoot Indian Tribe.

The historical record indicates that coho ascended Miller Creek to a waterfall at RM 2.8. The waterfall has been described as a complete barrier to upstream migrations of anadromous fish and confirmed as a migratory barrier by Trout Unlimited during recent spawning surveys. Surveys in 1980 found sparse numbers of coho spawning between the mouth of Miller Creek and RM 1.4, with four live spawners, seven dead spawners, and nine redds observed. Coho salmon also occur in Walker Creek.

In Des Moines Creek, coho ascended to at least RM 1.5 (possibly beyond). Annual returns of coho to Des Moines Creek are not known, but in Miller Creek total about 300 adults per year. Based on estimates of the pre-development carrying capacity of Miller Creek, the historical coho run size may have ranged from 700 to 1,200 adult fish per year. Coho salmon in Des Moines Creek consist of native and Green River hatchery-origin fish. Hatchery plantings are conducted by Trout Unlimited.

Currently, NMFS has not designated critical habitat or proposed listing Puget Sound coho salmon. Recently, NMFS proposed that critical habitat for Oregon coast coho salmon should include all freshwater "waterways and substrates below longstanding, naturally impassable barriers (i.e., natural waterfalls in existence for at least several hundred years) and several dams that block access to former coho salmon habitats." Key habitat characteristics for spawning coho includes stable channel and hydraulic features, and un-embedded substrates ranging from 13 to 100 mm.

Neither enhancement actions in the upper reaches of Miller Creek nor minor construction associated with stormwater management facilities will directly affect coho salmon. Instream or riparian habitat improvements that will occur in the lower reaches of Miller Creek (and any reaches of Walker or Des Moines creeks that are accessible to coho salmon) may directly affect juvenile coho during construction. Effects could include stress, injury, or mortality from construction or from efforts to remove fish from construction areas. Some construction in the upper reaches of Miller Creek could indirectly affect coho salmon by short-term impacts to water quality from increased turbidity and sedimentation, although the relocation of Miller Creek will occur upstream of reaches accessible to coho salmon and thus will not directly affect coho. Erosion control techniques and a temporary bypass will be used during construction of the new channel to limit sedimentation and other water quality impacts that could affect downstream habitat. Following construction, improved habitat conditions in Miller, Walker, and Des Moines creeks will be available to coho. In general, the effects from potential construction and operational activities that were described in the Final EIS and FSEIS on fish residing in Miller, Walker, and Des Moines creek are consistent with potential effects discussed in this document for coho salmon.

Long-term benefits to coho in Miller and Des Moines creeks are expected as a result of in-basin mitigation. Riparian restoration and stormwater improvements associated with the proposed action will assist in restoring both spawning and rearing habitats for coho salmon in Miller and Des Moines creeks.

Potential downstream effects of the proposed action to marine stages of coho salmon using nearshore marine waters at the estuaries of Miller and Des Moines creeks are unlikely. Strict adherence to BMPs will ensure protection of nearshore waters from downstream effects during construction phases of the project. No downstream effects on marine habitats, including marine water quality, are expected during the operation of the project, provided stormwater facilities are properly maintained. Improvements in the water quality of Miller and Des Moines creeks and the discharge area of the IWS Outfall are expected to result from increased riparian restoration and stormwater treatment.

Coho salmon occur in all accessible reaches of the Green River basin. Potential project effects from construction on salmon were described in the June 2000 *Biological Assessment and Pacific Coast Salmon Essential Fish Habitat Assessment for Master Plan Update Improvements at Seattle-Tacoma International Airport* and March 2001 *Salmonid Essential Fish Habitat Assessment*. Adherence to BMPs and specified project timing during construction phases will ensure that no direct impacts to freshwater stages of coho salmon would result from construction or operations.

Most of the existing Miller Creek and Des Moines Creek watersheds are developed, and lack adequate stormwater management facilities. The proposed action will develop new or retrofit existing stormwater facilities to meet or exceed current standards. These actions will likely improve or maintain habitat quality for coho salmon. For example, some residential neighborhoods contain failing septic systems and failing underground storage tanks that contribute to water quality degradation. These failing neighborhood septic systems and underground tanks will be removed and/or remediated, resulting in measurable improvements to water quality in Miller and Des Moines creeks.

Future projects may result in re-development of areas in existing residential land use to other uses that may, in some cases, remove pollutant sources from Miller and Des Moines creeks. Re-development may also provide opportunities to improve stream buffers or sub-standard culverts that degrade fish habitat. These conditions could be enhanced under re-development scenarios, and further reduce the potential from cumulative impacts that could result from other development projects in the Miller and Des Moines creek watersheds. Long-term effects on downstream habitats, including estuarine areas of Miller and Des Moines creeks, are not expected due to increased stormwater treatment in the basin that will result from the proposed action, and that will be imposed on future projects developed in the basins.

D. COMMERCIALLY MANAGED SPECIES AND ESSENTIAL FISH HABITAT

Congress passed the Sustainable Fisheries Act (SFA) on October 11, 1996, amending the Magnuson-Stevens Act, which contained Essential Fish Habitat (EFH) provisions for commercially managed species. The EFH provisions require that each Federal agency consult with the Secretary with respect to any proposed or final action authorized, funded, or undertaken that may adversely affect any designated essential fish habitat. Essential fish habitat is defined by that Act as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The potential effects on three main fisheries were considered: Coastal Pelagic Fisheries, West Coast Groundfish, and Pacific Coast Salmon.

Coastal Pelagic Fisheries: Coastal Pelagic Fisheries species include four finfish [Pacific sardine (*Sardinops sagax*), Pacific mackerel (*Scomber japonicus*), northern anchovy (*Engraulis mordax*), and jack mackerel (*Trachurus symmetricus*)]; however, none is found in Puget Sound. One invertebrate (*Loligo opalescens* – market squid) is found in Puget Sound and near the project area of the Master Plan Update projects. Essential fish habitat for market squid includes water and substrate necessary for the life cycle of this species.

EFH for the coastal pelagic squid fishery is not known to be present in small creeks, such as Miller/Walker and Des Moines Creeks, because all life stages occur in marine waters. EFH for market squid may be found in the estuaries of Miller and Des Moines creeks and near the general area of the IWS outfall.

Strict adherence to BMPs will protect nearshore waters from downstream water quality effects during project construction phases. Stormwater treatment and riparian restoration associated with the project will improve the quality of waters discharges from Miller/Walker and Des Moines Creeks. No downstream project-related effects to market squid EFH are expected during project operations if stormwater facilities are properly maintained. Thus, Master Plan Update improvements would not impair potential use of EFH by this species. Construction and operations of the project will have no effect on market squid EFH near the project area.

West Coast groundfish: West Coast groundfish make up a diverse set of more than 50 species, including dogfish, ratfish, flat fish, and rockfish. Essential fish habitat for many of these species is present in marine areas near the project area, and includes water and substrate necessary for the life cycles of the species.

EFH for West Coast groundfish is not known to be present in small creeks, such as Miller, Walker, and Des Moines creeks, because all lifestages of these species occur in marine waters. EFH for West Coast groundfish may be found in the estuaries of Miller and Des Moines creeks and near the general area of the IWS outfall.

Strict adherence to BMPs will protect nearshore waters from downstream water quality effects during project construction phases. Stormwater treatment and riparian restoration associated with the project will improve the quality of waters discharges from Miller, Walker, and Des Moines creeks. No downstream project-related effects to West Coast groundfish EFH are expected during project operation if stormwater facilities are properly maintained. Thus, Master Plan Update improvements would not impair potential use of EFH by these species. Construction and operation of the project will have no effect on West Coast groundfish EFH near the project area.

Coastal Pelagic Fisheries species and West Coast groundfish effects determination:

The June 2000 BA evaluated potential effects on EFH from Master Plan Update improvements and concluded that potential direct, indirect, and cumulative effects associated with the project were unlikely to affect EFH. Any cumulative or indirect impacts associated with other projects planned in these basins will comply with existing or emerging development standards required to protect habitat for commercially managed fish species. These standards will protect water quality, stream hydrologic conditions, stream habitat conditions, riparian buffers, and wetlands. With existing and emerging regulations, habitat and water quality conditions in the Miller/Walker Creek and Des Moines Creek watersheds are likely to improve or remain at their current condition, whether or not other development in the watershed occurs. Based on consideration of the EFH requirements of the market squid coastal pelagic species fishery and West Coast groundfish, including potential direct, indirect, and cumulative effects, the BA determined that construction and operation of the proposed improvements will have "no effect" on any identified pelagic EFH in the action area.

Pacific Coast salmon: On September 27, 2000, NMFS adopted Amendment 14 of the Pacific Salmon Fisheries Management Plan that identified and described essential fish habitat for three species of salmon – chinook (*Oncorhynchus tshawytscha*), coho (*O. kisutch*), and Puget Sound pink (*O. gorbuscha*). Essential fish habitat for these species is present in estuarine and marine waters near the project area, and includes water and substrate necessary for the life cycle of these species. Freshwater essential fish habitat is also present near parts of the project area for coho and chinook salmon.

A salmon essential fish habitat (EFH) assessment pertaining to the implementation of Master Plan Update improvements at Sea-Tac Airport was prepared by the FAA, on behalf of itself and the USACE, for consultation with NMFS under Section 305(b) of the Magnuson-Stevens Fisheries Act. This evaluation was undertaken in response to NMFS' recent approval of Amendment 14. The Pacific salmon EFH assessment analyzed the effects of FAA and USACE actions on designated EFH for chinook, coho, and Puget Sound pink salmon. The EFH assessment concluded that the proposed actions would have "no effect" on chinook and pink salmon EFH in fresh, estuarine, or marine waters. The EFH assessment also concluded that the proposed FAA and USACE actions "may adversely affect" coho freshwater EFH for a short-term period, but would have "no effect" long-term on freshwater, estuarine, or marine EFH, and would have a beneficial effect on coho salmon habitat.

Chinook and pink salmon have not been documented to occur in the Miller Creek or Des Moines Creek basins upstream of their discharge with Puget Sound. Construction and operations are not expected to affect the freshwater life stages or EFH of chinook or pink salmon. Although results of these actions are intended to improve baseline habitat conditions for all salmonids in the Miller Creek and Des Moines Creek basins (through increased stormwater management and habitat restoration), future use of the streams by chinook or pink salmon (i.e., through straying from other basins) is unlikely and not expected. Because these two salmon species do not occur in these basins, construction and operations of the project will have no effect on freshwater EFH of chinook or pink salmon in the Miller Creek or Des Moines Creek basins.

When the potential effects of the Master Plan Update improvements on EFH of coho, chinook, and pink salmon estuarine and marine habitats were considered relative to stormwater improvements and the proposed conservation measures, the EFH analysis concluded that the proposed action will have "no effect" in the long-term on designated estuarine and marine EFH for coho, chinook, and pink salmon, even though short-term adverse impacts to coho EFH may occur as a result of project construction.

Puget Sound pink salmon are not part of the Green/Duwamish hydrologic unit; therefore, effects on pink salmon EFH from the proposed projects in the Green River basin were not evaluated. Chinook salmon EFH is found in the Green River and a tributary, Gilliam Creek. When the potential effects of the proposed Master Plan Update improvements on chinook salmon EFH in the project area were considered relative to the proposed conservation and mitigation measures, the action agencies determined that the proposed action would have "no effect" on chinook Green River EFH.

Coho salmon are present within central and lower reaches of Miller, Walker, and Des Moines creeks and may be present in several areas where direct impacts could occur from construction of habitat improvements (e.g., installation of large woody debris, removal of rock weirs), and/or water quality alteration from turbidity, suspended sediment, or stormwater chemistry. A separate water quality analysis was conducted to evaluate the potential effects of ground and aircraft anti-icing and de-icing compounds, as well as copper and zinc, on coho salmon EFH in Miller, Walker, and Des Moines creeks, and near the IWS Outfall. Predicted concentrations for de-icing compounds and zinc in fresh and marine waters were below toxicity thresholds (LC50 at 96 hours), indicating no adverse effects. Predicted concentrations for copper in Miller Creek and near the IWS Outfall were also below the toxicity threshold. Copper concentrations in Des

Moines Creek were predicted above the toxicity threshold for a maximum of 18 days during a 49-year period; however, acute toxicity is not likely to occur because of high dissolved organic carbon concentrations that bind with copper before it can affect fish gills. Therefore, based on this analysis, the EFH assessment concluded that no adverse water quality effects were likely to occur in areas constituting coho salmon EFH.

Short-term direct effects on coho EFH would occur from habitat modification and changes in water quality during construction. Effects would be limited to temporary increases in turbidity and suspended sediment during construction and alteration of poor quality habitat. The potential short-term effects of turbidity and sedimentation would be reduced or avoided by construction best management practices and conservation measures. The short-term effects of habitat alteration would be offset by the long-term benefits of new, high quality, habitat features (pool/step complexes, large woody debris, removal of rock weirs, a culvert, bridges, native plant replacement, and enhancement of riparian zones). When the potential effects of the proposed Master Plan Update improvements on coho salmon EFH in the project area were considered relative to the proposed conservation and mitigation measures, the EFH assessment concluded that the proposed action "may adversely affect" coho EFH for a short-term period, but would have "no effect" long term, and would have an overall beneficial effect on coho EFH.

In its May 31, 2001 concurrence letter (page 16), NMFS states the following with regard to groundfish and pelagic EFH:

> "The action area includes habitats which have been designated as EFH for various life stages of 17 species of groundfish, said 4 coastal pelagic species (Table 2). Information submitted by FAA in the BA is sufficient for NMFS to conclude that the effects of the proposed actions are transient, local, and of low intensity and are not likely to adversely affect EFH in the long-term. NMFS also believes that the conservation measures proposed as an integral part of the actions would avert, minimize, or otherwise offset potential adverse impacts to designated EFH."

NMFS further recommended that the FAA consider conservation measures for EFH. NMFS found "The conservation measures that the FAA included as part of the STIA projects are along with those that NMFS recommends in the ESA Concurrence letter, adequate to minimize the adverse impacts from this project to designated EFH for the species in Table 3. It is NMFS' understanding that the FAA intends to implement the proposed activity with these built-in conservation measures that minimize potential adverse effect to the maximum extent practicable. Consequently, NMFS has no additional conservation recommendations to make at this time."

In its May 31, 2001 concurrence letter, NMFS stated that "EFH for Coho salmon (*O. kisutch*), a candidate species in Puget Sound, was not considered in this consultation although an independent assessment of EFH for coho was prepared by the Port and delivered to NMFS on March 27, 2001." Consequently, NMFS may recommend further conservation measures for coho salmon EFH. In the event final recommendations from NMFS concerning coho salmon EFH present significant new information not previously considered, FAA will supplement its NEPA record as appropriate.

E. MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act (MBTA) makes it illegal to pursue, hunt, take, capture, kill, attempt to take, capture or kill any migratory bird or "any part, nest, or egg of any such bird...by any means or in any manner," except as allowed by permit. Migratory birds that occur in King County include all birds except house sparrows, starlings, feral pigeons (rock doves), pheasant, quail, and domestic ducks, geese, and other exotic birds. **Table 2** lists the review of migratory bird species that may occur in the area.

The Final EIS and FSEIS addressed the effect of the proposed Master Plan Update projects on bird species in several places: Final EIS Chapter IV, Section 16 "Plants and Animals (Biotic Communities)"; Final EIS Chapter IV, Section 17 "Endangered Species", Final EIS Appendices K and M, and FSEIS Chapter 5-5 "Biotic Communities, Wetlands and Floodplains". Within these reports, the FAA considered the effect of the proposed project on bird species, including the issues governed by the MBTA.

As is noted in these report, within the project area, the Miller Creek and Des Moines creek corridors provide relatively low quality wildlife habitat, as they generally lack undisturbed native vegetation buffers and experience substantial human disturbance. The project will involve an overall improvement in the riparian habitat along these creeks, due to the enhancement of approximately 50 acres of riparian habitat in this area. The Master Plan Update projects will not alter or degrade any estuarine or nearshore habitat.

While the ESA defines the term "take" to include to harm and harass, including habitat modification. The term is not as broadly defined under the MBTA and thus includes only direct (albeit unintended) killing of protected birds.

In documenting the effect of the airport and the proposed project on birds in the EIS process, detailed consideration has been provided to the potential for bird strike incidents. Bird strikes and jet-engine bird ingestion have caused in the worst situations, aircraft to crash and resulted in loss of human life, or in lesser cases millions in dollars of aircraft damage. Such examples include a Boeing E-3 that crashed at Elmendorf Alaska in September 1995 after it ingested about 30 Canada geese on departure, resulting in the crash of the aircraft, killing all 24 on board.

At Sea-Tac Airport, approximately 20 bird strike incidents occur each year.[11] In response to Federal Aviation Regulation Part 139 and bird strike issues at the airport, the Port of Seattle developed a Wildlife Hazard Management Plan in August 2000. This plan replaced an earlier program that had been in place and approved by the FAA. The Port also has a Migratory Bird Depredation Permit issued by the FWS in June 2000, that enables the Port to "kill migratory birds for the purpose of assuring safe aircraft operations. The killing of birds must not be the principle control measure and is only to be employed in concert with an active scare and deterrent program." The Port is also authorized to "trap/release migratory birds which get caught in side SEA-TAC terminal buildings" and "raptors on or near runways to assure safe aircraft operations."[12] The

11/ Port of Seattle records, December 1996.

12/ Wildlife Hazard Management Plan, Seattle Tacoma International Airport, prepared by the Port of Seattle, August 2000.

permit excludes eagles and threatened or endangered species. Under the 2000 permit, the Port's wildlife coordinator is responsible for reporting controls to FWS (including species taken and hazed) each calendar year.

Noise disturbance associated with construction activities in the Miller and Des Moines creek evaluation areas is not expected to affect nesting eagles because the nearest active nest (No. 611) occurs over 2 mi away from the construction projects, beyond the quarter and half mile distances at which the bald eagle recovery plan regulates construction noise activities. The nearest inactive nest, associated with the Angle Lake territory, is 1 to 3 mi away from the various construction sites, also beyond the zone where noise activities are regulated.

Because major construction is planned outside the overwintering period for bald eagles (October 31 to March 31), increases in ambient noise levels at the site will not disturb overwintering eagles. Planting at the wetland mitigation site may occur during the overwintering period for bald eagles. During planting, noise levels at the wetland mitigation site will exceed ambient levels because trucks and other vehicles will deliver and distribute plant materials to the site. The change in noise levels that will occur at potential eagle perch trees (greater than 300 ft west of the planting activities) is unknown.

The Biological Assessment is in agreement with the 1996 Final EIS analysis in that construction activities are not expected to significantly impact nesting or wintering bald eagles or their prey because the eagles confine their activities to the vicinity of Puget Sound; thus, the loss of habitat associated with activities in this evaluation area would not affect eagle foraging or perching behavior.

The Auburn wetland mitigation site is too far from marbled murrelet nesting (in the Cascades) and foraging areas (in Puget Sound) for activities at this site to affect either nesting or foraging birds. Potential disturbance to traveling birds during wetland construction will be avoided given that murrelets travel between foraging and nesting sites during the early dawn hours when construction equipment would not be operating.

The Department of Ecology has been apprised of the Port of Seattle's plan to construct a wetland mitigation project near the Green River in Auburn to compensate for wetlands filled for construction of the third runway and related improvements at the Seattle-Tacoma International Airport. The primary function of the Auburn mitigation site will be to create wildlife habitat that cannot be replaced near the airport because of the potential hazard posed by an aircraft/wildlife collision. FAA guidelines (Advisory Circular 150/5200-33) state that wildlife-attracting mitigation projects should be located more than 10,000 feet from a runway serving jet aircraft. Migratory waterfowl, which frequent wetlands, are of particular concern because of their relatively large size and flocking characteristics. The City of Auburn has concluded that the Port's proposal is consistent with its Shoreline Master Program.

The *Final Environmental Impact Statement* identifies 56 bird species as occurring in the affected project area. The additional 14 species identified in the *Final Environmental Impact Statement* and that are excluded from **Table 2** in the comment are: green heron, American wigeon, Barrow's goldeneye, northern harrier, American coot, long-billed dowitcher, glaucous-winged gull, olive-sided flycatcher, barn swallow, Swainson's thrush, orange-crowned warbler, yellow warbler, American goldfinch, and American crow.

Many of those species listed in **Table 2** rely on habitat that is very different from that affected by the Master Plan Update projects. Of the remaining species, habitat quality limits use of the project area, and approximately 20 percent of these remaining species are unlikely to regularly use the project area for nesting. These species likely use the project area only briefly during migration.

The Port has reviewed 17 bird species that could be impacted by the loss of upland habitat areas associated with Master Plan Update actions. These species include the following:

<u>Band-tailed pigeon:</u> Although the band-tailed pigeon is in decline, the main threat to the species appears to be habitat loss and direct human-caused mortality in Central America (Audubon 2001). In urban parks and gardens in western Washington, the species is actually becoming more common. Consequently, loss of habitat due to the proposed action is not expected to significantly affect the species.

<u>Belted kingfisher:</u> Belted kingfishers use wetland habitats with open water components. Wetlands that will be impacted by the Master Plan Update improvements do not provide suitable kingfisher habitat.

<u>Pileated woodpecker:</u> As stated in Appendix M of the *Final Environmental Impact Statement*, pileated woodpeckers have been observed in the approximately 187-acre deciduous forest in the central portion of the South Borrow Area. Under the proposed action, some of this forested area would be removed. Loss of this acreage will not have a significant effect on pileated woodpeckers regionally, as large tracts of their preferred habitat, mature coniferous forests, will be unaffected.

<u>Barn swallow, tree swallow, cliff swallow, willow flycatcher, black-capped chickadee, bushtit, orange-crowned warbler, song sparrow, white-crowned sparrow, black-headed grosbeak, Wilson's warbler, American goldfinch:</u> These species are all common in suburban environments. Abundant habitat outside of the project area will remain for these species following construction of Master Plan Update projects, because the birds are widely distributed in urban and non-urban areas throughout Puget Sound.

<u>Swainson's thrush:</u> This species occurs in coniferous and mixed forests with dense undergrowth. The majority of the acreage impacted by the proposed action does not contain adequate cover to provide habitat for the species. Habitat in the project area that will be impacted contains marginal nesting habitat for species, and these areas are most likely used for foraging habitat during migration. Remaining habitat in nearby areas outside of the project area will provide foraging habitat. Suitable Swainson's thrush nesting habitat in the low-elevation coniferous forests of western Washington will be unaffected.

<u>Hutton's vireo:</u> This species is a resident of mixed forests with evergreens and oaks, with moderate to dense canopy cover (Davis 1995). Most of the habitat impacted by the Master Plan Update projects does not contain adequate canopy cover to provide habitat for the species. Because only a small amount of marginal Hutton's vireo habitat will be impacted by the proposed action, the project will not have a significant affect on the species.

The Port's review also considered eight additional species:

<u>Sharp-shinned hawk and Cooper's hawk:</u> Loss of forest represents loss of habitat for these species. However, forest types impacted under the proposed action (i.e., young, deciduous

forest) are relatively common in the Puget Sound region and adequate habitat outside the project area will remain for these species.

Northern harrier, American kestrel and western meadowlark: Harriers, kestrels, and meadowlarks prefer open habitats. Approximately two-thirds of the existing unmanaged grassland habitat will remain upon completion of the proposed action. Although some existing managed grassland will be impacted, the total acreage of managed grasslands will increase overall (due to creation of new managed grassland areas).

Common nighthawk: This species nests in open areas and forages in a wide variety of habitats (Csuti et. Al. 1997). By increasing the amount of open habitat, the project will increase the amount of nighthawk nesting habitat. Some loss of foraging habitat will occur where areas are paved and similarly developed. However, given the wide variety of foraging habitat that this species will use, foraging habitat is not expected to be a limiting factor for this species, and other habitat in surrounding areas will remain as foraging areas.

Vaux's swift: This species uses a wide variety of habitats where suitable cavities (i.e., dead trees, chimneys) are available (Smith et al. 1997). Removal of trees and abandoned houses (with chimneys) will reduce available cavities for this species, although remaining trees within and near the project site will continue to provide cavities for the species.

Streaked horned lark: This species has been extirpated from most of the Puget Trough, and no breeding records for the species are present in the project vicinity (Smith et al. 1997). Use of the project area is likely limited to occasional fly-overs and stop-overs during migration.

In summary, many of the bird species listed in **Table 2** rely on habitat types that are very different from those affected by the Master Plan Update projects. The remaining species likely use the project area only briefly during migration. Further, the tendency for many migratory (and resident) birds to disperse widely and use urban habitat for breeding and migration demonstrates that migration corridors will not be eliminated and that large amounts of marginal urban habitat suitable for use by migrating birds will remain following Master Plan Update project development. Since urban habitats similar to those being eliminated are common in Puget Sound and the Sea-Tac Airport vicinity, significant impacts on the regional populations of birds are unlikely. Consequently, the proposed action will not have a significant effect on regional populations of bird species considered in this analysis.

As is shown in this section, the proposed project would not have a significant adverse effect on migratory birds, and the documented project effects are consistent with the impacts discussed in the Final EIS and FSEIS.

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TABLE 1
Comparison of Wetlands In Study Area

Wetland	Classifications (percent of each type)	Size of Wetland/Water(Acres) Refined	Size of Wetland/Water(Acres) Original FSEIS	Project Impact (Direct and Indirect) Refined	Project Impact (Direct and Indirect) Original FSEIS
	Other Waters of U.S.	0.33	0.00[1]	0.14	0.00
1	Forested	0.07	0.07	0.00	0.07
2	Forested	0.73	0.74	0.00	0.74
3	Forested	0.56	0.56	0.00	0.19
4	Forested	5.00	5.02	0.00	0.46
5	Forested/Scrub-Shrub	4.63	4.58	0.14	1.69
6	Scrub-Shrub	0.86	0.87	0.00	0.00
7	Forested/Open Water/Emergent	6.68	6.70	0.00	0.00
8	Scrub-Shrub/Emergent	4.95	4.95	0.00	0.00
9	Forested/ Emergent (40/60)	2.83	2.85	0.03	0.13
10	Scrub-Shrub	0.31	0.31	0.00	0.00
11	Forested/Emergent (80/20)	0.50	0.50	0.50	0.47
12	Forested/Emergent (20/80)	0.21	0.21	0.21	0.21
13	Emergent	0.05	0.05	0.05	0.05
14	Forested	0.19	0.19	0.19	0.19
15	Emergent	0.28	0.28	0.28	0.28
16	Emergent	0.05	0.06	0.05	0.06
17	Emergent	0.02	0.03	0.02	0.03
18	Forested/Scrub-Shrub/Emergent (50/20/30)	3.56	0.12	2.84	0.12
19	Forested	0.56	0.57	0.56	0.57
20	Scrub-Shrub/Emergent (90/10)	0.57	0.06	0.57	0.06
21	Forested	0.22	0.22	0.22	0.22
22	Scrub-Shrub/Emergent (10/90)	0.06	0.06	0.06	0.06
23	Emergent	0.77	0.78	0.77	0.78
24	Emergent	0.14	0.14	0.14	0.14
25	Forested	0.06	0.06	0.06	0.06
26	Emergent	0.02	0.02	0.02	0.00
28	Scrub-Shrub/Emergent/Open Water (65/15/20)	35.45	18.10	0.07	0.06
29	Forested	0.74	0.74	0.00	0.74
30	Forested/Scrub-Shrub (80/20)	0.88	0.50	0.00	0.50
31	Emergent	0.05	0.05	0.00	0.00
32	Emergent	0.09	0.05	0.00	0.05
33	Forested/Shrub-Scrub/Emergent/Open Water	17.60	17.60	0.00	0.00
34	Open Water	1.40	1.40	0.00	0.00
35	Forested/Emergent (40/60)	0.67	0.21	0.67	0.18
36	Forested/Emergent	0.30	0.30	0.00	0.00
37	Forested/Emergent (70/30)	5.73[1]	2.41	4.11	1.68
38[2]	Emergent/Shrub Scrub	0.00	0.00	0.00	0.00
39	Forested	0.90	0.07	0.00	0.00
40	Scrub-Shrub	0.03	0.09	0.03	0.09
41a	Emergent/Open Water	0.35	NA	0.35	NA
41b	Emergent	0.09	0.09	0.09	0.08

Wetland	Classifications (percent of each type)	Size of Wetland/Water(Acres) Refined	Original FSEIS	Project Impact (Direct and Indirect) Refined	Original FSEIS
43	Forested/Scrub-Shrub/Emergent (estimated -50/30/20)	30.30	30.30	0.00	0.00
44a,b	Forested/Scrub-Shrub (70/30)	3.08	0.70	0.26	0.00
45	Emergent	5.00	5.00	0.00	0.00
46	Open Water	0.06	0.06	0.00	0.00
47	Open Water	0.20	0.20	0.00	0.00
48	Forested/Emergent (20/80)	1.58	0.02	0.00	0.00
49 [3]	Emergent	0.00	0.02	0.00	0.03
50 [3]	Shrub-Scrub	0.00	0.03	0.00	0.12
51	Forested	16.00	2.41	0.00	0.48
52	Forested/Scrub-Shrub/Emergent (80/20/20)	4.70	1.00	0.54	1.00
53	Forested	0.60	0.60	0.60	0.60
54	Shrub-Scrub/Open Water	25.70	25.70	0.00	0.00
55 [3]	Shrub-Scrub	0.00	0.04	0.00	0.04
A1	Forested/Scrub-Shrub/Emergent (15/15/70)	4.66	NA	0.59	NA
A2	Scrub-Shrub	0.05	NA	0.00	NA
A3	Scrub-Shrub	0.01	NA	0.00	NA
A4	Scrub-Shrub	0.03	NA	0.00	NA
A5	Emergent	0.03	NA	0.03	NA
A6	Forested	0.16	NA	0.16	NA
A7	Forested	0.30	NA	0.30	NA
A8	Forested/Scrub-Shrub (30/70)	0.38	NA	0.08	NA
A9	Scrub-Shrub	0.04	NA	0.00	NA
A10	Scrub-Shrub	0.01	NA	0.00	NA
A11	Scrub-Shrub	0.02	NA	0.00	NA
A12	Scrub-Shrub	0.11	NA	0.08	NA
A13	Forested	0.12	NA	0.00	NA
A14	Forested/ Scrub-Shrub/ Emergent (50/25/25)	0.19	NA	0.00	NA
A15	Emergent	0.04	NA	0.00	NA
A16	Scrub-Shrub/Emergent (20/80)	0.09	NA	0.00	NA
A17	Forest/Scrub-Shrub/Emergent (25/25/50)	2.66	NA	0.00	NA
A18	Scrub-Shrub	0.01	NA	0.01	NA
A19	Emergent	0.04	NA	0.00	NA
Lora Lake	Open Water	3.06	NA	0.00	NA
B1	Forested/Scrub-Shrub (30/70)	0.27	NA	0.00	NA
B10	Forested	0.02	NA	0.00	NA
B11	Emergent	0.18	NA	0.18	NA
B12 [4]	Scrub-Shrub	0.63	NA	0.07	NA
B14	Scrub-Shrub/Emergent (70/30)	0.78	NA	0.78	NA
B15a [4]	Shrub	0.21	NA	0.00	NA
B15b	Shrub	0.02	NA	0.00	NA
B4	Scrub-Shrub	0.07	NA	0.00	NA
B5	Forested/Scrub-Shrub (40/60)	0.08	NA	0.00	NA
B6	Forested/Scrub-Shrub (30/70)	0.55	NA	0.00	NA
B7	Forested/Scrub-Shrub (30/70)	0.03	NA	0.00	NA
B9	Forested	0.05	NA	0.00	NA

		Size of Wetland/Water(Acres)		Project Impact (Direct and Indirect)	
Wetland	Classifications (percent of each type)	Refined	Original FSEIS	Refined	Original FSEIS
E1	Forested	0.23	NA	0.00	NA
E2	Forested	0.04	NA	0.04	NA
E3	Forested	0.06	NA	0.06	NA
FW1	Farmed Wetland	0.03	NA	0.00	NA
FW2	Farmed Wetland	0.09	NA	0.00	NA
FW3	Farmed Wetland	0.59	NA	0.00	NA
FW5	Farmed Wetland	0.08	NA	0.08	NA
FW6	Farmed Wetland	0.07	NA	0.07	NA
FW8	Farmed Wetland	0.03	NA	0.00	NA
FW9	Farmed Wetland	0.01	NA	0.00	NA
FW10	Farmed Wetland	0.02	NA	0.00	NA
FW11	Farmed Wetland	0.11	NA	0.00	NA
G1	Emergent	0.05	NA	0.05	NA
G2	Emergent	0.02	NA	0.02	NA
G3	Emergent	0.06	NA	0.06	NA
G4	Emergent	0.04	NA	0.04	NA
G5	Emergent	0.87	NA	0.87	NA
G6	Emergent	0.01	NA	0.00	NA
G7	Forested/Scrub-Shrub (30/70)	0.50	NA	0.50	NA
G8	Emergent	0.04	NA	0.00	NA
R1	Emergent	0.17	NA	0.13	NA
R2	Scrub-Shrub/Emergent (70/30)	0.12	NA	0.00	NA
R3	Scrub-Shrub	0.02	NA	0.00	NA
R4	Emergent	0.11	NA	0.00	NA
R4b	Forest/Emergent (25/75)	0.11	NA	0.00	NA
R5	Emergent	0.05	NA	0.00	NA
R5b	Forest/Emergent (25/75)	0.07	NA	0.00	NA
R6	Forested/Emergent (25/75)	0.21	NA	0.00	NA
R6b	Emergent	0.09	NA	0.00	NA
R7	Forested	0.04	NA	0.00	NA
R7a	Emergent	0.04	NA	0.00	NA
R8	Scrub-Shrub/Emergent (40/60)	0.40	NA	0.00	NA
R9	Forested	0.38	NA	0.00	NA
R9a	Forest/Scrub-Shrub/Emergent (25/50/25)	0.74	NA	0.00	NA
R10	Forested	0.04	NA	0.00	NA
R11	Emergent	0.42	NA	0.00	NA
R12	Forested	0.03	NA	0.00	NA
R13	Emergent	0.12	NA	0.00	NA
R14a	Scrub-Shrub/Emergent (25/75)	0.13	NA	0.00	NA
R14b	Emergent	0.08	NA	0.00	NA
R15a	Forested/Scrub-Shrub/Emergent (25/65/10)	0.79	NA	0.00	NA
R15b	Forested/Emergent (25/75)	0.25	NA	0.00	NA
R17	Forested	0.31	NA	0.00	NA
IWS a, b	Forested	0.67	NA	0.00	NA
WH	Open water	0.25	NA	0.00	NA
DMC	Forest/Scrub-Shrub/Emergent	1.08	NA	0.00	NA

Wetland	Classifications (percent of each type)	Size of Wetland/Water(Acres) Refined	Original FSEIS	Project Impact (Direct and Indirect) Refined	Original FSEIS
W1	Emergent	0.10	NA	0.10	NA
W2	Forested/Emergent (20/80)	0.22	NA	0.22	NA
Auburn 1[5]	Emergent	20.42	NA	0.11	NA
Auburn 2	Emergent	0.60	NA	0.00	NA
Auburn 3	Emergent	0.01	NA	0.01	NA

[1] Impacts to non-wetland waters of the U. S. (i.e. relocation of Miller Creek) were described in the FEIS and FSEIS. Their acreage is quantified here.

[2] This area was determined not to be a regulated wetland by the City of SeaTac and the U.S. Army Corps of Engineers.

[3] Wetland areas 49, 50, and 55 were incorporated into Wetlands B-11, B-4, and 52, respectively.

[4] The portions of these wetlands located adjacent to the project site are estimated.

[5] This wetland extends off-site. The reported area includes wetlands in the construction access easement.

TABLE 2
Bird Species Reported near Sea-Tac Airport, wildlife surveys at Dumas Bay, and in the Kent Christmas Bird Count Area.

Common Name	Sea-Tac Master Plan EIS	Dumas Bay	Christmas Bird Count
Red-throated loon	No	Yes	Yes
Pacific loon	No	Yes	Yes
Common loon	No	Yes	Yes
Pied-billed grebe	Yes	Yes	Yes
Horned grebe	No	Yes	Yes
Red-necked grebe	No	Yes	Yes
Eared grebe	No	Yes	Yes
Western Grebe	No	Yes	Yes
Double-crested cormorant	No	Yes	Yes
Brandt's cormorant	No	Yes	Yes
Pelagic cormorant	No	Yes	Yes
American bittern	No	No	No
Great blue heron	Yes	Yes	Yes
Green heron	No	Yes	Yes
Trumpeter swan	No	No	Yes
Great white-fronted goose	No	No	Yes
Snow goose	No	Yes	Yes
Black brant	No	Yes	Yes
Canada goose	Yes	Yes	Yes
Wood duck	Yes	No	Yes
Green-winged teal	Yes	Yes	Yes
Mallard	Yes	Yes	Yes
Northern pintail	No	Yes	Yes
Cinnamon teal	No	Yes	Yes
Northern shoveler	No	Yes	Yes
Gadwall	Yes	Yes	Yes
Eurasian wigeon	No	Yes	Yes
American wigeon	Yes	Yes	Yes
Canvasback	No	Yes	Yes
Redhead	No	No	Yes
Ring-necked duck	No	No	Yes
Greater scaup	No	Yes	Yes
Lesser scaup	No	Yes	Yes
Harlequin duck	No	No	Yes
Black scoter	No	Yes	Yes
Surf scoter	No	Yes	Yes
White-winged scoter	No	Yes	Yes
Common goldeneye	No	Yes	Yes
Barrow's goldeneye	Yes	Yes	Yes
Bufflehead	No	Yes	Yes
Hooded merganser	No	Yes	Yes
Common merganser	Yes	Yes	Yes
Red-breasted merganser	No	Yes	Yes
Ruddy duck	No	Yes	Yes
Osprey	No	Yes	Yes

Common Name	Sea-Tac Master Plan EIS	Dumas Bay	Christmas Bird Count
Bald eagle	Yes	Yes	Yes
Northern harrier	Yes	No	Yes
Sharp-shinned hawk	Yes	Yes	Yes
Cooper's hawk	Yes	Yes	Yes
Northern goshawk	No	No	Yes
Red-tailed hawk	Yes	Yes	Yes
Rough-legged hawk	No	Yes	Yes
Swainson's hawk	No[13]	No	No
American kestrel	No	Historic	Yes
Merlin	No	Yes	Yes
Peregrine falcon	No	Yes	Yes
Ring-necked pheasant	No	Historic	Yes
Ruffed grouse	No	Historic	Yes
California quail	No	Yes	Yes
Virginia rail	No	Historic	Yes
Sora	No	Historic	Yes
American coot	No	Yes	Yes
Black-bellied plover	No	Yes	Yes
Semipalmated plover	No	Yes	No
Killdeer	Yes	Yes	Yes
Greater yellowlegs	No	Yes	Yes
Lesser yellowlegs	No	No (Expected)	No
Spotted sandpiper	No	Yes	Yes
Black turnstone	No	No (Expected)	Yes
Western sandpiper	No	Yes	Yes
Least Sandpiper	No	Yes	Yes
Dunlin	No	Yes	Yes
Snaderling	No	Yes	No
Long-billed dowitcher	No	No (Expected)	Yes
Short-billed dowitcher	No	Yes	No
Common snipe	No	Yes	Yes
Whimbrel	No	No	No
Parasitic Jaegar	No	Yes	No
Mew gull	No	Yes	Yes
Ring-billed gull	No	Yes	Yes
California gull	No	Yes	Yes
Herring gull	No	Yes	Yes
Thayer's gull	No	Yes	Yes
Western gull	No	Yes	Yes
Glaucous-winged gull	Yes	Yes	Yes
Glaucous x western gull	No	Yes	Yes
Gull sp	No	Yes	Yes
Heerman's gull	No	Yes	Yes
Caspian tern	No	Yes	No
Common tern	No	Yes	No
Common murre	No	Yes	Yes
Pigeon guillemot	No	Yes	Yes

[13] This species has been reported as salvaged on the STIA airfield.

Common Name	Sea-Tac Master Plan EIS	Dumas Bay	Christmas Bird Count
Marbled murrelet	No	Yes	Yes
Rhinoceros auklet	No	Yes	Yes
Band-tailed pigeon	Yes	Yes	Yes
Rock dove	Yes	Yes	Yes
Mourning dove	No	Historic	Yes
Common barn-owl	No	Yes	Yes
Western screech-owl	No	Yes	Yes
Great horned owl	Yes	Yes	Yes
Northern pygmy-owl	No	No	Yes
Snowy owl	No[1]	No	No
Short-eared owl	No	No	Yes
Northern saw-whet owl	No	Yes	Yes
Anna's hummingbird	No	Yes	Yes
Rufous hummingbird	No	Yes	No
Black swift	No[1]	No	No
Common nighthawk	No[1]	No	No
Belted kingfisher	Yes	Yes	Yes
Downy woodpecker	Yes	Yes	Yes
Hairy woodpecker	Yes	Yes	Yes
Northern flicker	Yes	Yes	Yes
Pileated woodpecker	Yes	Yes	Yes
Red-breasted sapsucker	No	Yes	Yes
Willow flycatcher	No	Yes	No
Pacific-slope flycatcher	No	Yes	No
Olive-sided flycatcher	Yes	Yes	No
Tree swallow	Yes	Yes	No
Violet-green swallow	No	Yes	No
Purple martin	No	Yes	No
Northern rough-winged swallow	No	Yes	No
Barn swallow	Yes	Yes	No
Cliff swallow	No	Yes	No
Bank swallow	No[1]	No	No
Horned lark	No[1]	No	No
Steller's jay	Yes	Yes	Yes
Common raven	No	Yes	Yes
Black-capped chickadee	Yes	Yes	Yes
Mountain chickadee	No	Yes	Yes
Chestnut-backed chickadee	No	Yes	Yes
Bushtit	Yes	Yes	Yes
Red-breasted nuthatch	Yes	Yes	Yes
White-breasted nuthatch	No	Historic	No
Brown creeper	Yes	Yes	Yes
Bewick's wren	Yes	Yes	Yes
Winter wren	Yes	Yes	Yes
Marsh wren	No	Yes	Yes
American dipper	No	Yes	Yes
Golden-crowned kinglet	No	Yes	Yes
Ruby-crowned kinglet	No	Yes	Yes
Hermit thrush	No	Yes	Yes

Common Name	Sea-Tac Master Plan EIS	Dumas Bay	Christmas Bird Count
American robin	Yes	Yes	Yes
Varied thrush	No	Yes	Yes
Swainson's thrush	No	Yes	No
Townsend's solitaire	No	Yes	No
American Pipit	No	Yes	Yes
Cedar waxwing	No	Yes	Yes
Northern shrike	No	Yes	Yes
European starling	Yes	Yes	Yes
Western warbling-vireo	No	Yes	No
Solitary vireo	No	Historic	No
Hutton's vireo	No	Yes	Yes
Orange-crowned warbler	Yes	Yes	Yes
Nashville warbler	No	Yes	No
Yellow warbler	Yes	Yes	No
Black-throated gray warbler	No	Yes	No
Common yellowthroat	No	Yes	Yes
Townsend's warbler	No	Yes	Yes
Audubon's warbler	No	Yes	Yes
MacGillivray's warbler	No	Yes	No
Wilson's warbler	No	Yes	No
Black-headed grosbeak	No	Yes	No
Western tanager	No	Yes	No
Rufous-sided towhee	Yes	Yes	Yes
Rustic bunting	No	No	Yes
Vesper sparrow	No	No	Yes
American tree sparrow	No	No	Yes
Savannah sparrow	No	Historic	Yes
Fox sparrow	No	Yes	Yes
Song sparrow	Yes	Yes	Yes
Lincoln's sparrow	No	No (Expected)	Yes
Swamp sparrow	No	No	Yes
White-throated sparrow	No	No	Yes
Golden-crowned sparrow	No	Yes	Yes
White-crowned sparrow	Yes	Yes	Yes
Harris' sparrow	No	No	Yes
Dark eyed junco	Yes	Yes	Yes
Red-winged blackbird	No	Yes	Yes
Western meadowlark	No	No	Yes
Brewer's blackbird	No	No	Yes
Brown-headed cowbird	No	Yes	Yes
Purple finch	No	Yes	Yes
House finch	No	Yes	Yes
Red crossbill	No	Yes	Yes
Pine siskin	No	Yes	Yes
American goldfinch	Yes	Yes	Yes
Evening grosbeak	No	Yes	Yes
House sparrow	Yes	Yes	Yes

Kent Christmas Bird Count Area. (modified from letter to US Army Corps of Engineers by Donald Norman, February 16, 2001)

ATTACHMENT A

BIOLOGICAL OPINION/CONCURRENCES FROM THE SERVICES

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Western Washington Office
510 Desmond Drive SE, Suite 102
Lacev Washington 98503
Phone: (360) ,53-9440 Fax: (360) 753-9008

MAY 22 2001

Lowell H. Johnson
Federal Aviation Administration
1601 Lind Avenue SW
Renton, Washington 98055-4056

FWS Reference #: 1-3-00-F-1420, Master Plan Update Improvements, Seattle-Tacoma International Airport

X Reference #: 1-3-96-I-29, 1-3-99-SP-0744

Dear Mr. Johnson:

This document transmits the U. S. Fish and Wildlife Service's (FWS) biological opinion (BO) regarding the effects of the proposed Master Plan Update Improvements (MPUI) for the Seattle-Tacoma International Airport (Sea-Tac) in King County, Washington on the threatened bull trout (*Salvelinus confluentus*), bald eagle (*Haliaeetus leucocephalus*), and marbled murrelet (*Brachyramphus marmoratus*) in accordance with Section 7 of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 et seq.). This project is proposed by the Port of Seattle, Sea-Tac (Port). Your June 15, 2000, request for formal consultation was received by our office on approximately June 16, 2000. We received a letter by fax from you on August 21, 2000, requesting that we concur with a "may affect, not likely to adversely affect" call for the marbled murrelet rather than a "no effect."

This biological opinion is based on the following information: biological assessment (BA) dated June 2000; Supplement for Property Acquisition and Demolition for 34X Runway Protection Zone, dated September 2000; supplement to the BA, dated December 18, 2000; Memorandum, dated December 21, 2000; Sea-Tac Runway Fill Hydrology Studies Report (PGG 2000), Comprehensive Stormwater Management Plan (Parametrix 2000a); Seattle-Tacoma Airport Master Plan Update, Low Streamflow Analysis (Earth Tech, Inc. 2000) letter dated October 30, 2000 transmitting new Joint Aquatic Resources Permit Application; Final Natural Resource Mitigation Plan (Parametrix 2000b) information provided by fax from you on October 16, 2000 and January 10, 2001; e-mail and telephone communications from the Port on April 20, 21, and 23, 2001; e-mails, letters and attachments dated March 26 and 30, and April 20 and 24, 2001 from James Lynch, Stoel Rives, LLP, the law firm representing the Port; information provided by telephone, fax and e-mail by your consultant, Parametrix Inc., on August 18, 21, 22, and 23, 2000, December 28 and 29, 2000, and January 17, 18, and 19, 2001; documents from the Airport

Communities Coalition; and other supplemental information provided in numerous telephone calls, and email or written correspondence up through May 22, 2001. A complete administrative record of this consultation is on file at this office.

CONSULTATION HISTORY

The FAA originally consulted with the Service on this action in 1995. The BA for that consultation addressed effects to bald eagles and peregrine falcons, and concluded that the proposed MPUI "may affect, but will not adversely affect" these species (Tims 1995, FAA 1995). The FWS concurred with these determinations (USFWS 1995).

Due to the recent listing of bull trout, new information regarding the presence of marbled murrelets in the action area, and modifications to the project proposal not previously analyzed, the FAA has requested reinitiation of this consultation. Since that time, the peregrine falcon has been delisted (August 25, 1999, 64 FR 46542), and therefore, is not addressed in this reinitiation of consultation.

The FAA determined that the current proposed action is "not likely to adversely affect" the bull trout, the bald eagle and the marbled murrelet. Although ESA Section 7 compliance for the proposed project could be completed through informal procedures, the FAA requested that the FWS use the formal consultation process. Therefore, this BO will address the effects to bull trout, bald eagle, and marbled murrelet.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

Project Location

The proposed MPUI is located at Sea-Tac within the cities of SeaTac and Des Moines, King County, Washington (Sections 4 and 5, Township 22 North, Range 4 East, and Sections 20, 21, 28, 29, 32, and 33, Township 23 North, Range 4 East, Willamette Meridian). Associated with these improvements is the off-site wetland mitigation located in the City of Auburn, King County, Washington (Section 31, Township 22 North, Range 5 East, Willamette Meridian).

Project Description

The MPUI would develop portions of property located on and near the existing Sea-Tac airport, and provide wetland mitigation near the Green River in the City of Auburn. The proposed actions will impact creek, riparian and wetland habitats within the action area. The FAA's proposed actions are:1) to approve future collection and use authorization for passenger facility charges related to implementation of Sea-Tac Master Plan update MPUI; 2) issue future grants and grants issued after May 24, 1999, related to the implementation of MPUI; and 3) direct construction of the airport traffic control tower and navigational aids. The U. S. Army Corps of Engineers (Corps) proposed action is the issuance of a Clean Water Act 404 permit for the proposed fill within waters of the United States, including wetlands, and associated mitigation. The proposed project will result in the permanent filling on-site of approximately 18.37 acres of wetlands and temporarily filling of 2.05 acres of wetlands. Also, approximately 21.64 acres of historically farmed and emergent wetlands will be temporarily filled and 0.12 acres of wetlands will be permanently filled as part of the off-site mitigation in Auburn. Mitigation for proposed aquatic impacts includes but is not limited to the following: restoration or enhancement of 25.21 acres of wetlands in basin and 49.48 acres of wetlands out-of-basin at the Auburn mitigation site. The following (Table 1) is a listing of all proposed actions included in the MPUI.

Table 1. Proposed Master Plan Update improvement projects at Sea-Tac Airport.

Project	**Description**
	Runway and Taxiway Projects
Property Acquisition, Street and Utility Vacation	Includes purchasing property and demolishing existing structures between existing Sea-Tac boundary west to Des Moines Memorial Drive and State Route (SR) 509. Required for third runway embankment fill and construction impact mitigation. Acquisition and demolition are also required for the south runway protection zone (RPZ).
Embankment Fill	Embankment for third runway, constructed using imported fill. Approximately 16.5 million cubic yards (cy) will be placed over a 5- to 7-year period. Existing roads and streets under the embankment footprint will be removed.
Interconnecting Taxiways	New connecting taxiways between existing runway and third runway. Project is located on existing airfield, requiring only minimal grading.
Runway 16X/34X	Paving of third runway after completion of embankment fill.
Extension of Runway 34R by 600 feet (ft)	Extend runway by 600 ft for improved warm weather and large aircraft operations. Project is located at the southern end of the east runway.
Additional Taxiway Exits on 16L/34R	Construction of new ramps to the existing terminal apron.
Dual Taxiway 34R	Improvements to taxiways serving the South Aviation Support Area (SASA) and south apron.

Project (cont.)	Description (cont.)
Runway Safety Areas (RSAs)	
Runway 34R Safety Fill	Extend runway safety fill to meet FAA standards.
RSAs 16R/16L	Extend safety fills by 1,000 ft to meet FAA standards.
Relocation of Displaced Threshold on Runway 16L	Airfield taxiway improvements. The runway threshold (i.e., the emergency landing pad at end of runway pavement) to be relocated onto new RSA.
Miller Creek Sewer Relocation	Relocate sewer for third runway embankment and runway safety fills. New sewer to run along alignment of new 154th/156th Street.
Borrow Sites	
Borrow Sites	Sources of fill for third runway embankment, located on Sea-Tac property south of the airport. Approximately 6.7 million cy[1] of material to be excavated from three sites and transported across airport property to the embankment.
FAA Navigation Aids (NAVAIDS)	
New Airport Traffic Control Tower	New air traffic control tower to be located in existing developed area near terminal.
Relocate Airport Surveillance Radar, Airport Surface Detection Equipment, NAVAIDS	Existing radar and navigation equipment will be relocated to allow construction of third runway.
Airfield Building Improvements	
New Snow Equipment Storage	New building to house snow removal equipment.
Weyerhaeuser Hangar Relocation	Relocate existing hangar on west side of airfield to allow construction of third runway. New hangar will be located near south end of third runway.
Terminal/Air Cargo Area Improvements	
Relocation of Airborne Cargo	Relocate existing cargo building from air traffic control tower site to north cargo area. Located in existing developed area near terminal.
Central Terminal Expansion	Passenger terminal remodel. Located in existing developed area at terminal.
South Terminal Expansion Project (STEP)	Passenger terminal remodel. Located in existing developed area to the south of the main passenger terminal.
Northwest Hangar Relocation	Relocate Northwest hangar to site now occupied by Delta hangar. Located in existing developed area.

Project (cont.)	Description (cont.)
Satellite Transit Shuttle System Rehabilitation	Remodel and upgrade underground transit system linking terminal to satellites.
Redevelopment of North Air Cargo	New or expanded air cargo facilities along Air Cargo Road at north end of airport.
Expansion of North Unit Terminal (North Pier)	Addition to new passenger terminal located north of existing terminal. Located in existing developed area (Doug Fox parking lot and airport access freeway).
New Airport Rescue and Fire Fighting Facility	Replaces facility displaced by new North Terminal. The new facility will be located to the north of the North Terminal.
Cargo Warehouse at 24th Avenue South	New air cargo facility located north of SR 518 on 24th Avenue South.
Westin Hotel	New hotel located immediately north of main passenger terminal. Located in existing developed area at terminal.
New Water Tower	Construct new water tower and piping in engineering yard south of South 160th Street in subbasins (Gilliam Creek watershed) served by stormwater outfalls 012 and 013.
Roads[2]	
Temporary SR 518 and SR 509 Interchanges	Temporary access ramps to serve construction of third runway embankment and runway safety fill; to be removed after project completion.
154th/156th Street Relocation	Relocate public roadway to allow construction of third runway embankment and runway safety fills. Existing road to be demolished.
154th/156th Street Bridge Replacement	Relocate existing South 156th Street bridge over Miller Creek to accommodate the third runway footprint and South 154th/156th Street relocation. In-water work associated with this project is limited to the removal of the existing bridge and bank restoration.
Improvements to Main Terminal Roads	Transportation circulation, seismic and other improvements to roadway systems serving terminal.
Improved Access and Circulation Roadway Improvements	Improvements to existing roadway system serving passenger terminal, garage, and air cargo facilities.
North Unit Terminal Roadways	Improvements to existing roadway system to serve the new North Terminal and garage.
Improvements to South Access Connector Roadway (South Link)	Improvements to existing roadway system serving passenger terminal, garage, and air cargo facilities. Will connect terminal and garage area to South Access roadway and SR 509 extension south of the airport.

Project (cont.)	Description (cont.)
Parking	
Main Parking Garage Expansion	Expand parking facility at main passenger terminal on north and south sides (existing developed areas), and add floors to portions of the existing garage.
The North Employees Parking Lot (NEPL), Phase 1	New parking facility for employees, located north of SR 518.
North Unit Parking Structure	Construction of new garage serving new North Terminal facility. Facility will be located at existing Doug Fox parking lot.
The South Aviation Support Area	
The SASA and Access Taxiways	New airport support facility for cargo and/or maintenance, located at the south end of the airport south of the Olympic Tank Farm and South 188th Street. Airplane access will be by new parallel taxiway constructed along Runway 34R.
Relocation of Existing Facilities to the SASA	Airport operation support facilities will be relocated to the SASA once SASA site development is completed. Many of these facilities must be relocated from their present locations due to main terminal expansion (i.e., STEP and North Terminal), including Northwest hangar, ground support equipment, ground and corporate aviation facilities, new airport maintenance building, and United maintenance complex.
Stormwater Facilities[3]	
Miller Creek Detention Facility Expansion	Expand the Miller Creek Detention Facility by 16.4 acre-ft to provide flow control retrofitting for existing Sea-Tac discharges to Miller Creek. All construction would take place in uplands, and would create free-draining detention volume.
SASA Detention Pond	Create regional stormwater detention pond for the SASA project and other sites. The pond is 33.4 acre-ft and discharges to Des Moines Creek.
NEPL Vault	A 13.9 acre-ft vault to retrofit the NEPL; discharges to Miller Creek via Lake Reba.
Third Runway Vaults and Ponds	Stormwater detention vaults and ponds at the north, west, and south sides of the airport, discharging to Miller, Walker, and Des Moines Creeks.
Sea-Tac Retrofit Facilities	Detention vaults or ponds to provide flow control retrofitting for existing Sea-Tac discharges to Des Moines Creek. Vaults to be constructed in combination with third runway facilities when possible.

Project (cont.)	Description (cont.)
Cargo Vault	Detention vault for North Cargo Facility (4.5 acre-ft discharging to Miller Creek via Lake Reba).
Natural Resources	
Miller Creek Relocation	Approximately 980 ft of Miller Creek immediately downstream of the Miller Creek Detention Facility will be relocated to accommodate third runway embankment and runway safety fill.
Miller Creek Buffer and Wetland Enhancement	Establish a 100-ft buffer (average) along approximately 6,500 linear ft of Miller Creek and riparian wetlands associated with Miller Creek within the acquisition area. Enhance approximately 7.4 acres of existing wetlands along the stream.
Miller Creek Floodplain and Wetland Restoration	Excavate approximately 9,600 cy from the Vacca Farm site adjacent to Miller Creek to compensate for approximately 8,500 cy of floodplain fill for third runway embankment and north safety fill. Restore and enhance approximately 17 acres of stream habitat, floodplain wetlands, aquatic habitat in Lora Lake, and buffers at Vacca Farm.
Miller Creek Instream Habitat Enhancement	Project 1: South of the Vacca Farm site, approximately 650 ft of channel. Remove rock riprap, footbridges, and trash. Place large woody debris (LWD) throughout this section of the stream. Plant riparian areas along the stream with native wetland and upland plant species. Project 2: Approximately 150 ft upstream of South 160th Street, approximately 235 ft[1] of channel. Install LWD in the stream channel, grade a small section of the west bank of the stream to create a gravel bench in the floodplain, remove two rock weirs to improve fish passage, and plant the upland area with native trees and shrubs. Project 3: Immediately downstream of South 160th Street, approximately 380 ft[1] of channel. Grade a section of the east bank, remove a rubber-tire bulkhead and install LWD in the stream and on its banks. Plant buffer areas with native trees and shrubs. Project 4: Miller Creek immediately upstream of 8th Avenue South, approximately 820 ft[4] of channel. Grade portions of both banks. Remove footbridges and portions of concrete block walls. Install LWD in the stream and on its banks. Plant buffer areas with native trees and shrubs.

Project (cont.)	Description (cont.)
Miller Creek Instream Habitat Enhancement (cont.)	In addition to these specific enhancements, debris such as tires, garbage, and fences will be removed throughout the entire stretch of Miller Creek from the Vacca Farm site south to Des Moines Memorial Drive. In areas where access is readily available, LWD will be selectively placed throughout the stream to improve instream habitat conditions.
Drainage Channels Relocation	Relocate a minimum of 1,290 linear ft of drainage channels to accommodate the third runway embankment. Plant buffers along the drainage channels with native grass and shrubs.
Restoration of Temporarily Impacted Wetlands	Approximately 2.05 acres of wetland located west of the third runway embankment, north of relocated South 154th Street, and west of the Miller Creek relocation project, will be temporarily filled or disturbed during embankment construction. When construction activities are completed, remove fill material, restore pre-disturbance topography, and plant wetlands with native shrub vegetation.
Tyee Valley Golf Course Wetlands Enhancement and Des Moines Creek Buffer Enhancement	Restore approximately 4.5 acres of emergent wetland area and approximately 1.6 acres of buffer located within Tyee Valley Golf Course to a native shrub vegetation community. The enhancement actions would be integrated into plans to construct a Regional Detention Facility on the golf course[2] (King County Capital Improvement Project Design Team 1999). The enhancement would convert the existing turf wetland to native shrub wetland community. Enhance approximately 3.4 acres (average 100 ft wide) of buffer and 1.0 acre of existing wetland along Des Moines Creek.
Wetland Habitat (including Avian Habitat) near the Green River in Auburn	Restore wetland functions to a 67-acre parcel near the Green River in the City of Auburn. Create and/or restore approximately 17.2 acres of forest, 6.0 acres of shrub, 6.2 acres of emergent, and 0.60 acre of open-water wetland. Enhance approximately 19.5 acres of existing wetlands. Enhance protective buffers totaling about 15.90 acres.

1 Size modified from that originally stated in BA.

2 Temporary roads used to haul fill material from three on-site borrow areas to construction sites are included in the analysis of the borrow areas and are not listed here.

3 Des Moines Creek Basin Plan Committee may construct a Regional Detention

Facility on Tyee Golf Course to provide regional flow control. This project would eliminate the need for Sea-Tac retrofit facilities described above. As this is project would be subject to a future federal action, it is not considered a Master Plan Update improvement and is not addressed in this BO.

4 Project length includes ap‸roximately 12 ft of instream work as part of driveway demolition, and 400 ft of riparian enhancement.

The proposed project would result in a relatively small increase in the total number of operations (airplane take-offs or landings) over existing conditions. Operations without the new facilities are approximately 460,000 annually. With the proposed project, by 2010, the operations would reach 474,000 (M. Vigelanti, Synergy Consultants, pers. com., 2001). This is an increase of approximately 14,000 take-offs or landings or approximately 3 percent.

STATUS OF THE SPECIES (rangewide and/or recovery unit)

Bull Trout

On November 1, 1999, the FWS (USDI 1999a) listed all distinct population segments (DPSs) of the bull trout, a member of the family Salmonidae, within the coterminous United States as threatened. Five DPSs with 187 subpopulations are currently identified. They include 1) Coastal/Puget Sound, 34 subpopulations; 2) Columbia River, 141 subpopulations; 3) Jarbidge River, 1 subpopulation; 4) St. Mary-Belly River, 4 subpopulations and; 5) Klamath River, 7 subpopulations. Critical habitat has not been designated at this time. The bull trout is mainly threatened by habitat degradation, passage restrictions at dams, and competition from non-native lake trout (*Salvelinus namaycush*) and brook trout (*Salvelinus fontinalis*).

The FWS has identified 35 subpopulations of native char (bull trout and/or Dolly Varden) within the Coastal/Puget Sound DPS. These subpopulations are grouped into five analysis areas based on their geographic location: Coastal, Strait of Juan de Fuca, Hood Canal, Puget Sound, and Transboundary. These groupings were made in order to identify trends that may be specific to certain geographic areas.

The FWS has rated the subpopulations as either strong, depressed, or unknown, modified after Rieman et al. (1997). A strong subpopulation is defined as having all life history forms that once occurred, abundance that is stable or increasing, and at least 5,000 total fish or 500 adult fish present. A depressed subpopulation is defined as having either a major life history form eliminated, abundance that is declining or half of the historic abundance, or less than 5,000 total fish or 500 adults present. A subpopulation status is unknown if there is insufficient information to determine whether the status is either strong or depressed. Within the Coastal/Puget Sound DPS, only one subpopulation is considered strong, 10 are depressed, and 25 are unknown.

The proposed project is located within the Puget Sound Analysis Area of the Coastal/Puget Sound DPS. Fifteen subpopulations occur in the Puget Sound Analysis Area, from the Nisqually River north to the Upper Middle Fork Nooksack River. The more northern subpopulations appear to be relatively more abundant compared to the southern populations (USDI 1999). The large amount of federal land in these northern drainages, and the lower levels of urbanization, provide better habitat conditions than in southern Puget Sound. All five of the subpopulations within the Seattle-Olympia urban corridor are considered depressed. These subpopulations are within the Nisqually River, Puyallup River, Green River, and Lake Washington basins. Although there is scant historical information on population abundance, adverse impacts associated with habitat degradation have been documented for other salmonid species in these systems (e.g., chinook salmon (*Oncorhynchus tshwytscha)*). Given the bull trout's more restrictive habitat requirements, it is reasonable to assume that native char have been similarly affected. These adverse impacts include fish passage barriers, water temperature, interactions with nonnative salmonids, geomorphic processes, timber harvest, agricultural practices, and urban development.

Taxonomists have considered the bull trout to be a separate char species from Dolly Varden (*Salvelinus malma*) since 1978 (Cavender 1978). The American Fisheries Society formally accepted the two separate species in 1980. Bull trout populations exhibit four distinct life history forms: resident, fluvial, adfluvial, and anadromous.

Resident bull trout inhabit the same streams or nearby tributaries in which they were hatched. Fluvial bull trout spawn in tributary streams where the young rear from one to four years before migrating to a river where they grow to maturity. Adfluvial bull trout spawn in tributary streams, and, after rearing, migrate to a lake (Fraley and Shepard 1989). Anadromous char are known only to occur in Coastal/Puget Sound DPS subpopulations where major growth and maturation occurs after migration to and from salt water. Potentially anadromous bull trout populations have been identified in the Puyallup, White, Carbon, and Green Rivers. These diverse life histories are important to the stability and viability of bull trout populations (Rieman and McIntyre 1993).

Bull trout have more specific habitat requirements than other salmonids. High quality bull trout habitat is typically characterized by cold temperatures; abundant cover in the form of large wood, undercut banks, boulders, etc.; clean substrate for spawning; interstitial spaces large enough to conceal juvenile bull trout; and stable channels. Because habitat has been degraded in many basins and bull trout populations in these basins may be depressed, the fish may utilize less optimal habitat.

Stream temperatures and substrate types are critical for their sustained long-term residence. Bull trout are found primarily in colder streams, although the fish are also found in larger, warmer river systems that may cool seasonally or provide migratory corridors and important forage bases. Bull trout are associated with the coldest, cleanest and most complex stream reaches within basins. Temperature is critical for spawning and early life history requirements. Very cold water is required for incubation, and juvenile rearing appears to be restricted to areas with cold water.

Spawning areas are often associated with the coldest streams in a river basin. In one study by Goetz (1994), juvenile bull trout were not found in water temperatures above 12 ° Celsius (C). Many studies show that temperatures must drop below 9 ° C or 10 ° C before spawning occurs (McPhail and Murray 1979; Craig 1997). Egg survival decreases as water temperature increases, with higher survival levels documented at 2 ° C to 4 ° C (McPhail and Murray 1979). The best bull trout habitat in several Oregon and Washington streams had temperatures which seldom exceeded 15 ° C (Buckman et al. 1992; Craig 1997; Ratliff and Howell 1992; Ziller 1992). Stream bottom and substrate composition are also highly important for bull trout (Pratt 1992), especially for juvenile rearing and spawning site selection (Rieman and McIntyre 1993; Graham et al. 1981; McPhail and Murray 1979). Fine sediments can influence incubation survival and emergence success (Weaver and White 1985) but might also limit access to substrate interstices that are important cover during rearing and over-wintering (Goetz 1994; Jakober 1995; USDI 1999a).

The anadromous life-form is more complex than the other life-forms discussed. Limited information on the marine and estuarine residency for bull trout is known. While it was thought that the Dolly Varden were primarily anadromous and the bull trout were fluvial and adfluvial in the north Puget Sound area, this is not the case. In the limited sampling done in Port Susan and Skagit Bay, the char have been identified as both bull trout and Dolly Varden (Kraemer in prep.).

In the north Puget Sound area many of the sub-adult char migrating out of headwater or mainstem areas adopt an anadromous life history. The smolts move downstream in the spring of the year (April, May, and early June) to the river mouths and nearby beaches. Sub-adults typically spend the spring and most of the summer in the marine environment where they experience rapid growth (25 millimeters (mm) to 40 mm per month).

Bull trout are opportunistic feeders. Like other apex predators, they require a large prey base and a large home range. Sub-adult and adult migratory bull trout move throughout and between basins in search of prey. Resident and juvenile bull trout prey on terrestrial and aquatic insects, macrozooplankton, amphipods, mysids, crayfish, and small fish (Wyman 1975; Rieman and Lukens 1979 in Rieman and McIntyre 1993; Goetz 1989; Donald and Alger 1993). Adult and sub-adult migratory bull trout are primarily piscivorous, feeding on various trout and salmon species, whitefish, yellow perch, and sculpin. A recent study in the Cedar River Watershed of western Washington found adult bull trout diets to also consist of salamanders (Connor et al. 1997).

Limited stomach content work and feeding observations indicate that while the char are in the marine environment of Skagit Bay and Port Susan they feed heavily on surf smelt (*Hypomesus pretious*). Other food items eaten in the marine waters include Pacific herring (*Clupea harengus pallasi*), Pacific sand lance (*Ammodytes hexapterus*), pink salmon smolts (*Oncorhynchus gorbuscha*), chum salmon smolts (*O. keta*), and a number of invertebrates. In Port Susan and Skagit Bay the smelt and herring spawning beaches match nearly exactly those used by the char while they are in the marine area (Kraemer in prep.). This matches information for foraging in freshwater, where bull trout were found to aggregate near seasonally concentrated forage fish in Flathead Lake, Montana (MBTSG 1998).

After several months in salt water, maturing adult bull trout begin their spawning migration. The fish leave the tidal areas in late May, June and early July. At this time, the first time spawners are 400 mm to 525 mm in length. In the Sauk basin the spawning migration can be as long as 195 km and the fish may climb to an elevation of 1000 meters (Kraemer in prep.). Bull trout become sexually mature between 4 and 9 years of age (Shepard et al. 1984), and may spawn in consecutive or alternate years (Shepard et al. 1984; Pratt 1992). Migratory bull trout frequently begin their spawning migrations as early as May, moving from the salt water back to the lower river and its tributaries to begin their spawning migration. The anadromous life-form does make considerable migrations. Migratory bull trout have been known to move upstream as far as 259 kilometers (155 miles) to spawning grounds (Fraley and Shepard 1989). Fish may be in salt water areas 40 km from the river mouth in the spring of the year and have been documented moving nearly 200 km upstream of the river mouth during spawning migrations. An adult tagged while staging in the spawning areas of the upper South Fork Sauk was recaptured by a fisherman the following spring in the marine area on the east side of Camano Island, fifteen air miles from the mouth of the Skagit River. A radio tagging study on the South Fork Skykomish (Kraemer pers. com. *in* WDFW 1997) showed that when the fish did migrate in the upper watershed, they commonly moved 2 km to 3 km a day with the maximum distance traveled of 15.2 km. In the lower river, the fish may travel at an even greater rate. During the low flows of summer and fall, most of the movement seemed to occur during the low-light periods just after dawn or before sunset. Once the fish reach staging areas near the spawning ground they may remain in the same general area, even the same pool, for several months.

In the Coastal/Puget Sound region, spawning occurs from August through December. Spawning typically occurs in cold, low-gradient 1st- to 5th-order tributary streams, over loosely compacted gravel and cobble having groundwater inflow (Shepard et al. 1984; Brown 1992; Rieman and McIntyre 1996; Swanberg 1997; MBTSG 1998). Spawning sites usually occur near cover (Brown 1992). They typically spawn in headwaters of tributary streams (Craig 1997). Hatching occurs in winter or early spring, and alevins may stay in the gravel for extended periods, sometimes exceeding 220 days. After spending the winter in the lower 35 kilometers (km) to 40 km of the river, the sub-adult char return to the marine environment. Some fish reenter the salt water as early as late February. Post-spawning mortality, longevity, and repeat-spawning frequency are not well known (Rieman and McIntyre 1996), but lifespans may exceed 10-13 years (McPhail and Murray 1979; Pratt 1992; Rieman and McIntyre 1993; USDI 1999a).

The full range of depths bull trout may use in Puget Sound is not known. There is some limited information on preferred depths available from freshwater lakes. This may be an appropriate surrogate for marine waters. One bull trout has been captured at 60 meters in Lake Washington, Washington (D. Beauchamp, University of Washington, pers. com. 2000). Bull trout were captured infrequently in Flathead Lake, Montana at depths greater than 34 meters (MBTSG

1998). However, there appeared to be tendency for bull trout to be associated with depths less than 34 meters (Leathe and Graham 1982 *in* MBTSG 1998, Huston 1975 *in* MBTSG 1998).

Bull trout are threatened by land management activities, water management activities, over-harvest, and competition or hybridization with non-native fishes (USDI 1999a). Urban and agricultural development has resulted in the loss of riparian habitat and wetlands, with a subsequent increase in impervious surfaces. These changes, especially in the lowland streams, have resulted in increased stream temperatures, alteration of stream flows and water quality, and impacts to forage species. Logging, road building activities and associated cumulative effects impact bull trout through increased sediment production and delivery to streams, loss of large pools and woody debris, increased water temperatures, and degradation of water quality and quantity. Dam, reservoir and irrigation construction and operations have altered portions of bull trout habitat. Dams without fish passage create barriers to migratory bull trout metapopulations. Dams and reservoirs also alter the natural hydrograph, thereby affecting forage, water temperature, and water quality.

Bald Eagle

A detailed account of the taxonomy, ecology, and reproductive characteristics of the bald eagle is presented in the Pacific States Bald Eagle Recovery Plan (USFWS 1986) and the final rule to reclassify the bald eagle from endangered to threatened in all of the lower 48 States (60 FR 36010). Additional information on the listing of the species, and its status in Washington State was included in the biological opinion for the Point Roberts golf course (USFWS 1999a).

The bald eagle is found throughout North America. It breeds primarily in Alaska, Canada, the Pacific Northwest states, the Rocky Mountain states, the Great Lake states, and Chesapeake Bay (USFWS 1986, American Ornithologists' Union 1983). The bald eagle winters over most of the breeding range, but is most concentrated from southern Alaska and southern Canada southward.

The recent proposal to delist the bald eagle in the lower 48 states (USDI 1999b) indicates that numeric delisting goals have been met for the bald eagle in the Pacific Recovery Region since 1995. The proposed project is located within the Pacific Recovery Region.

In Washington, bald eagles are most common along saltwater, lakes, and rivers in the western portion of the state and along the Columbia River east of the Cascade Mountains (Larrison and Sonnenberg 1968). Resident, breeding eagles are found throughout the state near large bodies of water. Most nesting habitat in Washington is located in the San Juan Islands and on the Olympic Peninsula coastline (Grubb 1976).

The primary wintering range of bald eagles in Washington is Puget Sound and its major rivers. Most eagles wintering in Washington occur along the Skagit, Nooksack, and Sauk River Basin (USFWS 1986).

The bald eagle is found along the shores of saltwater, and freshwater lakes and rivers. In Washington, breeding territories are located in predominantly coniferous, uneven-aged stands with old-growth components (Anthony et al. 1982).

Bald eagles typically build large stick nests in mature or old-growth trees, and these nests are generally used over successive years. In Washington, courtship and nest building activities normally begin in March or early April, with eaglets hatching in mid-April or early May. Eaglets usually fledge in mid-July (Anderson et al. 1986).

The size of an eagle nest is dictated by the forest type and tree species found within a geographic area; eagles apparently select nest sites for structure rather than tree species (Anthony et al. 1982, Anthony and Isaacs 1989). The three main factors affecting distribution of nests and territories include: 1) nearness to water and availability of food, 2) suitable trees for nesting, perching, and roosting, and 3) the number of breeding-aged eagles (Stalmaster 1987).

Wintering bald eagles generally concentrate in areas where food is abundant and disturbance is minimal. The birds use perches near feeding areas during the day, which are typically isolated areas in old-growth and mature stands that have trees larger than the surrounding trees; the perches also provide views of foraging areas. Night roost trees are chosen according to their diameter and growth form. The canopy of night roost trees provides protection from inclement weather and disturbances (USFWS 1986).

Important food items during fall and winter include carrion such as "spawned out" salmon taken from gravel bars along wide, braided river stretches (Stalmaster et al. 1985, Stalmaster 1987). Anadromous and warm-water fishes, small mammals, carrion, waterfowl, and seabirds are among the most prevalent food items consumed during the breeding season (Anderson et al. 1986, USFWS 1986).

Marbled Murrelet

The marbled murrelet was federally listed as threatened on September 28, 1992 (57 FR 45328). Critical habitat was designated on May 24, 1996 (61 FR 26256). In North America, marbled murrelets range along the Pacific coast from Alaska south to central California. Wintering birds have occasionally been found in southern California. Puget Sound has one of the more concentrated marbled murrelet populations of California, Washington and Oregon (USFWS 1997). An account of the taxonomy, ecology, and reproductive characteristics of the marbled murrelet is found in: the 1988 Status Review (Marshall 1988); the final rule designating the species as threatened; the Service's biological opinion for Alternative 9 (USFWS 1994) of the FSEIS (USDA and USDI 1994); the *Ecology and Conservation of the Marbled Murrelet* (Ralph et al. 1995a); the final rule designating critical habitat for the species (61 FR 26256); the recovery plan for the species (USFWS 1997); and, the biological opinion on the Simpson Habitat Conservation Plan (USDI 2000). The following summarizes some of this information.

The population size of murrelets in Washington, Oregon, and California has been estimated at 18,550 to 32,000 (Ralph et al. 1995b). The large range in the population estimate is a result of two widely divergent population estimates in Oregon. Based on demographic analyses, Beissinger and Nur (1997) estimate the murrelet population to be declining at a rate of at least 4 percent per year and perhaps as much as 7 percent per year in Washington, Oregon, and California.

Ralph et al. (1995b) summarized some of the reasons for variability in population estimates among researchers, including differences in methodology, assumptions, spatial coverage, and survey and model errors. Nevertheless, both Ralph et al. (1995b) and the Marbled Murrelet Recovery Team (1994) have concluded that the listed population appears to be in a long-term downward trend. The Marbled Murrelet Recovery Team estimates that the population may be declining at rates of between 4 and 12 percent, which means that in 20 years the population could be less than one-half to one-twelfth its current size.

In Washington, Speich and Wahl (1995) concluded that murrelet populations are lower now than they were at the beginning of the century. Total estimates for Washington, which were derived from surveys conducted in the early 1980s, are about 5,500 murrelets (Speich and Wahl 1995). Based on surveys conducted in 1993, Varoujean and Williams (1995) estimated that 3,250 murrelets occur on the outer coast of Washington and the western portion of the Strait of Juan de Fuca.

Nesting habitat is crucial to murrelets. Unlike other alcids, marbled murrelets nest inland in mature and old growth coniferous forests as far as 52 miles from the ocean (Marshall 1989). In Washington, Oregon, and California, murrelet nests have been found in trees. South of the Alaskan tundra, murrelets nesting occurs within mature or old growth coniferous forests within 50 miles of the ocean (Carter and Erickson 1988, Hamer and Cummins 1990, Hamer and Cummins 1991, Nelson 1989, Nelson 1990, Paton and Ralph 1990, Sealy and Carter 1984).

Murrelet nests have been found on platforms or broad surfaces that are formed by large limbs, moss, branches deformed by diseases such as mistletoe, or damaged branches. Suitable nesting platforms are found most commonly on older trees. Most nests are directly under overhanging branches, which may provide protection from harsh weather and predators. The Pacific Seabird Group defines potential nesting habitat as 1) mature (with or without an old growth component) and old growth coniferous forests; and 2) younger coniferous forests that have deformation or structures suitable for nesting (Ralph et al. 1993). Preferred tree species are Douglas-fir, coast redwood, western hemlock, Sitka spruce, or western red cedar. Because murrelets are seabirds, their nesting habitat must be within flight distance of a marine environment (USDA Forest Service et al. 1993).

The loss of nesting habitat (older forests) has generally been identified as the primary cause of the marbled murrelet's population decline and disappearance across portions of its range (Ralph et al. 1995a). Prey resources and nesting habitat are identified as the two main factors which can affect seabird populations (Cairns 1992 *in* USFWS 1997). As the proposed project may affect the marine environment as opposed to nesting habitat, we will focus on the former aspect of the environment.

Marbled murrelets typically are found foraging within 0.6 miles to 1.2 miles from shore (USFWS 1997). Marbled murrelets feed mostly in near-shore marine waters and in inland saltwater bays and sounds, and occasionally inland freshwater lakes (Marshall 1989). They often gather at the mouths of rivers. Many prey species concentrate in specific nearshore areas where conditions concentrate lower trophic levels which are food for marbled murrelet prey species. In areas were marbled murrelet prey are concentrated, foraging marbled murrelets have also been concentrated (Carter 1984 *in* USFWS 1997, Carter and Sealy 1990 *in* USFWS 1997).

Marbled murrelets are considered opportunistic foragers. They are known to feed on invertebrates as well as fish. Mysids, gammarid amphipods and euphausiids invertebrates have been identified as important forage species during various times of the year and in certain localities. Invertebrate species appear to be more important during the winter and spring, as opposed to the summer breeding period. The prey is known to differ by species and/or its size between that eaten by adults versus chicks (Sealy 1975 *in* USFWS 1997, Carter 1984 *in* USFWS 1997, Carter and Sealy 1990 *in* USFWS 1997, Burkett 1995).

In the Pacific Northwest, the main fish prey for marbled murrelets has been identified as Pacific sand lance (*Ammodytes hexapterus*), Pacific herring (*Clupea harengus*), northern anchovy (*Engraulis mordax*), and smelt (Osmeridae) (USFWS 1997). Marbled murrelets have been seen occasionally foraging on salmonids in inland lakes in British Columbia and Washington (Carter and Sealy 1990 *in* USFWS 1997).

While declines in forage species may affect marbled murrelet populations, little information on any direct effect is available. Declines in species such as the Pacific herring have been documented in parts of Puget Sound (Burkett 1995, WDFW 1995 *in* USFWS 1997). However, the spawning biomass of Pacific herring has remained stable over the last 20 years (WDFW 1995 *in* USFWS 1997).

Marbled murrelets may shift their feeding areas in response to changes in prey in localized areas. Marbled murrelets are known to shift their nearshore foraging areas between years off of the Oregon coast (Strong 1995). Marbled murrelets may change their foraging area by up to 50 miles, based on daily foraging distances from nest sites and feeding areas (Carter and Sealy 1990 *in* USFWS 1997, Jodice and Collopy 1995 *in* USFWS 1997, Kuletz et al. 1995).

Some anthropogenic impacts to marbled murrelets in marine waters include mortality from gill nets, oil spills, and other marine pollution. The actual number of net mortalities in Washington is low. These impacts are addressed in the biological opinions for Puget Sound area non-treaty commercial salmon net fisheries (USFWS 1996) and the treaty commercial salmon net fisheries in the Strait of Juan de Fuca and Puget Sound (USFWS 1999b). Oil pollution is a significant threat or conservation problem in southern Alaska, southern British Columbia, Washington, and California (King and Sanger 1979 *in* USFWS 1997, Wahl et al. 1981, Sealy and Carter 1984, Carter and Erickson 1988, Carter and Erickson 1992 *in* USFWS 1997, Marshall 1988, Carter and Kuletz 1995 *in* USFWS 1997). Oil spills include large spills, such as the 1991 Tenyo Maru spill off the Olympic Peninsula, Washington to small spills which may result from tank cleaning and bilge pumping. Other marine pollution which may affect marbled murrelets includes chemical contaminates which enter the water way via direct dumping and effluent from onshore sources. Marbled murrelets in Washington which were analyzed for contaminants appeared to be within the normal ranges for seabirds from clean environments (Grettenberger et al., in prep.).

Habitat Conservation Plans

The range-wide status of the bald eagle, marbled murrelet and bull trout has been affected by a number of recent Habitat Conservation Plans (HCPs) that were prepared in conjunction with incidental take permit applications to the Service pursuant to Section 10(a)(1)(B) of the Act.

Six HCPs have been completed within Washington. The following summarizes the anticipated and/or permitted take of bald eagles, marbled murrelets, and bull trout for the HCPs which include these species:

- West Fork Timber Co. HCP (formerly Murray Pacific HCP): bald eagle, marbled murrelet
- Port Blakely L.P.- Robert .B. Eddy Tree Farm HCP: bald eagle, marbled murrelet
- Washington Department of Natural Resources (WDNR) HCP: bald eagle, bull trout, marbled murrelet
- Seattle Public Utility's Cedar River Watershed HCP: bald eagle, bull trout, marbled murrelet
- Plum Creek Timber Company I-90 HCP: bull trout, marbled murrelet
- Simpson Timber HCP: bald eagle, bull trout, marbled murrelet,

West Fork Timber Co. HCP (formerly Murray Pacific HCP)

The West Fork Timber Co. HCP 100-year amended incidental take permit for the 53,527-acre Mineral Tree Farm, located in Lewis County in western Washington, was approved in June, 1995. Although no marbled murrelet occupancy has been identified by current surveys, the amended permit allows incidental take of murrelets associated with 800 acres out of 1,091 acres of potential murrelet habitat. If murrelets occupy potential habitat in the future, some incidental take may occur as a result of disturbance.

The HCP does not anticipate the incidental take of bald eagles, although bald eagles are a "covered" species under the terms of the permit.

Port Blakely L .P.- Robert B. Eddy Tree Farm HCP

The Port Blakely Tree Farms, L. P. 50-year incidental take permit for the 7,486-acre R. B. Eddy Tree Farm, located in Pacific and Grays Harbor counties in southwest Washington, was approved in July, 1996. No modification nor disturbance of known occupied murrelet sites is authorized under the HCP. However, due to the possibility that habitat surveyed in the first 5 years of the plan could eventually become occupied in the future, incidental take may result from harvest of 210 acres of deferred habitat and 250 acres of habitat that may develop in Riparian Management Zones. In addition, incidental take from disturbance due to harvest may occur during the nesting season. The HCP permits the incidental take of up to 25 wintering eagles due to harvest of wintering habitat.

City of Seattle for the Seattle Public Utility's Cedar River Watershed HCP

The City of Seattle for the Seattle Public Utility's Cedar River Watershed HCP permitted the take of an undetermined number of marbled murrelets associated with one known occupied stand and an unknown number of other occupied stands over a 50-year period as a result of the proposed action. The number of marbled murrelets taken annually could not be determined. Specifically, incidental take of marbled murrelets was authorized within the watershed as a result of 14,400 acres of forest restoration (ecological and restoration thinning, and conifer under-planting), 240 miles of road removal, and 380-520 miles of on-going road maintenance, and as much as 4 miles of streambank stabilization and re-vegetation work and 50 in-stream wood placement projects over the term of the HCP.

The incidental take permit for the HCP allowed an undetermined number of bald eagles to be taken over a 50-year period as a result of this proposed action. The number of bald eagles taken annually could not be determined. However, the number of bald eagles expected to be taken is very small, both because of the low number of bald eagles thought to occur within the watershed at this time (only transients and migrants and no known nesting activity), and due to the level of protection provided by the HCP.

Two harm and harassment estimates of take were determined for bull trout based on the assumption that this species occurs throughout lands managed by the City of Seattle.

The incidental take permit for the HCP allows the take of bull trout associated with 420 acres of restoration thinning (0 to 30-year old trees) conducted in the first fifteen years on the HCP and 150 acres of ecological thinning (30 to 60-year old trees) over the full term of the HCP. It also included take associated with maintenance of 520 miles of currently maintained roads, and with the ground disturbance associated with removing about 240 miles of existing roads during the first 20 years of the HCP. However, by year twenty of the HCP, the total maintained road mileage will drop to approximately 380. Some incidental take in the form of harm associated with improvement of about 4 miles to 10 miles of road per year is also anticipated.

Incidental take of bull trout in the Chester Morse Lake/Masonry Pool system occurs from entrainment through two intakes devices, the Cedar Falls Hydroelectric Project at Masonry Dam and the Overflow Dike into Masonry Pool. It is expected that no more than seven percent of the estimated bull trout population in that system will be killed per year through any combination of these intake devices. Take is also expected to occur due to inundation of redds and preventing spawners from accessing the tributaries of the reservoir by unusually low water levels in the reservoir. Studies have shown that less than ten percent of the bull trout redds in the Cedar River have been located below the normal high pool elevation of 1,563 feet. Thus, these lower elevation redds would be subject to take every year. Nearly all (~95 percent) Rex River bull trout redds were annually located below 1,563 feet. Therefore, these redds would be subject to some form of take, because they can be reasonably expected to be inundated for some duration before juvenile bull trout emerge. Reservoir management zones of "Infrequent" (2) and "Very Infrequent" (1) are expected to take more bull trout than the "Normal" (3) operating zone. Zone (2) and (1) are expected to occur once every ten and fifty years, respectively, with durations exceeding one week. Short durations of spawner impedance can be expected to occur in the reservoir management zone (Appendix 38) of "Normal" (3) every year, but periods longer than one week will only occur once every four years. Spawner blockage is not expected to occur in the "Normal" (3) zone. The "Infrequent" zone (4) is expected to occur with a frequency of one in ten years where both spawner impedance and blockage is expected to occur with durations of one to three weeks. The "Very Infrequent" zone (5) will impede and block spawners, but is expected to occur only once in fifty years.

Plum Creek Timber Company I-90 HCP

The Plum Creek Timber Company I-90 HCP addressed about 170,600 acres for 50 to 100 years in King and Kittitas Counties, Washington. The permit allows incidental take of murrelets associated with up to 400 acres of unsurveyed low-quality habitat west of the Cascade Crest and 1,400 acres of unsurveyed land east of the Crest. The amended HCP to address the I-90 land exchange in 1999 permitted the additional take of 721 acres of low-quality suitable habitat or marginal habitat west of the Cascade Crest. Also, some portion of 1,741 acres of nonhabitat (Mature Forest Structural Stage) west of the Cascade Crest, could eventually become habitat during the 100-year permit, and subsequently subject to harvest without surveys.

The Plum Creek Timber Company's HCP amended the HCP (USDI 1998a) to include the Columbia River DPS of bull trout. The amendment allowed for the take of bull trout associated with habitat degradation/loss due to 150 acres of selective and thinning/restoration-oriented silvicultural harvest per year, 2 miles of stream restoration per year, and 20.2 miles of road construction, maintenance, and removal per year.

WDNR's HCP

The WDNR incidental take permit for 1.6 million acres of State forest land in the State of Washington was approved on January 30, 1997. The 70-year permit covers all WDNR-managed lands within the range of the spotted owl and authorizes incidental take occurring from commercial forest activities as well as non-timber resource activities. The HCP permits the incidental take (in the form of harm) of all bald eagles associated with the harvest of 200,000 acres of forested habitat over the life of the HCP. In addition, incidental take (in the form of harassment) of bald eagles due to disturbance may occur on a total of 2,402,820 acres over the life of the HCP. This disturbance is due to both forest (i.e., harvest) and non-forest resource activities. Incidental take was issued for bald eagles under the WDNR HCP. However, inadvertent incidental take of bald eagles will be minimal because the DNR will actively conserve known nest sites.

Approximately 376,000 acres of State Forest land occurs within the Olympic Peninsula. Of this 376,000 acres, 23,836 acres of suitable murrelet habitat are scheduled for harvest under the HCP. In addition to habitat removal, disturbance related take for marbled murrelets due to timber harvest and non-timber resource activities may occur on 6,402 acres per year for the first decade of the HCP on the Olympic Peninsula.

The WDNR's HCP amendment (USDI 1998b) to include bull trout allowed for incidental take of bull trout associated with habitat degradation/loss due to 29 miles of road construction and maintenance per year, and 158 acres of selective and thinning harvest per year. This amendment added only the Coastal/Puget Sound DPS of bull trout to the WDNR's HCP.

Simpson Timber HCP

The Simpson Timber incidental take permit was issued on October 12, 2000. The HCP encompasses the Plan Area of 261,575 acres and approximately 640,000 acres of additional lands (known as the Assessment Area) surrounding the Plan Area. The Assessment Area lands are not currently owned by Simpson, but may be in the future. All lands occur in Mason, Grays Harbor, and Thurston counties. The incidental take permit authorizes take of bald eagles, bull trout, and marbled murrelets associated with commercial timber harvest and land management activities for a period of 50 years.

The FWS authorized incidental take of marbled murrelets in the form of harm, as a result of harvest of up to a total of 315 acres of suitable marbled murrelet (but currently unoccupied) habitat outside of Riparian Conservation Reserves (RCR). Take, in the form of harassment, due to disturbance of undiscovered nesting marbled murrelets, is anticipated to occur. Specifically, the FWS authorized take of marbled murrelets due to disturbance associated with timber harvest activities within the Plan Area, on potentially covered lands allowed to be added per Provision 10 of the Implementing Agreement (IA), and those immediately adjacent (within one mile) of the Plan Area. The FWS authorized take of marbled murrelets, due to harassment, as a result of activities near suitable habitat within the RCRs that are currently occupied, or which could become occupied over the proposed incidental take permit term (162 acres expected to develop within the RCR by the year 25, and 1231 acres are expected to develop within the RCR by the year 50 of the incidental take permit term). Marbled murrelets could be taken due to harassment as a result of harvest of trees outside of, but adjacent to RCRs. The FWS authorized take for marbled murrelets associated with habitat outside of RCRs that becomes occupied prior to being harvested, and for marbled murrelets associated with occupied habitat outside of the RCRs as a result of harvest of trees within 300 feet of such habitat. The FWS authorized take, due to harassment, of marbled murrelets associated with habitat that is within 0.25 mile of up to 250 miles of new road construction over the term of the HCP, a small portion of which may be as close as 300 feet to occupied marbled murrelet habitat, and for activities associated with potential remediation of a maximum of 2,001 miles of system roads (during the first 15 years of the proposed permit term,100 percent of all roads needing remediation would have such work completed; thus all potential take associated with road remediation would occur within the first 15 years of the permit term). The FWS authorized take due to harassment of all marbled murrelets associated with activities in habitat adjacent to a maximum of 6,160 acres of experimental thinning sites over the proposed ITP term, where timber harvest may occur. A small portion of the 6,160 acres could be adjacent to occupied marbled murrelet habitat (but would not occur within suitable or occupied habitat). The FWS anticipated take due to harassment for all marbled murrelets within one mile of any blasting activities occurring between September 1 and September 15 of any given year. Take due to harassment of marbled murrelets is not authorized during the time period April 1 through August 30 for blasting, as Simpson has stated that they would not blast during this time period near marbled murrelets. Take may occur on an unknown number of acres due to blasting in an unknown number of sites and locations over the life of the HCP, potentially causing nesting upset, loss of eggs, or nest abandonment if this blasting occurs proximal to nests. The FWS anticipated take in the form of harassment in limited areas of the Plan Area involved in proposed Covered Activities that were subject to protocol surveys and determined to be unoccupied, but become occupied during the ITP term.

The FWS authorized bull trout take as a result of timber harvest and experimental thinning associated with stream habitats on 2,987 acres (187 acres in the first 10 years of the permit term, and up to 5,973 (total of 6,160 acres minus 187 acres) for the remaining 40 years of the permit term. In addition, the FWS authorized take for bull trout associated with habitat adjacent to 250 acres of new road construction, and with habitat adjacent to potential remediation of 2,001 miles of system roads (during the first 15 years of the proposed permit term, 100 percent of all roads needing remediation would have such work completed). By year 15 of the HCP, effects to bull trout habitat resulting from road remediation should be eliminated.

The FWS authorized take, in the form of harassment, due to disturbance of all bald eagles associated with timber harvest adjacent to bald eagle roosting habitat, a maximum of 250 miles of new road construction, a maximum of 2,001 miles of system road remediation within the first fifteen years of the proposed ITP term, and a maximum of 6,160 acres of experimental thinning. Only winter roosting and migrant bald eagles are currently known from the Plan Area; no nesting activity is currently known. The communal roost site supports approximately 30 bald eagles. A small amount of nesting is likely to occur during the proposed ITP term within the Plan Area. Nesting during the proposed permit term is more likely within lands allowed to be added for coverage per Provision 10 of the IA, particularly near Puget Sound (nesting activity in this area is currently undetermined). The number of bald eagles anticipated to be taken is small, but the potential for take to occur is moderate. A small number of bald eagles are expected to occur

within the Plan Area and environs during the proposed permit term as most of the potential habitat is in a relatively young successional stage, and a relatively small amount of high function perching and nesting habitat is expected to develop during the proposed ITP term.
ENVIRONMENTAL BASELINE (in the action area)

Bull Trout and Aquatic Resource Conditions

The proposed project is located within and adjacent to the Green River Sub-Population of bull trout. Very limited information is available on the status of bull trout in this sub-population of the Coastal/Puget Sound DPS.

Green River

Very limited information is available on the status of bull trout in the Green River basin. Extensive surveys specifically for bull trout have not been conducted in the Green River. Bull trout are presumed to occur in very low numbers in this system. It is unknown how bull trout specifically use the Green River and its tributaries, although it is likely used for foraging, and migration for the purpose of this BO. However, there is unlikely to be any suitable spawning habitat in the action area. No spawning locations are known (WDFW 1998). The life history forms of bull trout in this drainage are not known; however, they are likely to be anadromous and/or fluvial. Historical accounts suggests that bull trout were once common (Suckley and Cooper 1860). However, creel counts on the Green River, dating from 1940, indicate bull trout are now extremely rare, with only four char taken by over 35,500 anglers checked between 1940 and 1973 (Cropp *in* WDW 1993). Though few in number, Cropp (*in* WDW 1993) indicated that char are still occasionally caught in the Green River. A native char was caught in May 1994 in the Duwamish River that was positively identified as a bull trout both by Haas measurements and by genetic work (E. Warner, Muckleshoot Indian Tribe, pers. com. 1997). Eight native char were caught in the turning basin of the Duwamish River Estuary near river mile (RM) 1.5 in August and September, 2000 (Taylor Associates 2001). Positive identification as bull trout has been established by genetic analysis for two of the six fish; the remaining fish have not been analyzed to date (W. Mavros, King County, pers. com. 2001a). Watson and Toth (1994 *in* WDFW 1998) state that native char have been harvested in the Green River as far upstream as RM 64. More recently, a bull trout, as determined by genetic work, was caught at the mouth of Newaukum Creek off the mainstem of the Green River, approximately 40 miles upstream from the mouth of the Green/Duwamish River (E. Warner, Muckleshoot Indian Tribe, 2000). Plum Creek Timber Company has conducted presence/absence surveys for bull trout in the upper Green River watershed above Howard Hanson dam, with no presence documented.

Mongillo (1993) listed bull trout in the Green River as a remnant population, with status unknown, and with an immediate need for data. WDFW (1998) lists the Green River population as unknown status. The FWS believes the status of this subpopulation is depressed, based on available information that indicates native char occur in very low numbers in comparison to historic levels. Total abundance for the subpopulation is believed to be less than 5,000 individuals or 500 adults.

The Green River and its tributaries presently provide only poor to fair habitat for bull trout because of industrial, residential and agricultural developments along the lower and middle reaches of the Green River and its tributaries, the presence of two dams at RM 61 and 64.5, and extensive timber harvest in the upper basin. These activities have resulted in the increase in fine sediments, a severe reduction in the riparian corridor, constriction of the river channel and isolation from its floodplain, a reduction in channel complexity and habitat diversity, instream flow reductions, alteration of the natural flow regime, elevated water temperatures, the interruption of the transport of large woody debris and spawning gravels, and the blockage of access to upstream habitats.

Bull trout spawning habitat is limited by the availability of suitable substrate and water temperatures. The Green River channel below Howard Hanson Dam and extending downstream to near Flaming Geysers Park is largely armored due to the interception of coarse sediments by Howard Hanson Dam (Perkins 1999). A large landslide near Flaming Geysers State Park and several tributaries, including Soos, Newaukum and Burns Creeks, contribute large amounts of fine sediment. Most of the tributary streams are also impacted by sedimentation. The temperature of the water released from Howard Hanson Dam may be too high for successful bull trout spawning and incubation in the Green River downstream from Howard Hanson Dam, but springs entering the channel bed may provide suitable conditions. Some of the spring fed tributaries, both upstream and downstream of Howard Hanson Dam, may also provide suitable spawning and incubation habitat.

Bull trout rearing habitat is likely limited by high water temperatures and the relative lack of channel complexity and habitat diversity. The Green River has been listed as water quality impaired by Washington Department of Ecology (WDOE) (WDOE 2000). It is on the 303(d) list for the following parameters: elevated temperatures, metals, ammonia, fecal coliform bacteria, pH, low dissolved oxygen, and high biochemical oxygen demand. However, State temperature standards themselves may not be adequate for bull trout given that the temperature standard for the highest class of waters is 16 ° C, whereas temperatures in excess of about 15 ° C are thought to limit bull trout distribution (Rieman and McIntyre 1993). The removal of riparian vegetation and large woody debris from the system, the confinement of the channel by levees and riprap, the elimination of the channel forming flood flows, water withdrawals, and reduced groundwater recharge have all contributed to degradation of bull trout rearing habitat. As a consequence, the Green River mainstem probably provides suitable rearing habitat for only a portion of the year, with spring fed tributaries providing summertime refuge.

The Green River and many of its tributaries provide suitable foraging habitat for bull trout, given the significant number of chinook, coho *(Oncorhynchus kisutch)* and chum salmon, and steelhead trout that are produced within the basin. Other potential prey resources include sculpins, suckers, whitefish, and crayfish, as well as a number of estuarine and marine species within the tidally influenced portion of the lower river.

Gilliam Creek

Gilliam Creek basin is highly developed by urban land uses. This has resulted in increased peak flows and runoff due to impervious surfaces. The creek is scoured and eroded in its upper reaches, with sediment deposition in the lower reaches. Gilliam Creek drains into the Green River with its confluence at RM 12.7. Its basin is composed of 2.9 square miles. The creek has been fragmented by streets, freeway crossings, residential and commercial development, and wetland fill.

Gilliam Creek does not have a specific water quality designation by the WDOE. The water quality designation is determined by its receiving water, the Green River (City of Tukwila 2000), which is currently listed as impaired.

Chinook, coho, chum, steelhead, and sea-run cutthroat (*Oncorhynchus clarki clarki*) have been reported from Gilliam Creek (Partee1999 pers. com. *in* City of Tukwila 2000, Jones and Stokes 1990 *in* City of Tukwila 2000). Partee (2000) reports that the correct list for Gilliam Creek is chinook and coho salmon, and cutthroat trout. Partee (2000) has identified juvenile chinook salmon in the lower reaches of the creek. Pacific lamprey (*Lampera tridentata*), river lamprey (*L. ayresi*), rainbow trout (*Oncorbynchus mykiss*), western brook lamprey (*L. richardsoni*), cutthroat trout (*O. clarki*), sculpin (*Cottus* sp.), longnose dace (*Rhinichthys cataractae*), largescale sucker (*Catostomus macrocheilus*), three-spine stickleback (*Gasterosteus aculeatus*), and speckled dace (*R. osculus*) may also occur within this creek system (Wydoski and Whitney 1979). There is a flap gate where Gilliam Creek drains into the Green River. Anadromous fish access to Gilliam Creek is therefore limited, although access by juveniles does occur. There is potential salmon spawning and rearing habitat in the lower reach of the creek (City of Tukwila 2000).

Miller Creek, Walker Creek and Miller Creek Estuary

The Miller Creek Watershed is approximately 8 square miles in size. The creek is approximately 4 miles long. At RM 1.8, the creek flows through a ravine. Miller Creek has been altered as a result of the loss of riparian habitat, and impervious surfaces which has lead to stream degradation. The estimates of the amount of impervious surfaces range from 23 percent to 49.4 percent.

Benthic macroinvertebrate sampling was performed in Miller Creek. A benthic index of biotic integrity (B-IBI) of 10 was scored. B-IBI scores tend to decrease with increasing impervious areas. B-IBI may be as high as 40 plus in Puget Sound lowlands for areas of low impervious surface (Kleindl 1995 *in* Karr and Chu 1999). Low B-IBI scores in Puget Sound creeks have indicated habitat degradation. Miller Creek has not been listed by WDOE as an impaired stream (WDOE 2000).

The streambank and riparian condition are variable. The upper sections of the creek are within urbanized areas, with housing in close proximity to the stream. Native and non-native vegetation occurs along the streambanks, providing some canopy cover and detrital matter. Some sections of the creek have been stabilized with hardened structures. The lower section winds through a private park, which includes its estuary. The park is primarily a grassy area with deciduous trees. The estuary banks are confined by riprap. The shoreline adjacent to Miller Creek is predominantly gravel and sand, with some driftwood. The intertidal zone at the mouth of the creek is composed predominantly of mixed gravel and sand. The creek channel in the upper intertidal zone contains more cobble than adjacent areas. The estuary channel is vegetated with green algae.

A water fall at RM 3.1 may be a migration barrier for anadromous fish. No anadromous fish have been reported upstream of this location, to date. Bull trout are known to ascend waterfalls that other anadromous fish are unable to pass. No bull trout have been noted within the creek. Bull trout may use the Miller Creek estuary for foraging. It is unlikely that they forage upstream of tidal influence due to the low forage base produced in the stream, high water temperatures, lack of cover, and their inability to osmoregulate rapidly.

Threespine stickleback, pumpkinseed sunfish, black crappie, and cutthroat trout have been found upstream of the water fall. Cutthroat and coho have been detected rearing below the falls. Chum salmon spawn in lower Miller Creek. Five chum redds were located in the lower 1.75 miles of the creek during the 1998-1999 spawning period.

Walker Creek is a tributary to Miller Creek. It enters Miller Creek at approximately 300 ft upstream from the mouth of Miller Creek. Its watershed is primarily urbanized. Its channel is approximately 3-ft wide and is incised approximately 1.5 ft. The creek is tidally influenced to approximately 100 ft of a control weir. Walker Creek is an anadromous fish bearing stream. Coho and chum salmon redds, and potentially a cutthroat trout redd have been located in the lower sections of the creek.

Des Moines Creek and Estuary

The Des Moines Creek Watershed is approximately 5.8 square miles. The watershed is urbanized, with approximately 35 percent impervious surface. Most of the stream in the upper watershed has been placed in culverts, road side ditches and drainage pipe. The creek is 3.5 miles long, beginning on a plateau, and then descending through a ravine before it reaches Puget Sound. The Des Moines Creek estuary is located within the Des Moines Creek Beach public park. Prior to flowing into the estuary, the creek flows through the park, and under buildings which span the creek.

Des Moines Creek is listed as a 303(d) stream by the WDOE (WDOE 2000). It is listed as an impaired water due to high fecal coliform levels.

Fish production in Des Moines Creek is limited due to fish barriers, high stream flows, limited rearing and overwintering habitat, low summer flows, low dissolved oxygen, and high water temperatures (Des Moines Creek Basin Committee 1997). Due to high flows, some areas of the creek have eroded, and the stream bed has been scoured of gravel.

Bull trout have not been noted within Des Moines Creek. Bull trout may use the creek estuary for foraging. It is unlikely that they forage upstream of tidal influence due to the low forage base produced in the stream, high water temperatures, lack of cover, and their inability to osmoregulate rapidly.

In the lower reaches of the creek, coho and chum salmon, steelhead, and cutthroat trout have been seen. Some spawning in the lower reaches also occurs. A culvert at Marine View Drive (RM 0.4) limits the migration of fish to spawn upstream. In 1998-1999, 22 coho redds were found in the first 1.24 miles of Des Moines Creek, with 21 of these redds in the first half mile. Sixteen chum redds were found during this same time period in the first half mile of the creek.

Puget Sound

Limited information regarding bull trout use of marine waters is available. No specific sub-population unit is specified for Puget Sound. Bull trout are known to use these waters for migration and foraging.

Puget Sound has been significantly altered from its original condition. It has been estimated that one-third of the shoreline in Puget Sound has been altered (PSWQAT 1998). In the eastern side of Puget Sound's main basin, which includes the action area, approximately 80 percent of the shoreline from Mukilteo to Tacoma has been altered (PSWQAT 1998). It is not known how the distribution of eelgrass has been affected over time. Eelgrass is important spawning and rearing habitat for bull trout forage fish.

Declines in populations, productivity and survival of a number of organisms that live in Puget Sound have been noted in recent years. This includes declines in the spawning runs of Pacific herring, rockfish stocks, and coho salmon, as well as declines in over-wintering grebes and scoters (PSWQAT 1998).

The distribution of the char in marine waters is believed to be closely tied to the distribution of the bait fish, especially their spawning beaches. A sandlance spawning area is known from less than one mile north of the Miller Creek estuary. Surf smelt spawning areas are identified approximately one mile north and south of the Des Moines Creek estuary (WDFW 2000). Marine observations of native char, including bull trout, nearest to the proposed project site have occurred in the turning basin of the Duwamish River and at Shilshole (W. Mavros, King County, pers. com. 2001b).

Toxic contaminants have also been released into Puget Sound from various sources, degrading the aquatic habitat. Some contaminants are in declining levels, which may be a result of improved pollution control. However, there is some evidence that polyaromatic hydrocarbons may be increasing in some areas. There has been a higher incidence of liver lesions in English sole in Elliot Bay, which may be the result of increased polyaromatic hydrocarbons (PSWQAT 1998). The WDFW is conducting tests on Pacific herring, a forage species for bull trout and marbled murrelet, to monitor the pollutants in Puget Sound (PSWQAT 1998). Results from the1995 pilot study in Fidalgo Bay showed that Pacific herring accumulated the same type of contaminants that have been observed for other species in Puget Sound. Some of the contaminants detected included polychlorinated biphenyls (PCB's), dichloro diphenyl dichloroethane (DDD) and dichloro diphenyl dicholorethylene (DDE) (metabolites of dichloro diphenyl tricholoroethane)(DDT)), and metals (i.e., mercury). These levels were within the range of that observed for other Puget Sound fish species (PSWQAT 1998). The Washington State Puget Sound Ambient Monitoring Program in the future plans to monitor the effects of PCB accumulation in the Puget Sound food webs (PSWQAT 1998).

Sea-Tac currently uses deicers, flocculents, petroleum products, pesticides, and herbicides which may enter the ground and surface water. Existing treatment facilities reduce but may not eliminate these contaminants in the aquatic system. Existing levels of potential contaminants, such as copper (Cu) and zinc (Zn), may be at levels which could have acute and/or chronic toxicity effects on aquatic species.

Des Moines Creek and Miller Creek, and discharges from the industrial wastewater system (IWS) may currently exceed lethal and sub-lethal toxicity levels for bull trout and their forage species for Cu and Zn (Eisler 1998) (Table 2). Except for lethal levels for Zn, all potential impacts are based on values available for other fish species. There is currently no specific information available for bull trout regarding Cu toxicity or sublethal effects of Zn.

Table 2. Cu and Zn concentrations within action area and sublethal and acute toxicity values for fish species, including bull trout.

Chemical	Location		
	Mouth of Miller Creek	Mouth of Des Moines Creek	IWS Outfall
Cu, existing levels, micrograms/liter[1](μg/L)	7 - 45	10 - 24	2 - 30

Cu sublethal effects (µg/L)[2]	4 - 10		
Cu LC_{50} toxicity value (µg/L)[3]	42 - 110		
Zn, existing levels (µg/L)[1]	35-234	24-60	7-103
Zn, sublethal and lethal effects (µg/L)[4]	50-235 4.9-9.8 for the brown trout (*Salmo trutta*)		
Zn LC_{50} toxicity value for bull trout, (µg/L)[5]	31.9-86.9		

1 Adapted from BA, Tables 7-10 and 7-11.

2 Eisler 1998.

3 Adapted from BA, Table 7-12.

4 Eisler (1993).

5 96 hour and 120 hour exposures at variable temperatures (8° C and 12° C), pH (6.5 and 7.5) and hardness (30 mg/L and 90 mg/L), and based on Spearman-Karber and Probit statistical analyses, Stratus Consulting, Inc. (1999).

Tempo, Banner, Triester, Cidekick, Diuron, Roundup, Crossbow, and Deluxe Turf with Trimec are included on the list of pesticides and herbicides that may be used on Sea-Tac. Tempo and Diuron have not been used. The Landscape Management Plan for Sea-Tac currently imposes a 50 ft buffer around waterbodies. A buffer of 50 ft may not adequately prevent some of these chemicals from entering the aquatic system via surface water and/or groundwater. This plan does not apply to the proposed mitigation areas and their buffers (J. Kelley, Parametrix, Inc. pers. com. 2000).

Cationic polyacrylamides (PAM) are currently used at Sea-Tac, and are proposed for continued use to reduce suspended solids from its treatment systems. Sojka and Lentz (no date) state that neutral and especial cationic PAMs have been shown to have LC_{50}s low enough for concern to certain aquatic organisms, whereas, anionic PAMs do not. Cationics are attracted to the hemoglobin in fish gills, which may result in suffocation. It is noted, however, that when PAMs are used in waters containing sediments, humic acids, or other impurities, the effects of PAMs on biota are buffered greatly (Buchholz 1992 *in* Sojka and Lentz (no date), Goodrich et al. 1991 *in* Sojka and Lentz (no date).

Bald Eagle

The action area is located in the Puget Sound Management Zone, which has the highest density of nesting bald eagles in Washington. In 1998, 298 occupied territories were documented (WDFW data), which far exceeds the recovery objective of 115 territories.

No bald eagle nest sites are located within the action area. The nearest nest is approximately one mile east of the action area, near Angle Lake. Bald eagles forage within Puget Sound and the Green River. It is assumed that the bald eagles occupying the Angle Lake nest site forage primarily in Angle Lake, though use of Puget Sound is also possible. Angle Lake has been stocked with rainbow trout and kokanee for a number of years (at least since 1982), therefore providing a very localized forage base for these eagles.

There is currently a risk of airplane strikes with bald eagles at the airport. However, no airplane strikes of bald eagles have been reported to date at Sea-Tac. Bald eagles have been seen on, and flying over and near the airport (Tables 3 and 4).

Table 3. Total bald eagle sightings reported by month at Sea-Tac, 1995 - April 2001.[1]

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2001	3	1 (2)[2]	5	3								
2000			3	1 (2)	1	1			1	3 (5)		
1999					1							
1998	1 (2)	1 (2)		1							1	
1997	1				1							
1996					2 (3)							
1995		2 (3)	1 (2)							1 (2)	1 (2)	1
Total	5 (6)	4 (7)	9 (10)	5 (6)	5 (6)	1	0	0	1	4 (7)	2 (3)	1

[1] Osmek (2001a)

[2] Numbers in parentheses represent actual number of birds sighted.

Table 4. Bald eagle behavior reported at Sea-Tac, 1995 - April 2001.[1]

Behavior	Total	Frequency (percent)
Fly (Passing over)	21 (25)[2]	
Fly (Passing over)/Harassed (by birds)	1	
Total Fly	22 (26)	59
Towering/Soaring	9 (15)	
Towering/Soaring/Harassed (by birds)	1	
Total Towering/Soaring	10 (16)	27
Loafing/Standing	4 (5)	
Perching	1	
Total Loafing/Standing/Perching	5 (6)	14
Grand Total	37 (48)	100

[1] Osmek (2001a)

[2] Numbers in parentheses represent actual number of birds sighted.

Based on the information provided by Osmek (2001a), most bald eagle sightings have been during the nesting and late wintering seasons. The number of bald eagles sighted has increased over the six and a half year period that was reported. This may be due to two factors: an increase in observer effort and an overall increase in bald eagle numbers in Washington.

Observations on the airport include the use of the embankment for loafing and use of the VHF tower for perching (S. Osmek, Port of Seattle, pers. com. 2001b). The embankment is currently about 50 ft higher than the rest of the airport (excluding facilities). Bald eagles have also been seen on the infield of the airport (between the runway and the taxiway) (M. Cleland, USDA, pers. com. 2001). There are likely to be close encounters between bald eagles and airplanes which do not result in airplane strikes. For example, a bald eagle was recently seen hunting over the Tyee Golf Course, in proximity to the end of runway 34R (M. Cleland, USDA, pers. com.2001) when a plane was landing. The majority of landings and take-offs on the runways are from the north heading south (71 percent). Bald eagle sightings at the airport are primarily in the south (65 percent). The largest risk to bald eagles may therefore occur in the southern portion of the airport due to the higher number of bald eagles and take-offs. Airplanes on take-off tend to lift-off at about the central part of the airport, and reach an altitude of approximately 1000 ft at the end of the airport. Bald eagles are more likely flying at a lower elevation at this point in their use near the airport, especially if they are moving between Angle Lake and Puget Sound.

Bald eagles may also forage near the mouths of Miller and Des Moines Creeks, but specific information on the use of these areas is not known. Due to the developed nature of and associated activity at Des Moines Creek estuary, use by bald eagles is likely to be minimal.

Marbled Murrelet

The action area for the proposed project is located in the Puget Sound Conservation Zone (USFWS 1997) in the marbled murrelet recovery plan. A population estimate for this zone has not been made. However, Speich and Wahl (1992) have estimated that there are approximately 2,600 marbled murrelets for the Strait of Juan de Fuca and Puget Sound. In this management zone, the largest number of murrelets is found in the northern Cascades and east Olympic Mountains and associated marine waters. Murrelets are found most commonly in the near shore waters of the San Juan Islands, Rosario Strait, the Strait of Juan de Fuca, Admiralty Inlet, and Hood Canal. They are more sparsely distributed elsewhere in this region, with smaller numbers observed at various seasons as far south as the Nisqually Reach and Budd Inlet, as well as in Possession Sound, Skagit Bay, Bellingham Bay, and along the eastern shores of Georgia Strait. Aggregations of murrelets are consistently observed in certain locations and at certain seasons. Marbled murrelets use these areas because of food availability, shelter or other ecological factors, and are also affected by the proximity and availability of nesting habitat.

In Puget Sound, few marine surveys have been conducted in the action area, primarily because murrelet occurrence is so infrequent. WDFW conducted surveys of Puget Sound from 1993 through 1995 during the marbled murrelet post-breeding season (Stein, J. and D. Nysewander 1999). Although the survey did not include the area specifically within the action area of this project, it did include areas north and south. These included surveys from Picnic Point to Edwards Point in the north, and Garden Point to Tatsolo Point, transect from Tatsolo Point to Sandy Point, transect from Yoman Point to McNeil Island stack, and shoreline from McNeil Island stack to Hyde Point. As the first survey in 1993 did not locate any marbled murrelets (first survey for Garden Point to Tatsolo Point occurred in 1994), future surveys of these areas were discontinued. The majority of marbled murrelet occurrences were documented in the Hood Canal area (Nysewander pers. com. 2000). Additional information regarding marbled murrelet occurrences in Puget Sound, including summer occurrences, is provided in Table 5. The majority of these occurrences are south of the action area.

Table 5. Marbled murrelet observations in Puget Sound.[1]

Date of Observation	Location	Number of Birds	Observer
NI[2]	Saltwater State Park	NI	T. Bock
NI	Redondo Beach	2 (1 pair)	T. Bock
NI	Narrow's Bridge, Tacoma	2 (1 pair)	T. Bock
NI	Brown's Point	NI	T. Bock
NI	Dash Point to Des Moines	6 (3 pair)	T. Bock
NI	Des Moines	4 (2 pair)	T. Bock
Summer 1990	Des Moines	6	T. Bock
NI	Des Moines	2 (1 pair)	T. Bock
NI	Brown's Point	12	T. Bock
NI	Brown's Point	8 (4 pair)	T. Bock
May 26 - June 3, 1993	Brown's Point	35-40	T. Bock
NI	Brown's Point	15	T. Bock
May 6, 1996	Brown's Point	8	T. Bock
NI	Brown's Point	7 (3 pair)	T. Bock
Summer 1999	Eastern Shore of Vashon-Maury Island	NI	M. Raphael, USFS

1 Adapted from information provided by Norman, D. 2001 *in* Airport Communities Coalition. 2001.

2 NI - No information provided.

Anecdotal observations indicate that marbled murrelets may occasionally forage in or near the Miller and Des Moines Creek estuaries on fish produced in these watersheds (including Walker Creek) and which migrate to the estuary and Puget Sound. The use of these estuaries and their vicinity by marbled murrelet, particularly during the breeding season, is likely to be limited due to low numbers of birds nesting in the nearest habitat, and possibly the lack of preferred prey species present in this area.

The number of murrelets nesting in the Cascades east of the action area, and using marine waters associated with the action area is relatively small. No suitable nesting habitat for marbled murrelets occurs within the action area. Detections of marbled murrelet exhibiting occupied behavior associated with nesting habitat, occur between 17 and 45 miles from the action area. There have been nine marbled murrelet detections (four occupied sites and five detections only) east of Sea-Tac whose flight path mi . cross the airport. It is likely that numbers of marbled murrelets are low in the Cascades east of the proposed project area and in the marine area west of the project area because of the limited availability of suitable nesting habitat and the degraded condition of the marine shoreline as a result of urban development.

Outside of marine areas, observations of marbled murrelets in the vicinity of the action area have been rare. In addition to the detections of marbled murrelets described in the BA, two additional detections of marbled murrelets are provided in the WDFW data base. These occurred approximately 8 miles north and south of the action area. These detections were for a marbled murrelet in flight (1992) and a grounded chick in a person's yard (1974). It is unknown how the marbled murrelet reached the yard, as it still had down, which could indicate a nearby nest. A sandlance spawning area is known to be less than one mile north of the Miller Creek estuary. Surf smelt spawning areas are identified approximately one mile north and south of the Des Moines Creek estuary (WDFW 2000). However, most spawning areas are disjunct from known marbled murrelet feeding areas (USFWS 1997). Certain herring stocks in local areas have probably gone extinct in Puget Sound due to the loss of eelgrass beds, which provide spawning habitat for this species (Pantella, pers. com. 1996 *in* USFWS 1997).

Information does not exist to indicate that, other than Pacific sardine and the northern anchovy in offshore and shelf waters, marbled murrelet prey resources have either increased or decreased in inner Washington waters from historical ranges (MacCall pers. com. *in* USFWS 1997, Pantella pers. com. 1996 *in* USFWS 1997). Although prey species abundance, such as Pacific herring in Puget Sound, may have been reduced in certain areas this is not known to affect the overall prey abundance and their availability for marbled murrelets (USFWS 1997). As a result, insufficient information exists to state that the overall prey abundance and availability have changed to a degree that it affects the maintenance and recovery of marbled murrelet populations.

EFFECTS OF THE ACTION

The proposed action may result in a variety of environmental effects, including short-term negative impacts from construction, and potentially long-term negative impacts from reduced baseflows and increased peak flows in Miller and Des Moines Creeks and chronic and acute toxicity due to chemical contaminants. Longer-term positive effects may result from improved forage fish habitat, and a reduction of sediments and chemical contaminants. There is also a risk of long-term adverse effects due to potential bird strikes from in-coming or out-going airplanes. How these impacts affect listed species will be evaluated below.

Bull Trout

The subpopulation of bull trout in Puget Sound, Miller and Des Moines Creek estuaries, and the Green River is likely composed of individuals from other spawning streams in the Coastal/Puget Sound DPS. Bull trout spawning and rearing habitat are not known to be present in Puget Sound, Miller, Des Moines, Walker, and Gilliam Creek, or the mainstem Green River at this time. Therefore, bull trout spawning and rearing habitats are unlikely to be affected by the proposed project. Bull trout habitats that could be affected, therefore, are primarily foraging and migratory habitat.

The proposed project would result in the construction of mechanically stabilized earth (MSE) walls in proximity to Miller Creek. Failure of these walls could result in significant impacts to Miller Creek and the aquatic resources within the creek and the estuary due to filling the creek and wetlands, and increasing sediment loads. There have been concerns raised regarding the potential failure of the embankment. FAA has stated that the embankment has been properly engineered to avoid failures (FAA, pers. com. May 2001). The Corps will be evaluating the stability of the MSE wall. We also understand that an independent review is being conducted by the University of Washington on the stability of this wall (M. Walker, Corps, pers. com., 2001). Should their evaluation determine that there is a high and/or likely risk of failure, we will reevaluate our determination of the effects of the proposed MSE walls. We currently do not believe that failure of the MSE walls is reasonably foreseeable, and therefore the effects of its failure will not be further addressed in this BO.

There are potential long term and short term direct and indirect effects to bull trout from the proposed project. These impacts include a potential reduction of forage species, exposure of bull trout to contaminants through surface water and consumption of contaminated forage species, and physical effects due to sediment. However, due to proposed water quality measures during construction, potential water quality improvements over baseline conditions, minimal exposure to potential contaminants, and the very low likelihood for bull trout to be present during construction or in proximity to the affected areas, we believe that the proposed impacts are not likely to be significant, as discussed below.

To reduce water quality impacts related to construction of the proposed action, the BA states that the Washington Department of Ecology standard best management practices are to be implemented (Table 6).

Table 6. Summary of the Ecology Manual BMPs generally applicable to Master Plan construction sites.

Category	Applicable BMPs
Temporary cover practices	Temporary seeding, straw mulch, bonded fiber matrices, and clear plastic covering
Permanent cover practices	Preserving natural vegetation, buffer zones, permanent seeding and planting
Structural erosion control BMPs	Stabilized construction entrance, tire wash, construction road, stabilization, dust control, interceptor dike and swale, and check dams
Sediment retention	Filter fence, storm drain inlet protection, and sedimentation basins

In addition to the above measures, the BA also commits to the following:

- MPU projects will meet the turbidity standard for Class AA waters. This standard states that turbidity may not increase more than 5 Nephelometric Turbidity Units (NTU) over background when background is 50 NTU or less, or register more than 10 percent increase in turbidity when background exceeds 50 NTU.

- Implementation of advanced BMPs, as needed, including polymer stormwater batch treatment system or high-volume mechanical filtering devices.

Stormwater quality and hydrology mitigation implemented as part of the Sea-Tac MPU projects is proposed to improve water quality and hydrologic conditions in Miller and Des Moines creeks. Improved conditions may occur due to:

- Improved stormwater quality and quantity treatment of runoff from new development compared to the existing baseline,

- Retrofitting of existing airport facilities to upgrade water quality and quantity treatment of runoff to King County standards,

- Implementation of improved Ecology BMPs for construction and operation, and

- Mitigation activities in Miller and Des Moines creeks to improve instream habitat for fish and invertebrates.

Standard sediment and erosion control practices to minimize sedimentation may result in other potential water quality impacts including solar heating of the stored runoff which could affect stream temperatures when water is finally discharged. Temperature effects from retained construction stormwater are unlikely because significant storms that would result in several days of water storage during warm weather are rare.

Some MPU project elements include in-water construction (e.g., Miller Creek Relocation, Vacca Farm restoration, 154th Street bridge replacement, and culvert replacement on the Tyee Golf Course) that could cause a direct increase of sediments to Miller and Des Moines creeks.

Degradation of the natural bank and stream will occur due to relocating and dewatering approximately 980 ft of the existing Miller Creek channel, and habitat enhancement activities. Some increased turbidity is likely to occur due to construction activities in-stream and along the banks. Construction elements for the stream relocation and the floodplain expansion occur concurrently, and are expected to occur during the driest time of the year, taking approximately 15 weeks, beginning in late June and ending by early October.

De-watering of Miller Creek within the project area will impact invertebrates inhabiting the substrate. These organisms could represent a potential food source for bull trout, but are primarily a food source for their forage fish. As the channel will only be dewatered for approximately 2 weeks and nearby sources of invertebrates are likely to recolonize the affected area following re-establishment of stream flows, the impact to bull trout is likely to be minimal.

Downstream of the floodplain and buffer enhancement areas at the Vacca Farm site, a 100-ft buffer will be established along the west side of approximately 6,500 linear ft of Miller Creek (within the acquisition area). Buffer averaging will be used on the east side of the creek, where a minimum 50-ft buffer will be established. Where the embankment design allows, buffers will be increased so that the average buffer width is 100 ft. A 100-ft buffer is also proposed on the West Branch of Des Moines Creek. The buffer enhancement should improve creek habitat over existing conditions. However, a 100-ft. buffer may not fully protect the aquatic resources. A 100-ft buffer may not adequately provide for sources of large woody debris. Large wood delivery into streams lessens at distances greater than one site potential tree height (FEMAT 1993). On the west side of the Cascades, one site potential tree height equates to approximately 150 ft.

Foraging bull trout are likely to be found in close association with their forage species. A sandlance spawning area is known from less than one mile north of the Miller Creek estuary. Surf smelt spawning areas are identified approximately one mile north and south of the Des Moines Creek estuary (WDFW 2000). Miller and Des Moines Creek estuaries may be used primarily as migration corridors for bull trout, with occasional foraging occurring on salmonids produced in these creeks. Since we believe that their primary forage base is not found within the Miller and Des Moines Creek estuaries, bull trout are unlikely to use these areas for extended periods of time. Therefore, their exposure to any potential increased sediment or contaminants which may enter the Miller or Des Moines Creek estuaries, or consumption of forage species which may have accumulated any contaminants from discharges associated with the proposed project, are reduced and likely insignificant.

Construction activities at the Auburn mitigation site could result in increased sediment inputs to the Green River. Prior to construction, the Auburn mitigation site will be dewatered. The pumped water will be discharge to the Green River about 1 mile north of the site via an existing drainage channel and outfall at South 277th Street. Dewatering will occur from approximately May 2001 through September 2001 for one or two seasons. The volume of dewatering water will be very small (2-8 cfs) compared to typical Green River flows (250-2000 cfs that occur during months when the system will operate), and therefore, unmeasurable and insignificant changes to river flows are expected. The existing farm drainage ditch between the site and South 277th Street will later be enlarged to create the outlet channel for the wetland. Discharged water will meet state water quality standards, and include pre-discharge treatment for sediment removal if necessary. Following dewatering, the mitigation site will be excavated and planted.

Pumped ground water may contain some sediments, but levels are not expected to be high. During excavation and until vegetation has formed adequate cover, turbid water may leave the site via the drain system, which eventually enters the Green River. Due to the proposed water quality controls and low levels of sediment which may be discharged, the distance from the project site to where the flows enter the Green River (thus allowing for some settling of sediments), and low likelihood for bull trout to be present near the existing outfall of the Green River, impacts to bull trout are expected to be insignificant.

During flood events, the Green River will back water into drainage channels and the wetland mitigation site (events greater than the approximate 10-year flood). The existing flap-gated culvert on the Green River, in its existing condition, may allow bull trout to access the drainage channel, where stranding may be possible. However, there is a low probability that bull trout access the drainage ditch through the drainage pipe. If bull trout do access the ditch, it is not anticipated that they would swim upstream to the mitigation site due to the lack of favorable conditions in the ditch and the minimal numbers of forage species present.

As bull trout are unlikely to be found within Miller, Walker, Des Moines, and Gilliam Creeks, as previously discussed, direct effects to this species in these waterways are unlikely. Indirect impacts may result due to impacts to bull trout forage species within these water bodies due to changes in flow, sediment discharges and chemical toxicity. However, based on the minimization measures proposed, these effects are likely to be minimal.

Indirect impacts caused by increases in impervious surfaces within a basin can increase the peak flows (duration and frequency) in receiving streams because the conversion to impervious surface speeds runoff and decreases infiltration and evapotranspiration (May *et al.* 1997). When a watershed's natural runoff cycle is modified by stormwater runoff, abnormal high flows increase erosion and destabilize channels during the wet season, and low summer flows are diminished due to lack of groundwater recharge. This limits fish populations by a number of interrelated mechanisms (Scott *et al.* 1986; Weaver *et al.* 1994; Whiles *et al.* 1995).

The proposed project will result in an increase of impervious surfaces as follows: approximately

106 acres (net) in Miller Creek watershed; approximately 6 acres in Walker Creek watershed; and approximately 128 acres in Des Moines Creek watershed. No increase in impervious surfaces is proposed for the Gilliam Creek watershed.

To minimize impacts from increases in impervious surfaces within these watersheds, stormwater management actions are proposed to reduce and minimize peak flows. Detention facilities will be sized to meet King County Level 2 flow control standards. These standards require that the flow duration of post-developed runoff match the pre-developed flow duration for all flow magnitudes between 50 percent of the 2-year flow event and the 50-year flow event.

The proposed project may result in reduced baseflows within Miller and Des Moines Creeks. Existing baseflows in Miller and Des Moines Creeks are approximately 1.8 cfs and 2.4 cfs, respectively. A reduction of approximately 4 percent (0.07 cfs) in Miller Creek baseflows and 7 percent (0.17 cfs) in Des Moines Creek baseflows was projected by Pacific Groundwater Group (2000). For Miller Creek, this equates to a reduction of approximately 1/8 inch to 1/4 inch in depth. In Miller Creek, there may be lower winter flows, but higher summer flows as a result of the potential for more groundwater infiltration with the project than currently exists. No information is available in the change in depth for Des Moines Creek. Additional streamflow analyses were conducted by Earth Tech, Inc. (2000) which also predicted reduced streamflows for both Des Moines and Miller Creeks during the low flow periods of August and September. Stream flows for Walker Creek were predicted to increase during August and September, 0.008 cfs and 0.010 cfs, respectively, as a result of pervious fill recharge and secondary impervious recharge. No net change in 7-day/2-year low flow is anticipated for Walker Creek. For the 7-day duration/2-year frequency stream discharge, a deficit of 0.10 cfs for Miller Creek at the SR 509 crossing and 0.08 cfs for Des Moines Creek were predicted. The reduction in baseflow may affect forage fish species. To minimize these impacts, reserved stormwater releases are proposed to be provided to Miller and Des Moines Creeks to off-set these reduced flows. The stormwater needs are calculated as 8.9 acre-feet for Miller Creek and 7.1 acre-feet for Des Moines Creek. The stormwater would be released at a prescribed rate, aerated, and discharged to the stream. Augmentation of baseflow in Des Moines Creek is also proposed using an existing Port owned well on the Tyee Golf Course. However, there are unresolved water rights issues with use of this well; therefore, other augmentation measures are being investigated. The well currently draws water from two zones. The Des Moines Creek Basin Plan includes inserting a casing and "packing off" the upper zone to eliminate potential wetland impacts resulting from well pumping. The Des Moines Creek Basin Committee would be responsible for implementing the use of the well for baseflow augmentation. Please see Table 7 for a summary of potential low flow changes.

Table 7. Summary of Des Moines, Miller and Walker Creek Streamflow Effects[1].

Creek		HSPF Model Stream Flow (cfs) 1994	HSPF Model Stream Flow (cfs) 1996	Predicted 2006 Conditions (cfs)[2]	Net Change from 1994 Conditions (cfs)
Des Moines	August	1.08	1.07	1.15	+0.07
	Sept	1.64	1.73	1.81	+0.17
	Aug./Sept	1.36	1.40	1.48	+0.12
	7-day/2-year low flow	0.35	0.27	0.35	0
Miller	August	1.27	1.10	1.31	+0.04
	Sept	1.50	1.40	1.55	+0.05
	Aug/Sept	1.39	1.25	1.43	+0.04
	7-day/2-year low flow	0.79	0.64	0.79	0
Walker	August	0.033	0.031	0.041	+0.008
	Sept	0.035	0.039	0.045	+0.010
	Aug/Sept	0.034	0.035	0.043	+0.009
	7-day/2-year low flow	0.021	0.015	0.021	0

1 Based on Earth Tech, Inc. (2000).

2 Flows based on the sum of 2006 HSPF streamflow, fill pervious recharge, non-hydrologic changes, secondary impervious recharge, and reserved stormwater release, as appropriate.

With the successful implementation of the proposed mitigation within the Miller and Des Moines Creek watersheds, the proposed action may benefit fish species due to improved riparian and instream conditions. The removal of structures near the stream channel, elimination of water withdrawals within the action area of Miller Creek, reduced turbidity, increased riparian vegetation, and augmented summer flows in Des Moines Creek should result in improved instream conditions in the long term for bull trout prey species. It is expected that baseline production for salmonids should be maintained or improved with successful implementation of the proposed mitigation as described in the BA and supporting documents. Even if the projected streamflows are not achieved, and potential forage species for bull trout are impacted (i.e., reduced spawning grounds, reduced survival due to increased temperatures, increased stranding, reduced flows, dewatering, and/or a reduction in invertebrate forage), we do not anticipate these levels to be reduced to such an extent as to significantly impact this listed species. Potential forage fish currently produced in Miller, Des Moines, and Walker creeks are believed to represent an insignificant portion of the available forage base for bull trout in Puget Sound.

There is a potential for contaminated leachate to enter Miller Creek from the embankment fill, as well as for terrestrial organisms to expose and possibly bioaccumulate toxic materials that are contained in the fill material. Exposure of bull trout, bald eagles and marbled murrelets could potential result in impacts to these species. Some fill materials which have been accepted for use as part of the proposed action are known to contain DDT, PCBs, PAHs, and mercury (Table 8).

Table 8. Detected contaminants in fill material for the Sea-Tac MPUI.

Contaminant	Maximum Level Detected (USCOE[1])	Maximum Level Detected (Boeing[2])
Total DDT	14 parts per billion (ppb)	no detection
Total PCB	160 ppb	no detection
PAHs (Carcinogenic)	no detection	459 ppb
Mercury	0.074 parts per million (ppm)	0.51 ppm

1 Corps detections, Hamm Creek Restoration Site, sampled June 16 and 17, 1997.

2 Boeing detections, Hamm Creek Restoration Site, sampled April 17 and 18, 1990.

The Port is accepting fill material which generally meets the Model Toxics Control Act (MTCA) Method A contaminant levels. The Port may determine that specific material that does not satisfy MTCA Method A contaminant levels is appropriate for placement in a specific project location and will consult with the Washington Department of Ecology (WDOE) for approval prior to placement. Material that is obtained from state-certified commercial borrow pits is generally accepted for airport airfield projects without source-specific environmental certification. State certified materials are those that the Washington Department of Transportation has found to have geotechnically suitable material. The Washington Department of Transportation testing does not include testing for contaminants. Over 50 percent of the soil that the Port has placed to date has been from large pits. Most of these pits are state-certified and do not have historical sources of contamination. To date, all fill material accepted by the Port has met the requirements of the Port/WDOE 1999 airfield project soil fill acceptance criteria, which includes the Method A standards for MTCA.

Limited information is available regarding effects of contaminants on bull trout. The lake trout, *S. namaycush,* a closely related species to bull trout, is the most sensitive species known for early life stage mortality associated with exposure of embryos to tetrachlorodibenzo-dioxin and related compounds. However, Cook et al. (1999) looked at the effects of 2, 3, 7, 8-Tetrachlorodibenzo-p-dioxin (TCDD) and polychlorinated biphenyl (PCB) 126 on early life stages of bull trout. Preliminary data indicated that bull trout are approximately three times more sensitive to TCDD than lake trout.

To ensure that leachate from the embankment fill does not result in contamination of aquatic resources in and adjacent to Miller Creek, and to reduce the risk to terrestrial organisms, the Port has agreed to the following measures, which are summarized below (see Enclosures 1 and 2 for the complete text):

1. No soil will be accepted that exceeds MTCA Method A standards for Resource Conservation and Recovery Act (RCRA) metals (Table 9) or organochlorines. If the Port considers placement of fill material that does not meet MTCA Method A Standards, the Port will discuss the results with the Service and reinitiate consultation, as appropriate. To mitigate stormwater runoff impacts on Miller and Des Moines creeks, the flow control standards adopted by the Port will comply with the approved MPU FEIS (FAA 1996), the Governors Certificate (Locke 1997), the King County Surface Water Design Manual (King County DNR 1998), and the Ecology Manual. The drainage layer cover (that layer immediately above the drainage layer of the embankment) will be composed of "ultra-clean" fill (as described below). It will measure at least 40 ft thick at the face of the embankment and will reduce in height to the east at a rate of 2 percent.

2. No soil will be accepted for the drainage layer cover that exceeds the back-calculated values in the second column of Table 9, unless the Synthetic Precipitation Leaching Procedure (SPLP) confirms the suitability of the soil, as described in Appendix 1, Attachment A, 1(b)(iv). The Port will consult with the FWS if site-specific data is collected which may merit a recalculation of the three phase model soil concentrations in Table 5, and reinitiate consultation, as appropriate.

3. If soil in the drainage cover layer exceeds background concentrations of metals, as stated in column 6 of Table 9, SPLP testing will be conducted to demonstrate that MTCA Method A criteria are protective of the baseline conditions for surface water receptors.

4. The Port will require testing for organochlorines where such compounds may be present.

5. Soils found to contain organochlorines at concentrations below Three Phase Partitioning Model concentrations (adjusted for PQLs) will be deemed acceptable. No soil will be

accepted for the drainage layer cover that exceeds Three Phase Partitioning Model concentrations unless SPLP testing confirms the suitability of the soil.

6. The surficial three feet of fill will be screened to not exceed the Proposed Ecological Standard or MTCA Method A, which ever is less.

7. The Port shall develop a plan to monitor the quality of seepage from the drainage layer beneath the embankment fill. Should monitoring detect adverse impacts to aquatic life in the project area, the Port shall reinitiate consultation as appropriate and implement measures to address such impacts.

Table 9. Soil Screening Criteria for the SeaTac Embankment Fill (milligram/kilogram (mg/kg)) (adapted from J. Lynch, Stoel Rives, pers. com. 2001).

RCRA [1] Metals	Three Phase Partioning Model Concentrations[2]	MTCA [3] Unrestricted Land Use			Puget Sound Background (upper 90 percent) [5]	Screening Criteria	
		Current Method A Standard	Proposed Method A Standard [4]	Proposed Ecological Standard [4]		Drainage Layer Cover	Top 3-feet of Embankment
Arsenic	88	20	20	95 (As V)	7	7 - 20 [6]	20 [7]
Barium	12,000	NA [8]	NA	1,250	NA	12,000 [9]	1,250 [10]
Cadmium	0.15	2	2	25	1	1 - 2 [11]	2 [7]
Chromium (total)	NA	100	NA	42	48	48 - 100 [11, 12]	48 [13]
Lead	500	250	250	220	24	24 - 250 [14]	220 [10]
Mercury (inorganic)	0.013	1	2	9	0.07	0.07 - 2 [11]	2 [7]
Selenium	0.52	NA	NA	0.8	NA	5 (PQL [15]) [16, 17]	5 (PQL) [16]
Silver	0.11	NA	NA	NA	NA	5 (PQL [15]) [16, 17]	5 (PQL) [16]

1 RCRA: Resource, Conservation and Recovery Act

2 MTCA WAC 173-340 747 (3), (4), and (5) Three Phase Partitioning Model soil concentrations calculated using aquatic freshwater quality criteria (WAC 173-201A). For purposes of this table, the lowest criteria from "Freshwater CCC Chronic" Screening Quick Reference Table (NOAA SQuiRT Table) were used.

3 MTCA: Model Toxics Control Act, Washington Administrative Code (WAC) 173-340.

[4] Proposed MTCA Method A and Ecological standards were finalized on February 15, 2001, and will become effective on August 15, 2001.

[5] Natural Background Soil Metals in Washington State (Ecology Publication 94-115).

[6] The MTCA Method A standard of 20 mg/kg is less than the Three Phase Partitioning Model concentration of 88 mg/kg indicating that the MCTA Method A standard is protective of surface water receptors. When soil concentrations are greater than background but below the MCTA Method A standard, sufficient SPLP testing will be conducted to confirm that the MCTA Method A standard is protective (see associated text in Attachment A for discussion of SPLP testing).

[7] Screening criteria based on MTCA Method A standards.

[8] NA: not available. Insufficient information available to develop the criteria.

[9] Three Phase Partitioning Model concentrations calculated using MTCA Method B ground water quality criteria because there was no available criteria for barium in surface water. If concentrations exceed calculated values, SPLP testing will be required to evaluate the suitability of the soil.

[10] Screening criteria based on ecological standards.

[11] Three Phase Partitioning Model concentrations, adjusted upward to background, and MTCA Method A standards. To verify the protectiveness of MCTA Method A standards, SPLP testing will be conducted when soil concentrations exceed background but are below MCTA Method A standards. (Note: exceedances in background concentrations anticipated due to natural variability of soil types being used as fill.)

[12] Chromium speciation may be conducted in the event SPLP is applied.

[13] Screening criteria based on ecological standards, adjusted for background.

[14] The MTCA Method A standard of 250 mg/kg is less than the Three Phase Partitioning Model concentration of 500 mg/kg indicating that the MTCA Method A standard is protective of surface water receptors. When soil concentrations are greater than background but below the MTCA Method A standard, sufficient SPLP testing will be conducted to confirm that the MCTA Method A standard is protective.

[15] PQL: Practical Quantification Limit

[16] PQLS from Department of Ecology "Implementation Memo No. 3: PQLs as Cleanup Standards," November 24, 1993.

[17] Three Phase Partitioning Model concentrations, adjusted upward to PQL. If soil concentrations exceed the PQL, SPLP testing will be required to evaluate the suitability of the soil.

In addition to these measures, the exposure to terrestrial organisms is further reduced as portions of the embankment are paved, and therefore, species cannot come into contact with fill material. Also, the Port actively manages the airport to dissuade the use of terrestrial organisms due to potential aircraft safety issues. Although some wildlife, such as small birds and rodents, may use and feed in areas of embankment fill, the numbers are expected to be low. It is anticipated that organisms which may utilize the embankment would provide a minor food source for bald eagles and there would be a low risk of bioaccumulation occurring should this listed species feed on these organisms.

Des Moines Creek and Miller Creek, and discharges from the IWS may currently exceed sub-lethal toxicity levels for bull trout and their forage species for Cu based on values available for other fish species (Eisler 1998) (Table 2). No specific information on Cu toxicity is available for bull trout.

IWS discharge rates will increase as a result of the proposed action. The plume from the IWS outfall diffuser is located at a depth of 156 ft to178 ft, 1,800 feet off shore in Puget Sound, and could raise baseline levels above ambient within 65 meters (213.2 ft) of the outfall. Bull trout could occur within this zone. Bull trout may also occur at the mouths of Des Moines and Miller Creeks. However, bull trout are unlikely to be exposed for long periods of time to chronic toxicity levels. Bull trout are opportunistic feeders, and their presence within an area of the marine environment is based largely on the forage base present. Cu is known to interact with many compounds in water. The amount of Cu compounds and complexes in solutions depends on many factors, including water pH, temperature, and alkalinity, as well as the concentrations of bicarbonate, sulfide, and organic ligands (USEPA 1980 *in* USGS 1998). The toxicity of Cu will depend on the interactions it has with other compounds. For example, mixtures of Cu and Zn salts are more-than-additive in toxicity in the marine and freshwater environment (Eisler and Garner 1973 *in* USGS 1998, Birge and Black 1979 *in* USGS 1998, Hodson et al. 1979 *in* USGS 1998). However, sequestering agents, increasing salinity, sediments and other variables reduce the toxicity of Cu in invertebrates and aquatic plants that have been tested (USGS 1998). Mortality from Cu to bony-fish is reduced in waters with high concentrations of organic sequestering agents (Hodson et al. 1979 *in* Eisler 1998). In rainbow trout, high salinities resulted in lower Cu toxicity (Wilson and Taylor 1993 *in* Eisler 1998).

The proposed project may result in a minor increase or possibly a reduction of Cu over existing levels due to the proposed conversion of land use from residential to open space and runway and taxiways, based on information provided in the BA and additional information provided by the consultants (Table 10).

Table 10. Estimation of Cu concentration change for Sea-Tac.[1]

	Runway/Taxiway	Residential	Commercial	Open-Space	Total Cu µg/L
Cu µg/L (median)	26	20	32	10	
Existing Conditions (acres)	149.2	373.7	0	0	
Existing Conditions (acres * Cu µg/L)	3,879	7,474	0	0	11,353
With Project (acres)	343.5	0	7.3	172.1	
With Project (acres * Cu µg/L)	8,931	0	234	1,721	10,886

[1] Based on information provided by Parametrix, from J. Lynch dated April 20, 2001.

The BA states that the median level of Cu from the runway and taxiway areas is 37 µg/L. This value has been updated based on two years of additional water quality data, and is currently calculated as 26 µg/L of Cu. Data for residential areas was assumed by the consultants to be similar to the data available for King County Metro of 20 µg/L. It was also assumed that any open space areas converted from residential would have a lower Cu value. Ten µg/L was estimated as the value for open-space based on the consultant's best professional judgement.

The Cu values cited for residential areas may not represent the Cu values currently discharged from the residential areas in the project area as the data used is a composite from King County rather than site specific information. Additionally, some of the residential area is misclassified. For example, Vacca Farms should be classified as agricultural lands, which may have a different Cu value from that presented. Therefore, the above values do not accurately predict existing or future conditions for Cu. However, we believe it is likely that lands that will be taken out of residential use and converted to open-space should result in a reduction of Cu being generated for this land use type. Taking into account the revised Cu discharges levels from Sea-Tac and the conversion of residential areas to open-space lands which should result in less Cu being generated over existing levels, we believe that the predicted Cu discharges are not likely to increase significantly over baseline values and may, in fact, be reduced.

Therefore, due to the relatively low production of forage fish in Miller and Des Moines Creeks, and the low forage base level near the outfall, limited exposure of bull trout to potential chronic toxicity levels, and potentially minor increase or decrease of Cu over existing conditions, affects from Cu are likely to be minimal compared to baseline conditions.

Zn levels within Des Moines and Miller Creek estuaries, and discharges from the IWS (Table 2) currently exceed acute toxicity levels for bull trout based on studies conducted by Stratus Consulting, Inc. (1999). Acute toxicity analyses were performed for bull trout with regard to Zn and cadmium (Cd) (Stratus Consulting, Inc. 1999). Bull trout had a lethal concentration for fifty percent of the test animals (LC_{50}s) ranging from 31.9 µg to 86.9 µg Zn/L, with an average value of 54 µg Zn/L. Higher hardness and lower pH water produced lower toxicity of Zn and Cd in bull trout, but higher water temperature increased their sensitivity to Zn. Several trends have been noted regarding the affects of Zn on fish: 1) freshwater fish are more sensitive to Zn than marine species; 2) embryos and larvae are the most sensitive developmental stages; 3) effects are lethal or sublethal for most species in the range 50-235 µg Zn/L and at 4.9-9.8 µg Zn/L for the brown trout specifically; and 4) behavioral modifications, such as avoidance, occur at concentrations as low as 5.6 µg Zn/L (Eilser 1993). Impacts to reproduction may be one of the more sensitive indicators of Zn stress in freshwater teleosts, with effects evident in the 50-340 µg Zn/L range (Spear 1981 *in* Eisler 1993).

The toxicity of Zn to aquatic organisms depends on the physical and chemical forms, the toxicity of each form, and the degree of interconversion among the various forms (Eisler 1993). Suspended Zn has minimal effect on aquatic plants and fish, but many aquatic invertebrates and some fish may be adversely affected from ingesting enough Zn-containing particulates (EPA 1987 *in* Eisler 1993). Freshwater fish are affected by Zn toxicosis by destruction of gill epithelium and consequent tissue hypoxia. Osmoregulatory failure, acidosis and low oxygen tensions in arterial blood, and disrupted gas exchange at the gill surface and at internal tissue sites are all indicators of acute Zn toxicosis in freshwater fish (Spear 1981 *in* Eisler 1993). Zn may also affect fish immune systems (Ghanmi et al. 1989 *in* Eisler 1993). Additionally, combinations of Zn and Cu are generally more-than-additive in toxicity to a wide variety of aquatic organisms, including freshwater fish (Skidmore 1964 *in* Eisler 1993; Hilmy et al. 1987a *in* Eisler 1993) and marine fish (Eisler and Gardner 1973 *in* Eisler 1993; Eisler 1984 *in* Eisler 1993).

There are a number of factors which are known to modify the biocidal properties of Zn in aquatic environment. Zn tends to be more toxic to embryos and juveniles than to adult, to starved animals, at elevated temperatures, in the presence of Cd and mercury, in the absence of a chelating agent, at reduced salinities, under conditions of marked oscillations in ambient Zn concentrations, at decreased water hardness and alkalinity, and at low dissolved oxygen concentrations (Skidmore 1964 *in* Eisler 1993; Weatherley et al. 1980 *in* Eisler 1993; Spear 1981 *in* Eisler 1993; EPA 1987 *in* Eisler 1993; Paulauskis and Winner 1988 *in* Eisler 1993).

Although the existing levels of Zn typically exceed those levels detected to have an acute effect on bull trout, the toxicity values are based on 96 and 120 hours of exposure. It is unlikely that bull trout will remain in proximity to the mouths of Des Moines and Miller Creeks, or in the vicinity of the IWS outfall for this length of time. Chronic toxicity levels of Zn were not tested and are not known for bull trout. Chronic toxicity levels would be expected to be lower than acute levels.

Again, bull trout exposure at these sites to acute or chronic levels is expected to be minor due to the low likelihood of their feeding or occupying these areas for a significant length of time. Additionally, Zn levels may be reduced from existing levels due to the conversion of residential land use to airport runway and taxiway areas based on information provided in the BA as well as from the Washington Department of Ecology NPDES permit for Sea-Tac (WDOE 1998). The predicted levels of Zn may affect other fish or invertebrate species which occupy these water bodies. For example, the LC $_{50}$ values listed in the BA for chinook salmon (446 µg/L) and brook trout (2,100 µg/L) are higher than those found by Stratus Consulting, Inc. (1999) for rainbow trout (27.3 µg/L to 447 µg/L). Therefore, although the data indicates that acute toxicity standards may not be exceeded for some species, prey species for bull trout and their forage fish may be affected by the levels of Zn occurring in these waters. However, we believe that the effects of Zn to bull trout as a result of the proposed project are likely to be minimal compared to existing baseline conditions.

Additionally, the proposed action includes improved stormwater treatment over existing conditions. Currently, approximately 166.2 acres of the 479.1 acres of pollutant generating impervious surface (PGIS) (the area requiring water quality treatment best management practices) are untreated. With the proposed project, approximately 80 acres will remain untreated due to proposed retrofitting of existing facilities or conversion from a PGIS to a non-PGIS status (approximately 7.3 acres). This increased treatment of stormwater includes source controls and additional best management practices, including wet vaults and bioswales. Based on the increased stormwater treatment over existing conditions, even with the new development which will also be fully treated, there is a potential improvement over existing water quality conditions.

The Port has committed to removing Tempo and Diuron from the list of allowable chemicals currently included for use on the airport (K. Smith, Port of Seattle, pers. com., 2001). The other pesticides and herbicides do to not pose as great a risk to aquatic species as do Tempo and Diuron (Meister 1995). In addition to the chemicals already included for use on Sea-Tac, the BA proposes to use 2,4-D amine and Garlon in the Green River mitigation area. No use of herbicides is proposed within other mitigation areas. Due to limited exposure bull trout would have to these chemicals, the effects are likely to be minimal.

Advanced stormwater treatment systems that use flocculation agents could potentially add chemicals to stormwater runoff. The potential water quality impacts from the advanced stormwater treatment BMPs used to control turbidity include changes to pH and the toxicity of treatment compounds. The draft Ecology Stormwater Manual Update includes a BMP for Construction Stormwater Chemical Treatment (Ecology 1999b). For its treatment regimes, the Port has used both organic polymers, such as CatFloc, and inorganic compounds such as alum. The use of cationic PAMs may result in impacts to forage fish and bull trout. However, due to the potential for buffering of treated water from sediments and the limited exposure bull trout may have to this chemical, the effects are likely to be minimal.

Bald Eagle

The proposed action is unlikely to result in significant impacts to bald eagles. Impacts are

expected to be minor since no bald eagle nesting territories occur within the action area and no potential nest trees will be removed. If permits to construct the third runway are obtained, the fill currently elevating the embankment 50 ft above the airport ground would be leveled and no longer serve as a perching area for bald eagles. Although trees within the MPUI are proposed to be removed, there is a low likelihood that th are used for perching due to the small forage base in Des Moines and Miller Creeks. Also, due to the high amount of noise generated by the airport, bald eagles are less likely to frequent this area in high numbers. Bald eagles may use the Tyee Golf Course area to forage for waterfowl. There is likely to be a reduction in waterfowl use of this area due to its conversion to scrub-shrub wetlands and airport facilities. This could result in a reduction in bald eagle foraging in this area over baseline conditions, should it currently occur. However, due to the existing human use and disturbance of this area, loss of this area as a possible foraging base is not expected to be significant to bald eagles. Additionally, since no additional habitat is provided by the proposed airport facilities, flight paths of bald eagles over the airport are not anticipated to increase due to the proposed project.
Runway 34R, which is the runway closest to Angle Lake, will be extended by 600 ft. It is estimated that larger planes will use the additional runway extension several times a year over existing conditions (E. Levitt, Port of Seattle, pers. com., 2001). Bald eagles flying from the nest site are likely to be at a lower flight elevation than planes that may be landing. Although there is a risk of collisions of bald eagles with airplanes due to the extension of this runway, the risk is anticipated to be minimal due to the few additional flights which will use this part of the runway over existing conditions. Additionally, most bald eagles are likely to be below 1000 ft. when planes are taking off from the airport, thus avoiding being struck by a plane.

No air strikes of bald eagles have been documented at Sea-Tac. There are a number of "unidentified" species that were struck by aircraft at Sea-Tac between 1991 and 1997. Of this total of 53 birds, 19 were small, 1 was large, and 33 were unknown (FAA 1999). Bald eagles have been identified in bird strikes by civil aircraft in the United States (FAA 1999). In a national report on bird strikes, out of a total of 22,320 bird strikes reported between 1990 and 1998, 20 were bald eagles and 32 were unidentified hawks, kites, and eagles. At least an additional 7 bald eagle strikes have occurred since 1998 (S. Wright, unpublished data). None of the eagle strikes reported were in Washington. The majority of the eagle strikes occurred in Alaska. Bird strike information is not required to be reported to FAA, and it is estimated that only about 20 percent of the bird strikes are reported, therefore the number of strikes is likely to be an underestimate (FAA 1999). Most bird strikes (53 percent) result during takeoff and climbing. Over 55 percent occurred within 99 ft above ground level and approximately 87 percent occurred within 2,000 ft above ground level (FAA 1999). Although bald eagles may be at risk of airplane strikes, the risk can be very low. Only one unconfirmed bald eagle strike in 1989 has been documented for Whidbey Island Naval Air Station, a site which is on Puget Sound north of the proposed project site and has daily use by bald eagles (M. Klop, Whidbey Island Naval Air Station, pers. com. 2001). Due to the large size of the bald eagle, should an air strike have occurred at Sea-Tac, it would be assumed that the bird would have been identified prior to contact or some body parts, including feathers, would still be identifiable. Even though reports of bird strikes are not required by FAA, Sea-Tac twice daily performs runways searches which would likely find signs of wildlife strikes should they occur. No bald eagles have been reported as a result of these searches.

Therefore, although there is a risk of an air strike of a bald eagle at Sea-Tac, we do not believe that this risk is significantly increased as a result of the proposed action

Concerns have been raised that air strikes of bald eagles might occur as this species may use thermals produced by the proposed retaining wall. It is unlikely that bald eagles would utilize th area near the retaining wall due to the lack of forage. Additionally, bald eagles primarily hunt from perches as opposed to soaring. Therefore, the risk of airplane strikes of bald eagles from their use of thermals is expected to be minimal.

The proposed on-site and off-site mitigation for the project could have some minor long term benefit for the bald eagle should it be successful. The proposed improvements to Miller and Des Moines Creeks may improve the forage base for bald eagles. However, bald eagles are not likely to forage in the upper watersheds. The creeks are relatively narrow with some canopy, limiting the ability of bald eagles to forage effectively. The proposed off-site mitigation may also have a beneficial effect on bald eagles, should it be successful, due to the potential to enhance waterfowl habitat, as waterfowl are prey for the bald eagle. However, depending on the amount of future disturbance due to increased development in the vicinity of the Auburn mitigation site, use of the site by foraging bald eagles may be minimal.

Marbled Murrelet

The proposed project is likely to result in insignificant impacts to marbled murrelets. Suitable marbled murrelet nesting habitat does not occur within the action area, including the off-site mitigation area. The nearest potential habitat to the east of the action area is approximately 32 miles away. The nearest known occupied site is approximately 36 miles away. Potential foraging habitat is present at the mouths of Miller Creek and Des Moines Creek, and within Puget Sound. Although the proposed project may result in some short term impacts to potential prey species (i.e., salmonids) that occur within Miller and Des Moines Creeks, salmonids are not known to form the primary diet of marbled murrelets. Thus, the effect to marbled murrelets from any impacts to the salmonid prey base would be minimal. There is a potential for a long term benefit to marbled murrelets should the proposed mitigation successfully enhance fish habitat and result in increased fish production within these creeks. However, as stated above, this benefit is likely to be minor as salmonids do not form the primary diet of the marbled murrelet.

Impacts from air strikes are unlikely. No air strikes have been documented for marbled murrelets at Sea-Tac. Although there are a number of "unidentified" species which have been struck by airplanes, the likelihood of aircraft striking marbled murrelets is considered insignificant. This conclusion is based on: 1) no alcids have been identified in any reported wildlife strikes to civil aircraft in the United States between 1990 and 1998 (FAA 1999); 2) marbled murrelets typically fly at altitudes greater than 2,770 ft (1,000 meters) in altitude when leaving the ocean to nesting habitat (Burger 1997) and most air strikes are within 900 ft above ground level (FAA 1999); and 3) marbled murrelets are fast fliers and can move quickly to avoid collisions, while the majority of bird strikes involve slower flying birds. Additionally, due to the rarity of marbled murrelets, few are likely to fly over Sea-Tac, therefore the risk of air strikes is reduced. Despite the numerous surveys which have occurred within this area, there have only been nine marbled murrelet detections (four occupied sites and five detections only) east of Sea-Tac whose flight path might cross the airport. The majority of marbled murrelet sightings and detections for nesting and foraging are north and south of the project area. Their travel paths are unlikely to cross the airport between nesting and foraging locations. Although this does not represent all marbled murrelets which might travel near Sea-Tac between Puget Sound and the Cascades, it does demonstrate the small population that has been found to date.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local or private actions that are reasonably certain to occur in the action area considered in this biological opinion. Future Federal actions that are unrelated to the proposed action are not considered in this Section because they require separate consultation pursuant to Section 7 of the Act.

Three broad categories of cumulative effects which may occur in the action area include: 1) growth and development; 2) forest management; and, 3) other management actions. Growth and development refer to permanent loss of suitable habitats. Growth and development actions include conversion of forest habitat to urban, other residential, commercial, or agricultural uses, and for structures or networks providing infrastructure support such as hydro power and irrigation diversions, roads, and power-lines. Forest management refers to temporal and spatial changes from other state or private actions in suitable habitats across the landscape in the action area. Examples include age or structural changes resulting from harvest and other forest-management actions such as planting, pruning, fertilizing, forest growth, and wildland fires. Other management actions refer to actions within suitable habitats which impact habitat structures or composition such as recreation, grazing, fishing, and mining. Each of these categories of impacts may result in the loss of secure habitat for species using suitable habitats within the action area. Examples of this include physical displacement, exposure to contaminants, and declining air and water quality. The proposed MPUI site may be developed further. Redevelopment of the borrow or acquisition areas may occur in the future. However, the Port states that they have no immediate plans to develop the sites. Proposed actions near the off-site wetland mitigation project in Auburn include a proposed trail along the Green River and development of private property to commercial and residential uses. Some of these proposals may have a federal nexus (i.e., ACOE Section 404 permits) associated with them. It is not known to what extent these proposals will be addressed by future consultations. These proposed actions could result in increased impervious surfaces with potential stormwater and water quality impacts, increased access and use (including fishing) within the Green River, and the reduction of restoration potential of the riparian buffer and input of large woody debris into the Green River.

CONCLUSION

After reviewing the current status of the bull trout, bald eagle, and marbled murrelet, the environmental baseline for the action area, the effects of the proposed MPUI, and the cumulative effects, it is the FWS's biological opinion that the MPUI, as proposed, is not likely to jeopardize the continued existence of the bull trout, bald eagle or marbled murrelet. We reached this conclusion on the basis that the proposed action is not likely to adversely affect these species, as discussed in the Effects section of this opinion.

No critical habitat has been designated for the bull trout or bald eagle. Therefore, none will be affected for these species. Critical habitat has been designated for the marbled murrelet. However, the project does not occur within designated critical habitat, therefore none will be affected for this species.

INCIDENTAL TAKE STATEMENT

Section 9 of the Act and federal regulation pursuant to Section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the FWS to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the FWS as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the Act provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

The FWS does not anticipate the proposed action will incidentally take bull trout, bald eagle or marbled murrelet. Therefore, no take exemption for the bull trout, bald eagle or marbled murrelet is provided.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

These are as follows:

1. The riparian buffers along Miller Creek and Des Moines Creek should be at least 150 ft on each side to better protect the aquatic environment, including cutthroat trout and coho salmon, which is a federal candidate for listing under the Act. This increased buffer width is critical in providing large woody debris and nutrients to the streams, as well as additional storm water benefits, should development occur immediately outside of the riparian buffers. Wider buffers also benefit wildlife species which use the riparian habitat for reproduction, foraging and resting by reducing the disturbance from human activities.

2. Monitor fish use, including spawning activities, in Miller and Des Moines Creeks to determine success of habitat enhancement and restoration activities.

3. Evaluate effects to invertebrates in the restored section of Miller Creek. Include changes in species composition from existing conditions, and recovery of the system following diversion of flows into the new channel.

4. Viable native plants shall be salvage and reused at mitigation sites.

5. Large diameter trees with attached rootwads or large rootwads that are to be removed as a result of the project should be retained/saved for future use on Port or other restoration/ mitigation sites in King County.

6. Large woody debris placed in Miller Creek should be keyed into the bank at a minimum 1 to 1 ratio (for every foot of wood instream, one foot should to be keyed into the bank). Root wads without boles should not be used. This will better insure the success that large woody debris placed for stream restoration will function as designed.

7. Pesticides and herbicides should not be used due to the potential to enter the groundwater and surface water where it may potentially affect the invertebrate forage base and fish species. Should their use be unavoidable, we recommend that a minimum 200 ft. buffer from waterbodies be required If a 200 ft buffer cannot be implemented, we recommend that a monitoring program be implemented to determine the adequacy of the 50 ft. buffer in protecting aquatic resources, including wetlands, from pesticide and herbicide contamination. Rodeo may be used if other non-chemical methods to control reed canary grass prove to be unsuccessful. If Garlon is used in the Green River mitigation area, it should be restricted to the use of Garlon 3a. Garlon 4 should not be used. Organophosphates, carbamates and triazine herbicides should not be used under any circumstance.

8. Reduce or eliminate airport sources of Cu and Zn. Implement additional best management practices to treat stormwater to levels of Cu and Zn below acute and chronic toxicity levels for aquatic organisms. Sufficient monitoring must be performed to determine that reduced levels are being achieved.

9. New structures should not contain pollution generating impervious surfaces.

10. Use anionic PAM products which have reduced toxicity on aquatic organisms compared to cationic PAM.

11. Evaluate the effectiveness of temporary erosion and sediment control measures.

12. Provide copies of monitoring reports to the Western Washington Office.

13. Conduct research to better define population status and use by bull trout of watersheds and marine areas where Port of Seattle and FAA activities occur.

For the FWS to be kept informed of actions minimizing or avoiding adverse affects or benefitting listed species or their habitats, we request notification of the implementation of any conservation recommendations.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the request. As provided in 50 CFR §402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

The WDOE and the Corps have not completed their review of the project at this time; therefore, issuance of the NPDES permit, water quality certification (401), and Clean Water Act Section 404 permit have not occurred. The BA includes a number of best management practices which are proposed to meet state water quality standards. The BA acknowledges that additional measures may be necessary. The FWS, in our review of the effects of the proposed action, assumes that the criteria in the Washington State surface water quality standards will be met by the project at all times. Any future actions that may be taken to meet state surface water quality standards or Section 404 permit requirements need to be evaluated to determine if reinitiation of this consultation is necessary.

If you have any questions regarding this Biological Opinion, please contact Nancy Brennan-Dubbs, of my staff, at (360) 753-5835 or Jim Michaels, of my staff, at (360) 753-7767.

Sincerely,

Lynn P. Childers

for Ken S. Berg, Manager
Western Washington Office

c: Corps, Seattle (M. Walker)
NMFS, Seattle (T. Sibley)
WDOE. Bellevue (A. Kenny)
Port of Seattle, Sea-Tac (E. Levitt)

Enclosures

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Enclosure A

ATTACHMENT A

Response to U.S. Fish and Wildlife Service Comments and Recommendations Concerning Embankment Fill at Seattle-Tacoma International Airport (FWS Comments and Recommendations in Bold)

1. **All fill material within the first 20 feet above the rock underdrain of the embankment fill shall be contaminant free (e.g., below probable affect levels stated in the appropriate NOAA SQuiRT tables or below background levels found within the area).**

Through its Clean Water Act section 401 permitting process, Washington Department of Ecology (Ecology) has required the Port to develop a process for insuring that contaminated fill material *is not* incorporated into the Third Runway embankment. The screening process developed by the Port includes the use of MTCA Method A standards as a tool to evaluate what is or is not environmentally suitable for placement in the embankment. In our January 22, 2001, meeting, and in its February 27, 2001, comments, FWS requested additional information concerning the Port's screening process, including information indicating this process is adequately protective of listed species.

First, it is important to recognize that the Port is not accepting large amounts of soil with constituent concentrations just at or below levels defined as "clean" by MTCA Method A standards. Over 50 percent of the soil placed in the Third Runway embankment to date has been from large pits, most state-certified, without historical sources of contamination. Though it is the responsibility of the individual contractor to identify sources of fill material, the Port anticipates that large pits will continue to be a primary source of fill for the embankment. Second, the remaining amount of embankment fill will not include contaminated soil that has been remediated to MTCA Method A standards. Rather, such soil will be taken from sites or portions of sites that have not historically been affected by contamination. Thus, Method A standards in this case are used simply as a screening tool to verify that clean fill sources are in fact clean.

To evaluate the environmental suitability of a proposed fill source, the Port currently requires that, for those fill sources for which testing is mandated, the supplier at a minimum test for concentrations of total petroleum hydrocarbons (TPH) and the eight Resource Conservation and Recovery Act (RCRA) metals. Analysis for chemicals other than TPH and metals is presently required based upon site-specific conditions. The approach used for evaluating appropriate testing, including location of samples, number of samples, and type of analysis, is similar to that used for Phase I and Phase II Environmental Site Assessments as discussed below.

When the Washington Department of Ecology and the Port developed the process for evaluating fill material proposed for placement in the Third Runway embankment, they used standards for conducting Phase I and Phase II Environmental Site Assessments as a model. Typically, Phase I and Phase II Environmental Site Assessments are conducted to identify environmental conditions at a site prior to some change of use or ownership. The nationally-accepted standard for these assessments is the American Society for Testing and Materials Standard (ASTM) Practice for Environmental Site Assessment: Phase I and Phase II Site Assessment Process (ASTM E 1527 and ASTM E 1903). Though not all ASTM procedures are relevant (e.g., lead paint testing, radon surveys, etc), the basic ASTM procedures for a site reconnaissance, review of historic operations, and appropriate testing to be conducted by a qualified environmental professional were adapted to the fill acceptance process. The use of Phase I and Phase II Environmental Site Assessments as a model is appropriate because it is a nationally-accepted process for evaluating the potential for contamination at a site.

Phase I and Phase II Environmental Site Assessments differ in objectives from Puget Sound Dredge Disposal Analysis (PSDDA) and remedial investigation studies. Phase I and Phase II Environmental Site Assessments look specifically for contamination. In contrast, PSDDA is a program which addresses the management and disposal of sediments that may be contaminated. As a result, sampling and analysis protocols are different. For Phase I and Phase II Environmental Site Assessments, the level of sampling and type of analyses can vary considerably from site to site based on the potential presence of contamination. This approach differs from PSDDA, in that PSDDA specifies a standard sampling protocol, including the number of samples and type of analyses, for evaluating the bulk characteristics of material proposed for open water disposal. This Phase I and II Environmental Site Assessment approach also differs from the more rigorous requirements for remedial investigation studies, which are designed to evaluate impacts from known contaminated sites.

When evaluating the suitability of proposed fill material, the Port uses MTCA Method A standards as a screening tool. However, the final suitability determination relies on best professional judgement. In general, the approach used in evaluating the fill suitability is similar to that of a prospective purchaser evaluating environmental information obtained in Phase I and Phase II Environmental Site Assessments. Careful consideration is given to other factors in addition to chemical test results. These include current and historic site uses, adequacy of the environmental documentation, type of proposed fill material (e.g., native vs. non-native) and the nature of the proposed excavation activities (e.g., Does the contractor have sound operational controls in place?). In some cases, the Port will condition acceptance to a specific area of a site, require ongoing testing and monitoring during excavation, or require regular site inspections to insure the quality of the incoming fill material. For example, the Port may determine that upper non-native soil at a source site may not be suitable because of its potential to contain asphalt or other debris, but that the underlying native soils at the same site are suitable. At the same site the Port may require an environmental professional monitor the site to ensure that the native and non-native materials are indeed separated.

In our January 22, 2001, meeting, and in subsequent comments, FWS inquired as to the protectiveness of Method A standards for the RCRA metals and for organochlorines. The Port will address these issues as follows:

(a) Drainage layer cover: The Port will establish a zone of "ultra-clean" fill above the drainage layer, in an area termed "drainage layer cover." The drainage layer cover will measure at least 40 feet thick at the face of the embankment and will reduce in height to the east at a rate of 2 percent (see Figures 1 and 2). The 2 percent slope is required for consistency with the embankment construction design, which has been developed to allow for appropriate drainage and runoff control. The overall thickness of the drainage layer cover will decrease away from the face of the embankment and will vary based on underlying topography. This configuration allows for the greatest protection for aquatic resources in the areas closest to the wetlands and Miller Creek, and will protect surface water quality in nearby Miller Creek.

(b) RCRA metals: The Port will employ the following standards and protocols concerning the placement of fill in the drainage layer cover with the goal of ensuring that baseline conditions are not altered for surface water receptors:

(i) For the drainage layer cover, as with the remainder of the embankment fill, no soil will be accepted that exceeds MTCA Method A standards for the RCRA metals per agreement with the Washington State Department of Ecology. These values are shown in columns 3 and 4 of Table 1.

(ii) The second column of Table 1 shows values for the RCRA metals that have been calculated using the Washington State Department of Ecology's (Ecology) "Three Phase Partitioning Model." Ecology uses this conservative model to establish soil concentrations that are protective of ground water as a drinking water source (see WAC 173-340-747(3), (4), and (5)) (Attachment B). The values in the second column of Table 1 are derived by using this model to "back-calculate" soil concentrations using freshwater ambient water quality criteria (WAC 173-201A) instead of ground water quality criteria. In other words, the model used by Ecology to establish soil concentrations that are protective of groundwater as a drinking water source has been employed to calculate soil concentrations that are protective of surface water receptors exposed to discharge or seepage from the drainage layer. No soil will be accepted for the drainage layer cover that exceeds the back-calculated values shown in the second column of Table 1 (with adjustments for PQLs and background concentrations as noted in Table 1 footnotes) unless the Synthetic Precipitation Leaching Procedure (SPLP) confirms the suitability of the soil as discussed below in (b)(iv). The Port will consult with the FWS if site-specific data is collected which may merit a recalculation of the three phase model soil concentrations in Table 1, and reinitate consultation as appropriate.

(iii) Column 6 shows Puget Sound Background concentrations for the eight RCRA metals. Exceedences of background metal concentrations can be expected due to the natural variability in soil types which will be offered from numerous sources in the region. Thus, in column 7, a range of screening criteria between background levels, when available, and Method A standards is shown. In the event the Port desires to establish site-specific background criteria, it will discuss proposed criteria with FWS and reinitiate consultation as appropriate. If the suppliers wish to place soil in the drainage cover layer that exceed background concentrations, the Port will confirm the acceptability of the material by requiring suppliers using that source to conduct sufficient SPLP testing to show that Method A criteria are protective of baseline conditions for surface water receptors.

(iv) To confirm the protectiveness of the Method A standards and the Three Phase Partitioning Model, SPLP testing will be used as a laboratory method to ensure that leaching of metals through potential embankment soil will not occurr at unacceptable levels. SPLP testing according to the procedures contained in WAC 173-340-747(7) and SPLP methodology are shown in Attachments B and D respectively. SPLP results will be compared, as an initial screening tool, to freshwater ambient water quality criteria according to guidelines outlined at WAC 173-201A-040 (Attachment C). If the SPLP results indicate that metals in the proposed fill material *do not leach* at levels above the freshwater ambient water quality criteria, adjusted for PQLs as appropriate, the material will be considered suitable for placement. If the SPLP indicates that metals in the proposed fill material *leach* at levels above ambient water quality criteria, the Port will either reject the material or discuss the results of the SPLP with FWS before acceptance of the material. The Port shall submit to FWS for its review and approval a plan describing the Port's SPLP protocol. The FWS shall approve this plan prior the Port's implementation of the SPLP protocol.

(c) Organochlorines: The Port will employ the following standards and protocols concerning the placement of fill in the drainage layer cover:

(i) The Port will require testing for organochlorines on those sites where such compounds may be present, including sites with potential commercial pesticide applications, and sites with historic wood preserving operations. The supplier, with Port review, will identify sites potentially containing such compounds through the process discussed above under Response 1 (i.e., Phase I and II Environmental Site Assessments). The Port will update guidelines provided to suppliers to clearly state that testing for additional constituents must be conducted as appropriate based on current and historical site land uses.

(ii) As with the remainder of the embankment fill, sources of fill proposed for placement in the drainage layer cover which have detectable levels of organochlorines will not exceed MTCA Method A criteria.

(iii) Sources of fill proposed for placement in the drainage layer cover which have detectable levels of organochlorines will be evaluated using the "Three Phase Partitioning Model" discussed in (b) above. When organochlorines are detected in potential fill, the Port will use the Three Phase Partitioning Model to back-calculate soil concentrations using freshwater ambient water quality criteria. Soil found to contain organochlorines at concentrations below Three Phase Partitioning Model concentrations (adjusted for PQLs) will be deemed acceptable. No soil will be accepted for the drainage layer cover that exceeds Three Phase Partitioning Model concentrations (adjusted for PQLs) unless SPLP testing confirms the suitability of the soil as discussed below in (c)(iv).

(iv) The Port will require SPLP testing when proposed soil exceeds calculated Three Phase Partitioning Model concentrations. SPLP test results will be compared, as an initial screening tool, to freshwater ambient water quality criteria according to guidelines outlined at WAC 173-201A-040 (Attachment C). If the SPLP results indicate that organocholorines in the proposed fill material *do not leach* at levels above the freshwater ambient water quality criteria, adjusted for PQLs as appropriate, the material will be considered suitable for placement. If the SPLP indicates that organochlorines in the proposed fill leach at levels above ambient water quality criteria, the Port will either reject the material or discuss the results of the SPLP with FWS before acceptance of the material, and reinitiate consultation as appropriate.

2. To isolate organisms in the biologically active zone from contaminants that may be contained in the fill material, the surficial 3 feet of fill should be contaminant free (e.g., below probable affect levels stated in the appropriate NOAA SQuiRTs or below background levels found within the area if available).

As discussed in our January 22, 2001, meeting, and dates thereafter, from a practical standpoint it is difficult to apply different acceptance criteria to the upper three feet of embankment fill material versus the underlying fill material. Final grading of the embankment will involve working and reworking of the upper material to achieve appropriate compaction and site elevations. Portions of the embankment will be paved for the runway and associated taxiways. Remaining embankment areas will be grass covered and will have very strict wildlife controls (i.e., hazing and elimination) in accordance with FAA regulations to insure aircraft safety.

During our January 22, 2001 meeting, the Port agreed to evaluate the eight RCRA metals with respect to the recently-adopted MTCA regulation WAC 173-340-7490 Terrestrial Ecological Evaluation Procedures (Attachment E). The goal of the terrestrial ecological evaluation process is the protection of terrestrial ecological receptors from exposure to contaminated soil with the potential to cause significant adverse effects. Table 749-2 - Priority Contaminants of Ecological Concern for Sites that Qualify for the Simplified Terrestrial Ecological Evaluation Procedure lists soil concentrations for seven of the eight RCRA metals (Attachment E). These concentrations are developed to protect wildlife through direct ingestion of soil using a robin/shrew food chain model, two surrogate receptors meant to represent highly exposed species. Soil concentrations were also developed for plants and soil invertebrates using toxicity values from the published literature. The most restrictive value was then placed into Table 749-2.

Generally, the Method A concentrations are less than or similar to Table 749-2 (see Table 1). However, the MTCA Method A standards list does not include values for barium, total chromium or selenium. For these constituents, the Table 749-2 ecological standards listed in Table 1 (adjusted for background and PQLs) will be used as screening criteria for the top three feet of embankment fill.

3. The Port of Seattle will monitor the seepage water from the rock underdrain for contaminants. Monitoring shall be for a period of 10 years, on a monthly basis. Based on the monitoring results, the monitoring schedule may be modified by FWS.

The Port of Seattle shall prepare a water quality monitoring plan to track the quality of seepage from the drainage layer beneath the Third Runway embankment fill. Such a plan shall be prepared to address the amount of monitoring in a tiered or phased approach. For example, if it is determined that water flowing through the new embankment is exceeding designated surface water quality criteria, new monitoring points may be established between the embankment and Miller Creek to evaluate the fate and transport of the impacted fill water. Monitoring Miller Creek would represent the final phase of a monitoring program if it were determined that constituents in embankment fill water were reaching the creek. The Port shall develop a monitoring plan in consultation with FWS. The Port shall submit a draft monitoring plan to FWS for its review and approval within 120 days after FWS' issuance of a biological opinion or concurrence letter. The monitoring plan shall provide for a minimum of three years of monthly monitoring, with the monitoring period commencing upon detection of seepage from the drainage layer of the completed embankment. At the end of the three-year monitoring period, the Port and FWS shall reevaluate the need to modify or continue the monitoring program. In the event seepage is not detected within six years after completion of embankment construction, the Port and FWS shall likewise reevaluate the need to modify or continue the monitoring program.

4, 5. If material is used which is known to have contaminants, this material shall be distributed over a large area to avoid creating a "hot spot" in the embankment. The Port of Seattle will request FWS approval for those fill materials proposed that do not meet MTCA Method A standards, at a minimum. Information on why these materials are to be used and proof that their chemical constituents/levels will not result in environmental impacts to aquatic organisms needs to be provided.

The use of MTCA Method A as a screening standard for incoming fill material will avoid the creation of "hot spots" in the embankment. In the event that the Port considers placement of fill materials that do not meet MTCA Method A standards, the Port will discuss results with FWS and consultation will be reinitiated as appropriate.

Acceptance of material above MTCA Method A standards requires Ecology approval. Discussion with the agencies will provide information regarding the environmental suitability of this material and proposed placement methods and locations.

TABLE 1
SOIL SCREENING CRITERIA FOR THIRD RUNWAY EMBANKMENT FILL (MG/KG)

		MTCA(a) -- Unrestricted Land Use				Screening Criteria	
RCRA Metals	Three Phase Paritioning Model Concentrations(b)	Current Method A Standard	Proposed Method A Standard (c)	Proposed Ecological Standard (c)	Puget Sound Background (Upper 90%) (d)	Drainage Layer Cover	Top 3-feet Embankment
Arsenic	88	20	20	95 (As V)	7	7 to 20 (e)	20 (l)
Barium	12000	NA	NA	1250	NA	12,000 (f)	1250 (m)
Cadmium	0.15	2	2	25	1	1 to 2 (g)	2 (l)
Chromium (Total)	NA	100	NA	42	48	48 to 100 (g), (h)	48 (n)
Lead	500	250	250	220	24	24 to 250 (i)	220 (m)
Mercury (Inorganic)	0.013	1	2	9	0.07	0.07 to 2 (g)	2 (l)
Selenium	0.52	NA	NA	0.8	NA	5 (PQL), (j), (k)	5 (PQL), (j)
Silver	0.11	NA	NA	NA	NA	5 (PQL), (j), (k)	5 (PQL), (j)

Note: See associated text in Attachment A for related discussion.

Footnotes:

NA: Not available. Insufficient information available to develop criteria.

PQL: Practical Quantitation Limit

(a) Model Toxics Control Act WAC 173-340.

(b) MTCA WAC 173-340 747 (3), (4), and (5) Three Phase Partitioning Model soil concentrations calculated using aquatic freshwater quality criteria (WAC 173-201A). For purposes of this table, the lowest criteria from "Freshwater CCC Chronic" Screening Quick Reference Table (NOAA SQuiRT Table) were used.

(c) Proposed Method A and Ecological standards were finalized on February 15, 2001, and will become effective on August 15, 2001.

(d) Natural Background Soil Metals in Washington State (Ecology Publication 94-115).

(e) The MTCA Method A standard of 20 mg/kg is less than the Three Phase Partitioning Model concentration of 88 mg/kg indicating that the Method A standard is protective of surface water receptors. When soil concentrations are greater than background but below the Method A standard, sufficient SPLP testing will be conducted to confirm that the Method A standard is protective (see associated text in Attachment A for discussion of SPLP testing).

(f) Three Phase Partitioning Model concentrations calculated using MTCA Method B ground water quality criteria because there was no available criteria for barium in surface water. If concentrations exceed calculated values, SPLP testing will be required to evaluate the suitability of the soil.

(g) Three Phase Partitioning Model concentrations, adjusted upward to background, and Method A standards. To verify the protectiveness of Method A standards, SPLP testing will be conducted when soil concentrations exceed background but are below Method A standards. (Note: exceedances in background concentrations anticipated due to natural variability of soil types being used as fill.)

(h) Chromium speciation may be conducted in the event SPLP is applied.

(i) The MTCA Method A standard of 250 mg/kg is less than the Three Phase Partitioning Model concentration of 500 mg/kg indicating that the Method A standard is protective of surface water receptors. When soil concentrations are greater than background but the Method A standard, sufficient SPLP testing will be conducted to confirm that the Method A standard is protective.

(j) PQLS from Department of Ecology "Implementation Memo No. 3: PQLs as Cleanup Standards", November 24, 1993.

(k) Three Phase Partitioning Model concentrations, adjusted upward to PQL. If soil concentrations exceed the PQL, SPLP testing will be required to evaluate the suitability of the soil.

(l) Screening criteria based on MTCA Method A standards.

(m) Screening criteria based on ecological standards.

(n) Screening criteria based on ecological standards, adjusted for background.

ATTACHMENT B

WAC 173-340-747(3-5, 7) (February 12, 2001)

WAC 173-340-747 (3) Overview of methods. This subsection provides an overview of the methods specified in subsections (4) through (10) of this section for deriving soil concentrations that meet the criteria specified in subsection (2) of this section. Certain methods are tailored for particular types of hazardous substances or sites. Certain methods are more complex than others and certain methods require the use of site-specific data. The specific requirements for deriving a soil concentration under a particular method may also depend on the hazardous substance.

(a) Fixed parameter three-phase partitioning model. The three-phase partitioning model with fixed input parameters may be used to establish a soil concentration for any hazardous substance. Site-specific data are not required for use of this model. See subsection (4) of this section.

(b) Variable parameter three-phase partitioning model. The three-phase partitioning model with variable input parameters may be used to establish a soil concentration for any hazardous substance. Site-specific data are required for use of this model. See subsection (5) of this section.

(c) Four-phase partitioning model. The four-phase partitioning model may be used to derive soil concentrations for any site where hazardous substances are present in the soil as a nonaqueous phase liquid (NAPL). The department expects that this model will be used at sites contaminated with petroleum hydrocarbons. Site-specific data are required for use of this model. See subsection (6) of this section.

(d) Leaching tests. Leaching tests may be used to establish soil concentrations for certain metals. Leaching tests may also be used to establish soil concentrations for other hazardous substances, including petroleum hydrocarbons, provided sufficient information is available to demonstrate that the leaching test can accurately predict ground water impacts. Testing of soil samples from the site is required for use of this method. See subsection (7) of this section.

(e) Alternative fate and transport models. Fate and transport models other than those specified in subsections (4) through (6) of this section may be used to establish a soil concentration for any hazardous substance. Site-specific data are required for use of such models. See subsection (8) of this section.

(f) Empirical demonstration. An empirical demonstration may be used to show that measured soil concentrations will not cause an exceedance of the applicable ground water cleanup levels established under WAC 173-340-720. This empirical demonstration may be used for any hazardous substance. Site-specific data (e.g., ground water samples and soil samples) are required under this method. If the required demonstrations cannot be made, then a protective soil concentration shall be established under one of the methods specified in subsections (4) through (8) of this section. See subsection (9) of this section.

(g) Residual saturation. To ensure that the soil concentration established under one of the methods specified in subsections (4) through (9) of this section will not cause an exceedance of the ground water cleanup level established under WAC 173-340-720, the soil concentration must not result in the accumulation of nonaqueous phase liquid (NAPL) on or in ground water. The methodologies and procedures specified in subsection (10) of this section shall be used to determine if this criterion is met.

WAC 173-340-747 (4) Fixed parameter three-phase partitioning model.

(a) Overview. This subsection specifies the procedures and requirements for establishing soil concentrations through the use of the fixed parameter three-phase partitioning model. The model may be used to establish soil concentrations for any hazardous substance. The model may be used to calculate both unsaturated and saturated zone soil concentrations.

This method provides default or fixed input parameters for the three-phase partitioning model that are intended to be protective under most circumstances and conditions; site-specific measurements are not required. In some cases it may be appropriate to use site-specific measurements for the input parameters. Subsection (5) of this section specifies the procedures and requirements to establish site-specific input parameters for use in the three-phase partitioning model.

(b) Description of the model. The three-phase partitioning model is described by the following equation:

[Equation 747-1]

Place illustration here.

Where:
Cs = Soil concentration (mg/kg)
Cw = Ground water cleanup level established under WAC 173-340-720 (ug/l)
UCF = Unit conversion factor (1mg/1,000 ug)
DF = Dilution factor (dimensionless: 20 for unsaturated zone soil; see (e) of this subsection for saturated zone soil)
Kd = Distribution coefficient (L/kg; see (c) of this subsection)
&thgr;w = Water-filled soil porosity (ml water/ml soil: 0.3 for unsaturated zone soil; see (e) of this subsection for saturated zone soil)
&thgr;a = Air-filled soil porosity (ml air/ml soil: 0.13 for unsaturated zone soil; see (e) of this subsection for saturated zone soil)
Hcc = Henry's law constant (dimensionless; see (d) of this subsection)
&rgr;b = Dry soil bulk density (1.5 kg/L)

(c) Distribution coefficient (Kd). The default Kd values for organics and metals used in Equation 747-1 are as follows:

(i) Organics. For organic hazardous substances, the Kd value shall be derived using Equation 747-2. The Koc (soil organic carbon-water partition coefficient) parameter specified in Equation 747-2 shall be derived as follows:

(A) Nonionic organics. For individual nonionic hydrophobic organic hazardous substances (e.g., benzene and naphthalene), the Koc values in Table 747-1 shall be used. For hazardous substances not listed in Table 747-1, Kd values may be developed as provided in subsection (5) of this section (variable three-phase partitioning model).

(B) Ionizing organics. For ionizing organic hazardous substances (e.g., pentachlorophenol and benzoic acid), the Koc values in Table 747-2 shall be used. Table 747-2 provides Koc values for three different pHs. To select the appropriate Koc value, the soil pH must be measured. The Koc value for the corresponding soil pH shall be used. If the soil pH falls between the pH values provided, an appropriate Koc value shall be selected by interpolation between the listed Koc values.

[Equation 747-2]
Kd = Koc x foc
Where:
Kd = Distribution coefficient (L/kg)
Koc = Soil organic carbon-water partitioning coefficient (ml/g). See (c)(i) of this subsection.
foc = Soil fraction of organic carbon (0.1% or 0.001 g/g)

(ii) Metals. For metals, the Kd values in Table 747-3 shall be used. For metals not listed in Table 747-3, Kd values may be developed as provided in subsection (5) of this section (variable three-phase partitioning model).

(d) Henry's law constant. For petroleum fractions, the values for Henry's law constant in Table 747-4 shall be used in Equation 747-1. For individual organic hazardous substances, the value shall be based on values in the scientific literature. For all metals present as inorganic compounds except mercury, zero shall be used. For mercury, either 0.47 or a value derived from the scientific literature shall be used. Derivation of Henry's law constant from the scientific literature shall comply with WAC 173-340-702 (14), (15) and (16).

(e) Saturated zone soil concentrations. Equation 747-1 may also be used to derive concentrations for soil that is located at or below the ground water table (the saturated zone). The following input parameters shall be changed if Equation 747-1 is used to derive saturated zone soil concentrations:

(i) The dilution factor shall be changed from 20 to 1;

(ii) The water-filled soil porosity value shall be changed from 0.3 ml water/ml soil to 0.43 ml water/ml soil; and

(iii) The air-filled soil porosity value shall be changed from 0.13 ml air/ml soil to zero.

WAC 173-340-747 (5) Variable parameter three-phase partitioning model.

(a) Overview. This section specifies the procedures and requirements to derive site-specific input parameters for use in the three-phase partitioning model. This method may be used to establish soil concentrations for any hazardous substance. This method may be used to calculate both unsaturated and saturated zone soil concentrations.

This method allows for the substitution of site-specific values for the default values in Equation 747-1 for one or more of the following five input parameters: Distribution coefficient, soil bulk density, soil volumetric water content, soil air content, and dilution factor. The methods that may be used and the requirements that shall be met to derive site-specific values for each of the five input parameters are specified in (b) through (f) of this subsection.

(b) Methods for deriving a distribution coefficient (Kd). To derive a site-specific distribution coefficient, one of the following methods shall be used:

(i) Deriving Kd from soil fraction of organic carbon (foc) measurements. Site-specific measurements of soil organic carbon may be used to derive distribution coefficients for nonionic hydrophobic organics using Equation 747-2. Soil organic carbon measurements shall be based on uncontaminated soil below the root zone (i.e., soil greater than one meter in depth) that is representative of site conditions or in areas through which contaminants are likely to migrate.

The laboratory protocols for measuring soil organic carbon in the Puget Sound Estuary Program (March, 1986) may be used. Other methods may also be used if approved by the department. All laboratory measurements of soil organic carbon shall be based on methods that do not include inorganic carbon in the measurements.

(ii) Deriving Kd from site data. Site-specific measurements of the hazardous substance concentrations in the soil and the soil pore water or ground water may be used, subject to department approval, to derive a distribution coefficient. Distribution coefficients that have been derived from site data shall be based on measurements of soil and ground water hazardous substance concentrations from the same depth and location. Soil and ground water samples that have hazardous substances present as a nonaqueous phase liquid (NAPL) shall not be used to derive a distribution coefficient and measures shall be taken to minimize biodegradation and volatilization during sampling, transport and analysis of these samples.

(iii) Deriving Kd from batch tests. A site-specific distribution coefficient may be derived by using batch equilibrium tests, subject to department approval, to measure hazardous substance adsorption and desorption. The results from the batch test may be used to derive Kd from the sorption/desorption relationship between hazardous substance concentrations in the soil and water. Samples that have hazardous substances present as a nonaqueous phase liquid (NAPL) shall not be used to derive a distribution coefficient and measures shall be taken to minimize biodegradation and volatilization during testing.

(iv) Deriving Kd from the scientific literature. The scientific literature may be used to derive a site-specific distribution coefficient (Kd) for any hazardous substance, provided the requirements in WAC 173-340-702 (14), (15) and (16) are met.

(c) Deriving soil bulk density. ASTM Method 2049 or other methods approved by the department may be used to derive soil bulk density values.

(d) Deriving soil volumetric water content using laboratory methods. ASTM Method 2216 or other methods approved by the department may be used to derive soil volumetric water content values.

(e) Estimating soil air content. An estimate of soil air content may be determined by calculating soil porosity and subtracting the volumetric water content.

(f) Deriving a dilution factor from site-specific estimates of infiltration and ground water flow volume. Site-specific estimates of infiltration and ground water flow volume may be used in the following equation to derive a site-specific dilution factor:

[Equation 747-3]
DF = (Qp + Qa)/Qp
Where:
DF = Dilution factor (dimensionless)
Qp = Volume of water infiltrating (m3/yr)
Qa = Ground water flow (m3/yr)

(i) Calculating ground water flow volume. The following equation shall be used under this method to calculate the volume of ground water flow (Qa):

[Equation 747-4]
Qa = K x A x I
Where:

Qa = Ground water flow volume (m3/year)
K = Hydraulic conductivity (m/year). Site-specific measurements shall be used to derive this parameter.
A = Aquifer mixing zone (m2). The aquifer mixing zone thickness shall not exceed 5 meters in depth and be equal to a unit width of 1 meter, unless it can be demonstrated empirically that the mixing zone thickness exceeds 5 meters.
I = Gradient (m/m). Site-specific measurements shall be used to derive this parameter.

(A) Equation 747-4 assumes the ground water concentrations of hazardous substances of concern upgradient of the site are not detectable. If this assumption is not true, the dilution factor may need to be adjusted downward in proportion to the upgradient concentration.

(B) Direct measurement of the flow velocity of ground water using methods approved by the department may be used as a substitute for measuring the ground water hydraulic conductivity and gradient.

(ii) Calculating or estimating infiltration. The following equation shall be used under this method to calculate the volume of water infiltrating (Qp):

[Equation 747-5]
Qp = L x W x Inf
Where:
Qp = Volume of water infiltrating (m3/year)
L = Estimated length of contaminant source area parallel to ground water flow (m)
W = Unit width of contaminant source area (1 meter)
Inf = Infiltration (m/year)

(A) If a default annual infiltration value (Inf) is used, the value shall meet the following requirements. For sites west of the Cascade Mountains, the default annual infiltration value shall be 70 percent of the average annual precipitation amount. For sites east of the Cascade Mountains, the default annual infiltration value shall be 25 percent of the average annual precipitation amount.

(B) If a site-specific measurement or estimate of infiltration (Inf) is made, it shall be based on site conditions without surface caps (e.g., pavement) or other structures that would control or impede infiltration. The presence of a cover or cap may be considered when evaluating the protectiveness of a remedy under WAC 173-340-350 through 173-340-360. If a site-specific measurement or estimate of infiltration is made, then it must comply with WAC 173-340-702 (14), (15) and (16).

WAC 173-340-747 (7) Leaching tests.

(a) **Overview.** This subsection specifies the procedures and requirements for deriving soil concentrations through the use of leaching tests. Leaching tests may be used to establish soil concentrations for the following specified metals: Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium, and zinc (see (b) and (c) of this subsection). Leaching tests may also be used to establish soil concentrations for other hazardous substances, including petroleum hydrocarbons, provided sufficient information is available to correlate leaching test results with ground water impacts (see (d) of this subsection). Testing of soil samples fro... the site is required for use of this method.

(b) **Leaching tests for specified metals.** If leaching tests are used to establish soil concentrations for the specified metals, the following two leaching tests may be used:

(i) EPA Method 1312, Synthetic Precipitation Leaching Procedure (SPLP). Fluid #3 (pH = 5.0), representing acid rain in the western United States, shall be used when conducting this test. This test may underestimate ground water impacts when acidic conditions exist due to significant biological degradation or for other reasons. Underestimation of ground water impacts may occur, for example, when soils contaminated with metals are located in wood waste, in municipal solid waste landfills, in high sulfur content mining wastes, or in other situations with a pH <6. Consequently, this test shall not be used in these situations and the TCLP test should be used instead.

(ii) **EPA Method 1311, Toxicity Characteristic Leaching Procedure (TCLP).** Fluid #1 (pH = 4.93), representing organic acids generated by biological degradation processes, shall be used when conducting this test. This test is intended to represent situations where acidic conditions are present due to biological degradation such as in municipal solid waste landfills. Thus, it may underestimate ground water impacts where this is not the case and the metals of interest are more soluble under alkaline conditions. An example of this would be arsenic occurring in alkaline (pH >8) waste or soils. Consequently, this test shall not be used in these situations and the SPLP test should be used instead.

(c) **Criteria for specified metals.** When using either EPA Method 1312 or 1311, the analytical methods used for analysis of the leaching test effluent shall be sufficiently sensitive to quantify hazardous substances at concentrations at the ground water cleanup level established under WAC 173-340-720. For a soil metals concentration derived under (b) of this subsection to be considered protective of ground water, the leaching test effluent concentration shall meet the following criteria:

(i) For cadmium, lead and zinc, the leaching test effluent concentration shall be less than or equal to ten (10) times the applicable ground water cleanup level established under WAC 173-340-720.

(ii) For arsenic, total chromium, hexavalent chromium, copper, mercury, nickel and selenium, the leaching test effluent concentration shall be less than or equal to the applicable ground water cleanup level established under WAC 173-340-720.

ATTACHMENT C

WAC 173-201A-040

WAC 173-201A-040 Toxic substances. (1) Toxic substances shall not be introduced above natural background levels in waters of the state which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by the department.
(2) The department shall employ or require chemical testing, acute and chronic toxicity testing, and biological assessments, as appropriate, to evaluate compliance with subsection (1) of this section and to ensure that aquatic communities and the existing and characteristic beneficial uses of waters are being fully protected.
(3) The following criteria shall be applied to all surface waters of the state of Washington for the protection of aquatic life. The department may revise the following criteria on a statewide or waterbody-specific basis as needed to protect aquatic life occurring in waters of the state and to increase the technical accuracy of the criteria being applied. The department shall formally adopt any appropriate revised criteria as part of this chapter in accordance with the provisions established in chapter 34.05 RCW, the Administrative Procedure Act. The department shall ensure there are early opportunities for public review and comment on proposals to develop revised criteria. Values are µg/L for all substances except Ammonia and Chloride which are mg/L:

Substance	Freshwater Acute	Freshwater Chronic	Marine Water Acute	Marine Water Chronic
Aldrin/Dieldrin	2.5a	0.0019b	0.71a	0.0019b
Ammonia (un-ionized NH3) hh	f,c	g,d	0.233h,c	0.035h,d
Arsenic dd	360.0c	190.0d	69.0c,ll	36.0d, cc,ll
Cadmium dd	i,c	j,d	42.0c	9.3d
Chlordane	2.4a	0.0043b	0.09a	0.004b
Chloride (Dissolved) k	860.0h,c	230.0h,d	-	-
Chlorine (Total Residual)	19.0c	11.0d	13.0c	7.5d
Chlorpyrifos	0.083c	0.041d	0.011c	0.0056d
Chromium (Hex) dd	15.0c,l,ii	10.0d,jj	1,100.0c ,l,ll	50.0d,ll
Chromium (Tri) gg	m,c	n,d	-	-
Copper dd	o,c	p,d	4.8c,ll	3.1d,ll
Cyanide ee	22.0c	5.2d	1.0c,m m	-
DDT (and metabolites)	1.1a	0.001b	0.13a	0.001b
Dieldrin/Aldrin e	2.5a	0.0019b	0.71a	0.0019b
Endosulfan	0.22a	0.056b	0.034a	0.0087b
Endrin	0.18a	0.0023b	0.037a	0.0023b
Heptachlor	0.52a	0.0038b	0.053a	0.0036b
Hexachlorocyclohexane (Lindane)	2.0a	0.08b	0.16a	-
Lead dd	q,c	r,d	210.0c,l l	8.1d,ll
Mercury s	2.1c,kk,d d	0.012d,ff	1.8c,ll,d d	0.025d,ff
Nickel dd	t,c	u,d	74.0c,ll	8.2d,ll
Parathion	0.065c	0.013d	-	-
Pentachlorophenol (PCP)	w,c	v,d	13.0c	7.9d
Polychlorinated Biphenyls (PCBs)	2.0b	0.014b	10.0b	0.030b
Selenium	20.0c,ff	5.0d,ff	290c,ll, dd	71.0d, x,ll,dd
Silver dd	y,a	-	1.9a,ll	-

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Toxaphene	0.73c,z	0.0002d	0.21c,z	0.0002d
Zinc dd	aa,c	bb,d	90.0c,ll	81.0d,ll

Notes to Table:

a. An instantaneous concentration not to be exceeded at any time.

b. A 24-hour average not to be exceeded.

c. A 1-hour average concentration not to be exceeded more than once every three years on the average.

d. A 4-day average concentration not to be exceeded more than once every three years on the average.

e. Aldrin is metabolically converted to Dieldrin. Therefore, the sum of the Aldrin and Dieldrin concentrations are compared with the Dieldrin criteria.

f. Shall not exceed the numerical value given by:

$$0.52 \div (FT)(FPH)(2)$$

where:
$FT = 10^{[0.03(20-TCAP)]}$; $TCAP \leq T \leq 30$
$FT = 10^{[0.03(20-T)]}$; $0 \leq T \leq TCAP$
$FPH = 1$; $8 \leq pH \leq 9$
$FPH = (1 + 10^{(7.4-pH)}) \div 1.25$; $6.5 \leq pH \leq 8.0$
$TCAP = 20°C$; Salmonids present.
$TCAP = 25°C$; Salmonids absent.

g. Shall not exceed the numerical value given by:

$$0.80 \div (FT)(FPH)(RATIO)$$

where:
$RATIO = 13.5$; $7.7 \leq pH \leq 9$
$RATIO = (20.25 \times 10^{(7.7-pH)}) \div (1 + 10^{(7.4-pH)})$; $6.5 \leq pH \leq 7.7$

where: FT and FPH are as shown in (f) above except:
TCAP = 15°C; Salmonids present.
TCAP = 20°C; Salmonids absent.

h. Measured in milligrams per liter rather than micrograms per liter.

i. $\leq (0.944)(e(1.128[\ln(\text{hardness})]-3.828))$ at hardness= 100. Conversion factor (CF) of 0.944 is hardness dependent. CF is calculated for other hardnesses as follows: CF= 1.136672 - [(ln hardness)(0.041838)].

j. $\leq (0.909)(e(0.7852[\ln(\text{hardness})]-3.490))$ at hardness= 100. Conversions factor (CF) of 0.909 is hardness dependent. CF is calculated for other hardnesses as follows: CF= 1.101672 - [(ln hardness)(0.041838)].

k. Criterion based on dissolved chloride in association with sodium. This criterion probably will not be adequately protective when the chloride is associated with potassium, calcium, or magnesium, rather than sodium.

l. Salinity dependent effects. At low salinity the 1-hour average may not be sufficiently protective.

m. $\leq (0.316)e^{(0.8190[\ln(\text{hardness})]+3.688)}$

n. $\leq (0.860)e^{(0.8190[\ln(\text{hardness})]+1.561)}$

o. $\leq (0.960)(e^{(0.9422[\ln(\text{hardness})]-1.464)})$

p. $\leq (0.960)(e^{(0.8545[\ln(\text{hardness})]-1.465)})$

q. $\leq (0.791)(e^{(1.273[\ln(\text{hardness})] - 1.460)})$ at hardness= 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF= 1.46203 - [(ln hardness)(0.145712)].

r. $\leq (0.791)(e^{(1.273[\ln(\text{hardness})] - 4.705)})$ at hardness= 100. Conversion factor (CF) of 0.791 is hardness dependent. CF is calculated for other hardnesses as follows: CF= 1.46203 - [(ln hardness)(0.145712)].

s. If the four-day average chronic concentration is exceeded more than once in a three-year period, the edible portion of the consumed species should be analyzed. Said edible tissue concentrations shall not be allowed to exceed 1.0 mg/kg of methylmercury.

t. $\leq (0.998)(e^{(0.8460[\ln(\text{hardness})] + 3.3612)})$

u. $\leq (0.997)(e^{(0.8460[\ln(\text{hardness})] + 1.1645)})$

v. $\leq e^{[1.005(\text{pH}) - 5.290]}$

w. $\leq e^{[1.005(\text{pH}) - 4.830]}$

x. The status of the fish community should be monitored whenever the concentration of selenium exceeds 5.0 ug/l in salt water.

y. $\leq (0.85)(e^{(1.72[\ln(\text{hardness})] - 6.52)})$

z. Channel Catfish may be more acutely sensitive.

aa. $\leq (0.978)(e^{(0.8473[\ln(\text{hardness})] + 0.8604)})$

bb $\leq (0.986)(e^{(0.8473[\ln(\text{hardness})] + 0.7614)})$

cc. Nonlethal effects (growth, C-14 uptake, and chlorophyll production) to diatoms (Thalassiosira aestivalis and Skeletonema costatum) which are common to Washington's waters have been noted at levels below the established criteria. The importance of these effects to the diatom populations and the aquatic system is sufficiently in question to persuade the state to adopt the USEPA National Criteria value (36 µg/L) as the state threshold criteria, however, wherever practical the ambient concentrations should not be allowed to exceed a chronic marine concentration of 21 µg/L.

dd. These ambient criteria in the table are for the dissolved fraction. The cyanide criteria are based on the weak acid dissociable method. The metals criteria may not be used to calculate total recoverable effluent limits unless the seasonal partitioning of the dissolved to total metals in the ambient water are known. When this information is absent, these metals criteria shall be applied as total recoverable values, determined by back-calculation, using the conversion factors incorporated in the criterion equations. Metals criteria may be adjusted on a site-specific basis when data are made available to the department clearly demonstrating the effective use of the water effects ratio approach established by USEPA, as generally guided by the procedures in USEPA Water Quality Standards Handbook, December 1983, as supplemented or replaced. Information which is used to develop effluent limits based on applying metals partitioning studies or the water effects ratio approach shall be identified in the permit fact sheet developed pursuant to WAC 173-220-060 or 173-226-110, as appropriate, and shall be made available for the public comment period required pursuant to WAC 173-220-050 or 173-226-130(3), as appropriate.

ee. The criteria for cyanide is based on the weak and dissociable method in the 17th Ed. Standard Methods for the Examination of Water and Wastewater, 4500-CN I, and as revised (see footnote dd, above).

ff. These criteria are based on the total-recoverable fraction of the metal.

gg. Where methods to measure trivalent chromium are unavailable, these criteria are to be represented by total-recoverable chromium.

hh. Tables for the conversion of total ammonia to un-ionized ammonia for freshwater can be found in the USEPA's Quality Criteria for Water, 1986. Criteria concentrations based on total ammonia for marine water can be found in USEPA Ambient Water Quality Criteria for Ammonia (Saltwater)-1989, EPA440/5-88-004, April 1989.

ii. Conversion factor to calculate dissolved metal concentration is 0.982.

jj. Conversion factor to calculate dissolved metal concentration is 0.962.

ATTACHMENT E

WAC 173-340-7490 (February 15, 2001)

WAC 173-340-7490
Terrestrial ecological evaluation procedures.

(1) **Purpose.**
(a) WAC 173-340-7490 through 173-340-7494 define the goals and procedures the department will use for:
(i) Determining whether a release of hazardous substances to soil may pose a threat to the terrestrial environment;
(ii) Characterizing existing or potential threats to terrestrial plants or animals exposed to hazardous substances in soil; and (iii) Establishing site-specific cleanup standards for the protection of terrestrial plants and animals.
(b) Information collected during a terrestrial ecological evaluation shall also be used in developing and evaluating cleanup action alternatives and in selecting a cleanup action under WAC 173-340-350 through 173-340-390. WAC 173-340-7490 through 173-340-7494 do not necessarily require a cleanup action for terrestrial ecological protection separate from a human health-based cleanup action. Where appropriate, a terrestrial ecological evaluation may be conducted so as to avoid duplicative studies of soil contamination that will be remediated to address other concerns, as provided in WAC 173-340-350 (7)(c)(iii)(F)(II).
(c) These procedures are not intended to be used to evaluate potential threats to ecological receptors in sediments, surface water, or wetlands. Procedures for sediment evaluations are described in WAC 173-340-760, and for surface water evaluations in WAC 173-340-730. Procedures for wetland evaluations shall be determined by the department on a case-by-case basis.

(2) **Requirements.** In the event of a release of a hazardous substance to the soil at a site, one of the following actions shall be taken:
(a) Document an exclusion from any further terrestrial ecological evaluation using the criteria in WAC 173-340-7491;
(b) Conduct a simplified terrestrial ecological evaluation as set forth in WAC 173-340-7492; or
(c) Conduct a site-specific terrestrial ecological evaluation as set forth in WAC 173-340-7493.

(3) **Goal.** The goal of the terrestrial ecological evaluation process is the protection of terrestrial ecological receptors from exposure to contaminated soil with the potential to cause significant adverse effects. For species protected under the Endangered Species Act or other applicable laws that extend protection to individuals of a species, a significant adverse effect means an impact that would significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering. For all other species, significant adverse effects are effects that impair reproduction, growth or survival.
(a) The simplified terrestrial ecological evaluation process has been developed to be protective of terrestrial ecological receptors at most qualifying sites, while the site-specific terrestrial ecological evaluation process is intended to be highly likely to be protective at any site.
(b) The following policy on terrestrial ecological receptors to be protected applies to all terrestrial ecological evaluations. For land uses other than industrial or commercial, protectiveness is evaluated relative to terrestrial plants, wildlife, and ecologically important functions of soil biota that affect plants or wildlife.
For industrial or commercial properties, current or future potential for exposure to soil contamination need only be evaluated for terrestrial wildlife protection. Plants and soil biota need not be considered unless:
(i) The species is protected under the federal Endangered Species Act; or
(ii) The soil contamination is located on an area of an industrial or commercial property where vegetation must be maintained to comply with local government land use regulations.
(c) For the purposes of this section, "industrial property" means properties meeting the definition in WAC 173-340-200. "Commercial property" means properties that are currently zoned for commercial property use and that are characterized by or are committed to traditional commercial uses such as offices, retail and wholesale sales, professional services, consumer services, and, warehousing.
(d) Any terrestrial remedy, including exclusions, based at least in part on future land use assumptions shall include a completion date for such future development acceptable to the department.

(4) **Point of compliance.**
(a) **Conditional point of compliance.** For sites with institutional controls to prevent excavation of deeper soil, a conditional point of compliance may be set at the biologically active soil zone. This zone is assumed to extend to a depth of six feet. The department may approve a site-specific depth based on a demonstration that an alternative depth is more appropriate for the site. In making this demonstration, the following shall be considered:
(i) Depth to which soil macro-invertebrates are likely to occur;

(ii) Depth to which soil turnover (bioturbation) is likely to occur due to the activities of soil invertebrates;
(iii) Depth to which animals likely to occur at the site are expected to burrow; and
(iv) Depth to which plant roots are likely to extend.
(b) **Standard point of compliance.** An institutional control is not required for soil contamination that is at least fifteen feet below the ground surface. This represents a reasonable estimate of the depth of soil that could be excavated and distributed at the soil surface as a result of site development activities, resulting in exposure by ecological receptors.

(5) **Additional measures.** The department may require additional measures to evaluate potential threats to terrestrial ecological receptors notwithstanding the provisions in this and the following sections, when based upon a site-specific review, the department determines that such measures are necessary to protect the environment.

Table 749-2

Priority Contaminants of Ecological Concern for sites that Qualify for the Simplified Terrestrial Ecological Evaluation Procedure.[a]

Priority contaminant	Soil concentration (mg/kg)	
	Unrestricted land use[b]	Industrial or commercial site
METALS[c]		
Antimony	See note d	See note d
Arsenic III	20 mg/kg	20 mg/kg
Arsenic V	95 mg/kg	260 mg/kg
Barium	1,250 mg/kg	1,320 mg/kg
Beryllium	25 mg/kg	See note d
Cadmium	25 mg/kg	36 mg/kg
Chromium (total)	42 mg/kg	135 mg/kg
Cobalt	See note d	See note d
Copper	100 mg/kg	550 mg/kg
Lead	220 mg/kg	220 mg/kg
Magnesium	See note d	See note d
Manganese	See note d	23,500 mg/kg
Mercury, inorganic	9 mg/kg	9 mg/kg
Mercury, organic	0.7 mg/kg	0.7 mg/kg
Molybdenum	See note d	71 mg/kg
Nickel	100 mg/kg	1,850 mg/kg
Selenium	0.8 mg/kg	0.8 mg/kg
Silver	See note d	See note d
Tin	275 mg/kg	See note d
Vanadium	26 mg/kg	See note d
Zinc	270 mg/kg	570 mg/kg
PESTICIDES		
Aldicarb/aldicarb sulfone (total)	See note d	See note d
Aldrin	0.17 mg/kg	0.17 mg/kg
Benzene hexachloride (including lindane)	10 mg/kg	10 mg/kg
Carbofuran	See note d	See note d
Chlordane	1 mg/kg	7 mg/kg
Chlorpyrifos/chlorpyrifos-methyl (total)	See note d	See note d
DDT/DDD/DDE (total)	1 mg/kg	1 mg/kg
Dieldrin	0.17 mg/kg	0.17 mg/kg
Endosulfan	See note d	See note d
Endrin	0.4 mg/kg	0.4 mg/kg
Heptachlor/heptachlor epoxide (total)	0.6 mg/kg	0.6 mg/kg
Hexachlorobenzene	31 mg/kg	31 mg/kg
Parathion/methyl parathion (total)	See note d	See note d
Pentachlorophenol	11 mg/kg	11 mg/kg
Toxaphene	See note d	See note d

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OTHER CHLORINATED ORGANICS		
Chlorinated dibenzofurans (total)	3E-06 mg/kg	3E-06 mg/kg
Dioxins (total)	5E-06 mg/kg	5E-06 mg/kg
Hexachlorophene	See note d	See note d
PCB mixtures (total)	2 mg/kg	2 mg/kg
Pentachlorobenzene	168 mg/kg	See note d
OTHER NONCHLORINATED ORGANICS		
Acenaphthene	See note d	See note d
Benzo(a)pyrene	30 mg/kg	300 mg/kg
Bis (2-ethylhexyl) phthalate	See note d	See note d
Di-n-butyl phthalate	200 mg/kg	See note d
PETROLEUM		
Gasoline Range Organics	200 mg/kg	12,000 mg/kg except that the concentration shall not exceed residual saturation at the soil surface.
Diesel Range Organics	460 mg/kg	15,000 mg/kg except that the concentration shall not exceed residual saturation at the soil surface.

Footnotes:

a Caution on misusing these chemical concentration numbers. These values have been developed for use at sites where a site-specific terrestrial ecological evaluation is not required. They are not intended to be protective of terrestrial ecological receptors at every site. Exceedances of the values in this table do not necessarily trigger requirements for cleanup action under this chapter. The table is not intended for purposes such as evaluating sludges or wastes.
This list does not imply that sampling must be conducted for each of these chemicals at every site. Sampling should be conducted for those chemicals that might be present based on available information, such as current and past uses of chemicals at the site.

b Applies to any site that does not meet the definition of industrial or commercial.

c For arsenic, use the valence state most likely to be appropriate for site conditions, unless laboratory information is available. Where soil conditions alternate between saturated, anaerobic and unsaturated, aerobic states, resulting in the alternating presence of arsenic III and arsenic V, the arsenic III concentrations shall apply.

d Safe concentration has not yet been established.

kk Conversion factor to calculate dissolved metal concentration is 0.85.

ll. Marine conversion factors (CF) used for calculating dissolved metals concentrations. Conversion factors are applicable to both acute and chronic criteria for all metals except mercury. CF for mercury is applicable to the acute criterion only. Conversion factors are already incorporated into the criteria in the table. Dissolved criterion= criterion x CF

Metal	CF
Arsenic	1.000
Cadmium	0.994
Chromium (VI)	0.993
Copper	0.83
Lead	0.951
Mercury	0.85
Nickel	0.990
Selenium	0.998
Silver	0.85
Zinc	0.946

m The cyanide criteria are: 9.1µg/l chronic and 2.8µg/l acute and are applicable only to waters which are east of a line from
m. Point Roberts to Lawrence Point, to Green Point to Deception Pass; and south from Deception Pass and of a line from Partridge Point to Point Wilson.

(4) USEPA Quality Criteria for Water, 1986 shall be used in the use and interpretation of the values listed in subsection (3) of this section.

(5) Concentrations of toxic, and other substances with toxic propensities not listed in subsection (3) of this section shall be determined in consideration of USEPA Quality Criteria for Water, 1986, and as revised, and other relevant information as appropriate. Human health-based water quality criteria used by the state are contained in 40 CFR 131.36 (known as the National Toxics Rule).

(6) Risk-based criteria for carcinogenic substances shall be selected such that the upper-bound excess cancer risk is less than or equal to one in one million.

[Statutory Authority: Chapter 90.48 RCW and 40 CFR 131. 97-23-064 (Order 94-19), § 173-201A-040, filed 11/18/97, effective 12/19/97. Statutory Authority: Chapter 90.48 RCW. 92-24-037 (Order 92-29), § 173-201A-040, filed 11/25/92, effective 12/26/92.]

NOTES:

Reviser's note: The brackets and enclosed material in the text of the above section occurred in the copy filed by the agency.

of the eight RCRA metals (Attachment E). These concentrations are developed to protect wildlife through direct ingestion of soil using a robin/shrew food chain model, two surrogate receptors meant to represent highly exposed species. Soil concentrations were also developed for plants and soil invertebrates using toxicity values from the published literature. The most restrictive value was then placed into Table 749-2.

Generally, the Method A concentrations are less than or similar to Table 749-2 (see Table 1). However, the MTCA Method A standards list does not include values for barium, total chromium or selenium. For these constituents, the Table 749-2 ecological standards listed in Table 1 (adjusted for background and PQLs) will be used as screening criteria for the top three feet of embankment fill.

3. **The Port of Seattle will monitor the seepage water from the rock underdrain for contaminants. Monitoring shall be for a period of 10 years, on a monthly basis. Based on the monitoring results, the monitoring schedule may be modified by FWS.**

The Port of Seattle shall prepare a water quality monitoring plan to track the quality of seepage from the drainage layer beneath the Third Runway embankment fill. Such a plan shall be prepared to address the amount of monitoring in a tiered or phased approach. For example, if it is determined that water flowing through the new embankment is exceeding designated surface water quality criteria, new monitoring points may be established between the embankment and Miller Creek to evaluate the fate and transport of the impacted fill water. Monitoring Miller Creek would represent the final phase of a monitoring program if it were determined that constituents in embankment fill water were reaching the creek. The Port shall develop a monitoring plan in consultation with FWS. The Port shall submit a draft monitoring plan to FWS for its review and approval within 120 days after FWS' issuance of a biological opinion or concurrence letter. The monitoring plan shall provide for a minimum of three years of monthly monitoring, with the monitoring period commencing upon detection of seepage from the drainage layer of the completed embankment. At the end of the three-year monitoring period, the Port and FWS shall reevaluate the need to modify or continue the monitoring program. In the event seepage is not detected within six years after completion of embankment construction, the Port and FWS shall likewise reevaluate the need to modify or continue the monitoring program. In the event monitoring detects unforeseen adverse impacts to aquatic life in the project area, the Port shall reinitiate consultation as appropriate and implement measures to address such impacts.

4, 5. **If material is used which is known to have contaminants, this material shall be distributed over a large area to avoid creating a "hot spot" in the embankment. The Port of Seattle will request FWS approval for those fill materials proposed that do not meet MTCA Method A standards, at a minimum. Information on why these materials are to be used and proof that their chemical constituents/levels will not result in environmental impacts to aquatic organisms needs to be provided.**

The use of MTCA Method A as a screening standard for incoming fill material will avoid the creation of "hot spots" in the embankment. In the event that the Port from numerous sources in the region. Thus, in column 7, a range of screening criteria between background levels, when available, and Method A standards is shown. In the event the Port desires to establish site-specific background criteria, it will discuss proposed criteria with FWS and reinitiate consultation as appropriate. If the suppliers wish to place soil in the drainage cover layer that exceed background concentrations, the Port will confirm the acceptability of the material by requiring suppliers using that source to conduct sufficient SPLP testing to show that Method A criteria are protective of baseline conditions for surface water receptors.

(iv) To confirm the protectiveness of the Method A standards and the Three Phase Partitioning Model, SPLP testing will be used as a laboratory method to ensure that leaching of metals through potential embankment soil will not occur at unacceptable levels. SPLP testing according to the procedures contained in WAC 173-340-747(7) and SPLP methodology are shown in Attachments B and D respectively. SPLP results will be compared, as an initial screening tool, to freshwater ambient water quality criteria according to guidelines outlined at WAC 173-201A-040 (Attachment C). If the SPLP results indicate that metals in the proposed fill material *do not leach* at levels above the freshwater ambient water quality criteria, adjusted for PQLs as appropriate, the material will be considered suitable for placement. If the SPLP indicates that metals in the proposed fill material *leach* at levels above ambient water quality criteria, the Port will either reject the material ~~or discuss the results of the SPLP with~~ or obtain FWS' approval before acceptance of the material~~.~~ through a reinitiated consultation. The Port shall submit to FWS for its review and approval a plan describing the Port's SPLP protocol. The FWS shall approve this plan prior the Port's implementation of the SPLP protocol.

(c) Organochlorines: The Port will employ the following standards and protocols concerning the placement of fill in the drainage layer cover:

(i) The Port will require testing for organochlorines on those sites where such compounds may be present, including sites with potential commercial pesticide applications, and sites with historic wood preserving operations. The supplier, with Port review, will identify sites potentially containing such compounds through the process discussed above under Response 1 (i.e., Phase I and II Environmental Site Assessments). The Port will update guidelines provided to suppliers to clearly state that testing for additional constituents must be conducted as appropriate based on current and historical site land uses.

(ii) As with the remainder of the embankment fill, sources of fill proposed for placement in the drainage layer cover which have detectable levels of organochlorines will not exceed MTCA Method A criteria.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

May 31, 2001

AR

Lowell H. Johnson
Manager, Airport Division
Federal Aviation Administration
1601 Lind Avenue S.W.
Renton, Washington 98055-4056

Re: Biological Assessment for Master Plan Update Improvements at Seattle-Tacoma International Airport (NMFS No. WSB-00-318) and Essential Fish Habitat consultation

Dear Mr. Johnson:

On June 16, 2000, the National Marine Fisheries Service (NMFS) received a Biological Assessment (BA) from the Federal Aviation Administration (FAA) on behalf of the Port of Seattle (Port). The Port is FAA's designated non-federal representative for this consultation. The BA considered numerous construction projects included in the Master Plan Update Improvements for Seattle-Tacoma International Airport (STIA). FAA requested consultation under the Endangered Species Act (Sec 7(a)(2)) for chinook salmon (*Onchorhynchus tshawytscha*). The Port is the proponent of the STIA projects but FAA provides partial funding for the action, thus creating a Federal nexus and the need for section 7 consultation. This consultation covers federal actions that are required to implement STIA projects including: 1) FAA funding of airport improvements, 2) FAA construction of a control tower and navigational aids, 3) Issuance of a 404 permit by the Corps of Engineers (COE) as required by the Federal Clean Water Act. The BA also addressed the effects of STIA projects on Essential Fish Habitat (EFH) of coastal pelagic species and West Coast groundfish as required by Section 305(b) of the Magnuson-Stevens Act. EFH for Coho salmon (*O. kisutch*), a candidate species in Puget Sound, was not considered in this consultation although an independent assessment of EFH for coho was prepared by the Port and delivered to NMFS on March 27, 2001.

The BA concludes that STIA projects "may affect," but are "not likely to adversely affect" chinook salmon and that construction and operation of the projects "may affect" but is "not likely to destroy or adversely modify" designated critical habitat. The BA also concludes that STIA projects are "not likely to adversely affect" any identified EFH for the coastal pelagic species and West Coast Groundfish.

ENDANGERED SPECIES ACT

This consultation is based upon the BA (June 2000) and supplemental information that was formally transmitted to NMFS by FAA or the Port. These submittals include: Supplement for Property Acquisition and Demolition for 34X Runway Protection Zone (September 11, 2000), Clean Water Act Section 404 Permit Application (October 30, 2000), Supplement to the BA

(December 14, 2000) as well as Sea-Tac Runway Fill Hydrology Studies Report (PGG 2000), Seattle-Tacoma Airport Master Plan Update, Low Streamflow Analysis (Earth Tech, Inc. 2000) and Comprehensive Stormwater Management Plan (Parametrix 2000) submitted in January, 2001. In addition numerous telephone conversations and e-mail messages have transmitted information between NMFS, the Port and Parametrix, the Port's environmental consultant. The final document required to initiate formal consultation, a response to concerns raised by the Fish and Wildlife Service (FWS) about potential contamination in the embankment fill, was submitted on 26 March 2001 and modified on 30 March 2001.

Scientific consultants retained by the Airport Communities Coalition (ACC) also reviewed the above documents and provided extensive comments for NMFS evaluation during the consultation process.

The NMFS concurs with the effects determination of "may affect not likely to adversely affect" freshwater or marine life stages of threatened Puget Sound chinook salmon or designated critical habitat. Additionally, construction and operation of the STIA projects are "not likely to adversely affect" EFH for coastal pelagic species or West Coast Groundfish.

Project Location and Description

Most STIA projects are located within the cities of SeaTac and Des Moines, King County, Washington (Sections 4 and 5, Township 22 North, Range 4 East, and Sections 20, 21, 28, 29, 32, and 33, Township 23 North, Range 4 East, Willamette Meridian). Off-site wetland mitigation will occur in the City of Auburn, King County, Washington (Section 31, Township 22 North, Range 5 East, Willamette Meridian).

STIA projects will develop portions of property located on and near the existing Sea-Tac airport, and provide wetland mitigation near the Green River in the City of Auburn. The principal objectives of these actions are: 1) to provide a new 8,500 foot air carrier runway, 2) to provide a 600 foot extension to an existing runway, 3) to extend runway safety areas to meet existing FAA safety standards, 4) to upgrade existing facilities at SEA-TAC airport. Construction is scheduled for completion in 2010.

STIA projects (Table 1) include: the construction of runways, taxiways, borrow areas and runway safety areas (RSAs); installation of FAA and navigation aids (e.g., the new Airport Traffic Control Tower, airport surveillance radar [ASR], and airport surface detection equipment [ASDE]); improvements to airfield buildings, terminal and air cargo areas, roads, parking, the South Aviation Support Area (SASA), stormwater management facilities and the Industrial Wastewater System (IWS) facilities; and acquisition and demolition of existing structures. Proposed actions also include the relocation of approximately a 980-foot reach of Miller Creek as well as the development of avian habitat at a mitigation site near the Green River in Auburn.

The "action area" for these actions is the locations where STIA project construction will occur and the surrounding vicinity where direct and indirect effects could reasonably be expected to occur. This includes the aquatic habitat of Miller, Walker (a tributary to Miller), Des Moines, and Gilliam creeks downstream of the airport and the associated estuaries of Miller and Des Moines Creeks. The area surrounding the Midway Sewer District outfall in Puget Sound is

considered to be part of the action area because effluent from the Industrial Wastewater System is released to the Midway Sewer District. The Auburn wetland mitigation site and vicinity, where indirect effects could reasonably occur, are also included in the action area.

Status of the Species and Critical Habitat

The NMFS assessment of the effects of an action involves the initial steps of defining the biological requirements and current status of the listed species, and evaluating the relevance of the environmental baseline to the species' current status.

The status review of west coast chinook salmon populations defined 15 Evolutionarily Significant Units (ESUs) in Washington, Oregon, Idaho, and California, including the Puget Sound ESU (Myers et al. 1998). Chinook salmon in the Puget Sound ESU have declined substantially from historic levels due to the effects of hatchery supplementation on genetic fitness of stocks, severely degraded spawning and rearing habitats throughout the area, and harvest exploitation rates exceeding 90 percent for some Puget Sound chinook stocks. Puget Sound chinook were designated as threatened in March 1999 (NMFS 1999a)

Chinook salmon from the Puget Sound region consist largely of summer and fall run stocks, with juveniles that typically migrate to the marine environment during their first year of life (Myers et al. 1998). These "ocean-type" chinook rear in freshwater a few months or less, and most of their rearing occurs in the nearshore marine environment. Generally, ocean-type chinook migrate downstream in the spring, within months after emergence, or during the summer and autumn after a brief period of rearing in fresh water (Healey 1991; Myers et al. 1998). In Puget Sound, subyearling chinook salmon smolts typically migrate near the shoreline then move offshore as they grow in size. Yearling chinook smolts, that are typically produced by spring run adults and are uncommon in the project area, would spend less time near the shoreline of Puget Sound. Chinook juveniles may reside in the Puget Sound region until at least November before migrating to the North Pacific Ocean (Hartt and Dell 1986). Mature chinook salmon return to their natal rivers predominately as three-, four- and five-year-olds.
Juvenile chinook salmon feed opportunistically in Puget Sound. They consume large zooplankton, such as euphausiids and large copepods, amphipods, juvenile shrimp, and larval fishes (e.g., herring and sandlance) (Miller et al. 1977; Fresh et al. 1979, Simenstad et al. 1982). In areas where riparian habitat is abundant near the Sound, terrestrial insects can be an important prey item for juveniles up to 75 mm or so. Larger chinook will typically consume larger prey and the proportion of fish in the diet increases with size.

Chinook salmon that are present in the action area will most likely be from either the Green/Duwamish River (for the off-site mitigation action area and Gilliam creek) or the Puyallup River (for the estuaries of Miller and Des Moines creeks) stocks. The Duwamish/Green stock is considered to be healthy (WDFW 1993). The status of the Puyallup River stock was considered to be uncertain by WDFW (1993). Population trends for each stock is reported (Myers et al 1998) to be increasing gradually (1-5%).

Critical habitat for Puget Sound chinook salmon was designated in February 2000 (NMFS 2000) and includes all Puget Sound waters, estuaries, and freshwater habitats accessible to Puget Sound chinook salmon. Due to the complex life histories of salmonid species, habitats must be available for juvenile rearing, juvenile migration corridors, growth and development to adulthood, adult migration corridors and spawning. Major river basins that support this ESU include the Nooksack, Skagit, Stillaguamish, Snohomish, Green/Duwamish, Puyallup, Nisqually, Skokomish, Dungeness, Cedar, and Elwha Rivers. Critical habitat for threatened Puget Sound chinook salmon in the Duwamish hydrologic units is limited to habitat downstream from the Howard Hansen Dam. Major bays and estuarine/marine areas providing critical habitat to this ESU include the South Sound, Hood Canal, Elliott Bay, Possession Sound, Admiralty Inlet, Saratoga Passage, Rosario Strait, Strait of Georgia, Haro Strait, and the Strait of Juan De Fuca.

No threatened Puget Sound chinook salmon occur in Miller, Walker or Des Moines Creeks. There is no documented historical usage of Miller or Walker Creeks by chinook salmon. Recent surveys confirm that coho and chum salmon spawn in Miller creek but did not observe any chinook salmon. These surveys found a general lack of clean, unembedded gravel of a suitable size for chinook spawning, and a general lack of pools and instream cover for rearing. The specific physical characteristics of the stream do not provide appropriate habitat for spawning or rearing of chinook salmon. Consequently, there is no critical habitat present in Miller or Walker Creeks upstream of the estuary.

Des Moines Creek also lacks suitable habitat for chinook salmon spawning and rearing and was not used historically by chinook. Although nearly 75,000 juvenile chinook were released in Des Moines Creek between 1990 and 1993 (Myers et al 1998), there is no documented return of adults. Because few anadromous fish are able to pass the culvert beneath Marine View Drive, adult spawners would have been concentrated in the creek's lower 0.4 mile and evident to users of Des Moines Beach Park. Coho and chum salmon as well as cutthroat and steelhead trout occur in the lower reaches of Des Moines creek.

Given these considerations, the freshwater portion of Miller and Des Moines Creeks is not critical habitat for chinook salmon. The only critical habitat in either basin is located at the estuarine mouths of each creek. These areas may provide habitat for juvenile and adult migration. During the summer of 2000, the King County Department of Natural Resources conducted a pilot study to evaluate the use of nearshore marine areas by all species of juvenile salmonids. The collected samples between June and August at eight sites including Miller Creek using beach seines. On the nearshore marine beaches near Miller Creek they obtained approximately 0.5 fish per seine haul, lower population densities than were reported for other sites in their study area. These data suggest that the nearshore area around Miller Creek, and probably at Des Moines Creek, do not p ide significant marine rearing habitat for Puget Sound chinook salmon.

The wetland mitigation site and Gilliam Creek are located in the Green/Duwamish River Basin. Development of the 482 mi^2 Green/Duwamish watershed has resulted in a variety of changes to the basin's suitability for salmonids. This development includes the diversion of Black and White rivers during the early 1900s, construction of Howard Hansen Dam (RM 64) that blocks access to significant habitat upstream, diking of the mainstem below RM 38, forest practices, agriculture, urbanization, and industrialization in the lower Duwamish River. Of the original Green/Duwamish estuary, 97 percent has been filled; 70 percent of its original flow has been diverted to other basins, and 90 percent of the original floodplain is no longer flooded on a regular basis (USEPA 2000a). The city of Tacoma diverts flows in the upper watershed for use as a municipal water supply. The middle portion of the basin remains primarily rural; however, agriculture has increased sediments and nutrients in the river, degrading water quality as well as salmon spawning and rearing habitats. The lower reaches are becoming increasingly urbanized. The tidally influenced Duwamish Waterway has been extensively dredged and channelized for maritime use by the Port of Seattle and private industry. Despite these significant anthropogenic alterations, chinook salmon and other anadromous salmonids (coho, chum, steelhead) use the Green/Duwamish for spawning, rearing and migration. The BA indicates that chinook and other salmon spawn in the Green River, within several hundred feet of the wetland mitigation site. Therefore, this portion of the Green River is critical habitat for threatened Puget Sound chinook salmon.

Gilliam Creek is a small creek that is a tributary to the Green River and discharges to the Green River in the vicinity of the city of Tukwila. This creek discharges to that part of the Green River used for migration by returning adults and outmigrating juveniles. Gilliam Creek is used primarily by resident fish because culverts limit adult salmonid access to this tributary. Gilliam creek has been impacted by development; it is extensively culverted and receives stormwater runoff that causes high peak flows and low base flows. The lack of spawning gravel and appropriate flow conditions for chinook makes it very unlikely that adult chinook salmon will use Gilliam Creek for spawning. During the winter and spring months, juvenile salmon could be rearing in the area where Gilliam Creek discharges to the Green River. One juvenile salmon observed in Gilliam creek in February 1997 was recorded s a chinook by Ryan Partee, a fisheries biologist employed by the City of Tukwila. Thatnfish apparently entered Gilliam creek because the flap gate located at the confluence of Gilliam creek and the Green River was partially open. The occurrence of chinook salmon in Gilliam Creek is a rare event. Entering Gilliam Creek may impede outmigration of juvenile salmonids and because the flap gate restricts flow and may limit return to the Green River for outmigration. Proposed restoration projects in Gilliam Creek and removal of the flap gate may increase the value of Gilliam Creek for chinook rearing habitat, although the stream will still be impacted by urban development unrelated to STIA.

The IWS outfall is located in Puget Sound 1,800 ft offshore and in 170 ft of water. This area is critical habitat and represents a migration corridor for returning adult chinook salmon. No juvenile chinook will be present at this depth.

Effects Determination

Guidance for making determinations of effects are contained in The Habitat Approach, Implementation of Section 7 of the Endangered Species Act for Actions Affecting the Habitat of Pacific Anadromous Salmonids, (NMFS 1999b). The NMFS' critical habitat analysis considers the extent to which the proposed action impairs the function of essential elements necessary for migration, spawning, incubation and rearing of the listed salmon under the existing environmental baseline.

Not likely to adversely affect (NLAA) is the appropriate conclusion when effects on listed species are expected to be discountable, or insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs (USFWS/NMFS 1998). Discountable effects are those so extremely unlikely to occur that a reasonable person would not be able to meaningfully measure, detect or evaluate it (NMFS 1999b). This level of effect requires informal consultation, which consists of NMFS concurrence with the action agency's determination.

NMFS has related the biological requirements for listed salmonids to a number of habitat attributes, or pathways, in the Matrix of Pathways and Indicators (MPI). These pathways (Water Quality, Habitat Access, Habitat Elements, Channel Condition and Dynamics, Flow/hydrology, Watershed Conditions, Disturbance History, and Riparian Reserves) indirectly measure the baseline biological health of listed salmon populations through the health of their habitat. Specifically, each pathway is made up of a series of individual indicators (e.g. indicators for Water Quality include Temperature, Sediment, and Chemical Contamination.) that are measured or described directly (NMFS 1996). Based on the measurement or description, each indicator is classified within the properly functioning condition (PFC) framework as: 1) properly functioning, 2) at risk, or 3) not properly functioning. Properly functioning condition is defined as "the sustained presence of natural habitat forming processes in a watershed that are necessary for the long-term survival of the species through the full range of environmental variation."

The BA included MPIs for Miller Creek, the Miller Creek estuary, Des Moines Creek, the Des Moines Creek estuary and the Green River near the Auburn mitigation site. The MPI for Gilliam Creek was submitted, in response to a request from NMFS, on 2 November 2000. For Miller, DesMoines and Gilliam creeks nearly all indicators are considered to be "not properly functioning" and none were "properly functioning". Habitat conditions in the estuaries are somewhat better than upstream habitat conditions, generally being classified as "at risk" rather than "not properly functioning". However, the estuaries have been seriously altered by riprap along the channel and filling of tidelands that limits total benthic production in the estuaries. All habitat conditions in the Green River were classified as "at risk" except for refugia which was considered to be "not properly functioning" because of lack of off channel habitat for rearing juveniles.

STIA projects will have temporary and long-term impacts to the aquatic habitat in Miller, Walker, and Des Moines Creeks. Less substantial impacts are expected to occur in Gilliam Creek, the estuaries of Miller and Des Moines Creeks, the outfall of the Midway Sewer District and in the Green River during construction of the offsite mitigation wetland. Potential impacts include changes in water quality, alterations to hydrologic conditions and alterations to wetland and stream habitats. Numerous conservation measures are proposed to reduce and minimize potential adverse impacts.

Since there are no chinook salmon, or critical habitat for chinook salmon, in Miller, Walker or Des Moines Creeks, STIA projects in these watersheds will have no direct effects to threatened Puget Sound chinook. The only potential indirect effects will occur in the estuaries of Miller and Des Moines Creeks and are expected to be insignificant or discountable. Effects of STIA projects are also insignificant or discountable for Gilliam Creek, the Midway Sewer outfall and the Green River. Consequently, NLAA is the appropriate determination for the project. The NMFS has completed a detailed evaluation of these projects in case reinitiation of consultation will be required in the future.

Water quality: Miller, Walker and Des Moines Creeks could potentially be affected by STIA projects due to construction activities and permanent additions of impervious surface that could lead to additional sediments and contaminants in stormwater runoff. Contaminants include conventional pollutants associated with urban type development, ground and aircraft de-icing activities, and discharge of effluent from the IWS system. There is also concern that contaminants from the embankment fill may leach into downstream wetlands and streams.

In Washington State protection of water quality protection is regulated by the Washington State Department of Ecology (DOE) under the Federal Water Pollution Control Act, also known as the Clean Water Act, and the Washington Water Pollution Control Act. The Clean Water Act is designed to protect the "chemical, physical, and biological integrity of the Nation's waters" and is implemented through Section 401, Section 402 (the National Pollutant Discharge Elimination System [NPDES]) and Section 404 (addressing fill and the waters of the United States). According to DOE, the conditions of the NPDES permit "constitutes compliance with the Federal Water Pollution Control Act.and the Washington Water Pollution Control Act (RCW 90.48)." NMFS has not consulted with EPA on impacts of water quality standards to threatened and endangered species. However, restrictions imposed in the past by the NPDES permits have improved the water quality of stormwater discharged by the Port. Conditions imposed by DOE for the NPDES permit include: 1) Effluent limitations based on the more stringent of either technology- or water quality-based limits; 2) A stormwater pollution prevention plan (SWPPP) that identifies source control and treatment best management practices (BMPs); 3) Routine water quality and toxicity monitoring for STIA stormwater outfalls and IWS discharge, and reporting of these results to Ecology and; 4) Evaluation of pollution sources and BMP effectiveness via self-inspection and monitoring results.

The Port has proposed numerous BMPs to reduce and minimize water quality effects including pollutant source control, water quality treatment and enhancement of wetland and stream water quality functions. Past monitoring programs identified the need for specific BMPs to reduce or eliminate identified or potential water quality impacts. This adaptive management approach will continue to be used to identify additional BMPs for new, existing, and redeveloped areas at STIA. Thus, the quality of stormwater discharge should improve as new technologies are developed or specific sources of contamination are identified.

Changes on the landscape due to removal of vegetation, excavation and grading during construction could contribute to increased turbidity and sedimentation in the receiving waters. The Port will utilize BMPs (eg. Temporary and permanent cover practices, erosion control and sediment retention) and a stormwater treatment system during construction to reduce potential impacts. Demonstration projects to date indicate that treated discharge water meets applicable water quality criteria and is often less turbid than untreated water in the streams.

Increased sedimentation and turbidity are likely short-term effects due to instream construction in Miller and Des Moines Creeks. Sediment inputs may result from a variety of activities including the initial redirection of the stream, disturbance of the banks by construction, planting activities, and stormwater runoff. Exposed soil is vulnerable to erosion from short-term hydration rainfall or steady rainfall over a longer period of time which saturates the soil. Failure of erosion control measures could result in higher levels of sediment and turbidity in the aquatic system. Since chinook salmon are not found in these streams we do expect any effects to this species from sediment and turbidity changes in these streams. However, resident salmonids and other vertebrate and invertebrate species in the streams may be affected.

Increased turbidity and sedimentation is not expected to occur in Gilliam Creek because the only construction project in this basin, a new water tower, has the same footprint as the existing tower and no new impervious surfaces will be added in the basin.

Sediment may initially enter the Green River due to construction of the alternative mitigation site. The mitigation site will be dewatered during construction and pumped water will be discharged to the Green River. During excavation and until replanted vegetation has formed adequate cover, turbid water may also leave the site via the drain system, which eventually flows into the Green River.

Quantifying the impacts of turbidity to fish species is complicated by several factors (Bisson and Bilby 1985, Spence et al 1996). Turbidity will typically decrease downstream from instream activity. However, the rate at which turbidity levels attenuate is dependent upon the quantity of materials in suspension (e.g. mass or volume), the particle size of suspended sediments, the amount and velocity of ambient water (dilution factor), and the physical/chemical properties of the sediments. The impact of turbidity on fishes is related not only to the turbidity levels (NTUs), but also the particle size of the suspended sediments. When salmonids are exposed to turbidity, they display a number of behavioral and physiological responses (i.e., gill flaring, coughing, avoidance, increase in blood sugar levels) that indicate some level of stress (Berg and Northcote 1982, Servizi and Martens 1992). The magnitude of these responses is generally higher when turbidity is increased and particle size decreased. However, moderate levels of turbidity (35-150 NTU) may benefit juvenile chinook salmon by increasing foraging rates and growth and reducing vulnerability to predators (Gregory and Northcote 1992). A particularly important impact of fine sediments is to cause embeddedness of spawning and incubation gravel with subsequent reductions in the survival of eggs and embryos.

Several factors contribute to minimize the potential impacts of sediment discharges to chinook in the Green River. Proposed water quality controls will limit the amount of sediment that will be discharged. Distance from the project site to discharge in the Green River will allow for settling of sediments prior to discharge. High turbidity levels in the Green River will cause sediment load in the discharge from the mitigation site to be imperceptible. The timing window will reduce the likelihood of chinook juveniles being present in the river during the construction period. If juvenile chinook are present in the river and turbidity levels are high, the fish are expected to move temporarily to refuges where high turbidity can be avoided, thus preventing injury or death. Because the turbidity caused by this action will be short lived, returning to baseline levels soon after construction is over, long-term impacts (i.e., adverse modification of critical habitat) will not occur. Overall, this project will not increase the existing baseline turbidity level of the Green River.

Operation of the airport after implementation of the STIA projects could impact water quality in Miller and Des Moines creeks and waters of the Puget Sound near the IWS outfall. Water quality impacts to each creek could result from the discharge of pollutants typically present in urban stormwater, as well as the anti-icing and de-icing chemicals used in airport operations. Additional water quality impacts could occur in the water column at the IWS discharge.

Effects of chemicals in stormwater generated by the STIA operations were predicted using measured chemical concentrations in existing discharges and then mathematically modeling exposure concentrations for critical habitats where chinook salmon may be present. The Port has monitored stormwater quality from its outfalls since 1995. Total petroleum hydrocarbon [TPH], fecal coliforms, BOD, TSS, turbidity, total recoverable copper (Cu), lead (Pb), and zinc (Zn), ethylene glycol and propylene glycol are the chemicals that DOE and the Port have considered to be the significant chemicals most likely to be discharged to surface waters by airport activities. Ethylene glycol and propylene glycol, potassium acetate (KA), and calcium magnesium acetate (CMA) are de-icing chemicals used at STIA.

Past data show the efficacy of BMPs implemented by the Port. For example, airport runoff is, for most parameters measured, cleaner than runoff from other urban areas although it may not meet water quality standards for protection of aquatic life. Cu and Zn concentrations have dropped significantly at outfall SDS-1 since new BMPs re-routed runoff from the SDS to the IWS in June 1997. Cu and Zn concentrations at SDN-3 and SDN-4 are high relative to water quality standards but may be reduced with new BMPs imposed with new STIA projects. Although these outfalls discharge into an area where listed chinook salmon do not occur, and where critical habitat does not exist, concentrations of Cu and Zn that exceed the water quality standards may adversely impact resident fish and other aquatic species.

Water in Des Moines Creek and Miller Creek, and discharges from the IWS may exceed chronic toxicity concentrations for Cu and acute toxicity values for Zn. The plume from the IWS outfall diffuser is located 1,800 feet off shore in Puget Sound at a depth of 156 ft to 178 ft. Discharge rates at the IWS will increase as a result of the proposed action and could raise baseline chemical concentrations above ambient in the vicinity of the outfall. Migrating adult chinook may occur within this area, however, they are unlikely to be exposed for long periods of time. Therefore, exposure in the vicinity of the IWS outfall will not significantly affect Puget Sound chinook.

Juvenile chinook salmon may also be exposed to elevated concentrations of Cu and Zn if they migrate through the estuaries at the mouths of Des Moines and Miller creek. Exposure to current concentrations of contaminants does not appear to be detrimental because toxicity testing with 100% stormwater discharge generally does not exhibit toxicity to the cladoceran (*Daphnia pulex*), a species that is very sensitive to trace metal contaminants. In addition, the healthy salmonid populations that occur in these streams would not be expected if the streams were exposed to significant contamination from Cu and Zn for extended periods. If there are no significant effects near the stormwater discharges, it is unlikely that more significant impacts would be observed in the estuary as a result of these discharges. Concentrations of Zn and Cu discharged into Miller and Des Moines creeks will decline as a result of STIA projects because pollution generating impervious surfaces (PGIS) that currently exist at the airport will be retrofit with BMP's or diverted to the IWS to reduce discharges to the streams. Conversion of current residential areas to runways and open space will also reduce heavy metal discharges from these areas.

Application of ground de-icers (potassium acetate. calcium magnesium acetate and sand on road surfaces) is not expected to affect chinook salmon because these chemicals degrade into naturally occurring elements or will be retained by treatment BMPs. Runoff of aircraft anti-icing and de-icing fluids could potentially affect chinook salmon and other aquatic species. The maximum modeled concentrations at the IWS outfall and at the mouths of Miller and Des Moines creeks are a factor of seven lower than the relevant toxicity value. Therefore, anti-icing and de-icing fluids are not expected to negatively impact chinook salmon. In addition, the highest concentrations of de-icing fluids will occur in the winter when chinook salmon are not expected to occur at these sites.

Numerous other actions are proposed by the Port to improve overall water quality in Miller and Des Moines creeks. These include source controls, diversion of contaminated materials to the IWS for treatment, extensive implementation of treatment BMPs, conversion of farmlands and golf course to shrub wetlands, and conversion of residential areas to open lands and streams with more extensive buffers.

There is a potential for contaminated leachate to enter Miller Creek from the embankment. Although the Port is accepting fill material that generally meets the Model Toxics Control Act (MTCA) Method A contaminant levels that have been established by DOE, some fill material has been accepted that contains DDT, PCBs, PAHs, and mercury. Material that is obtained from state-certified commercial borrow pits is generally accepted for airport airfield projects without source-specific environmental certification. The Washington Department of Transportation certifies materials that are geotechnically suitable but does not include testing for contaminants. Some material that does not satisfy MTCA Method A levels of contaminant may be appropriate for placement in a specific project location. The Port will consult with the DOE for approval prior to accepting fill that does not meet the Method A standard. The Port, in consultation with USFWS, has redesigned the embankment to minimize the potential release of contaminants. The Port will also develop a monitoring program to confirm that the concentration of contaminants in seepage water from the embankment are not impacting aquatic life in the streams.

Hydrology: The most important effects of urban and suburban development on salmonid populations results from alterations in stream hydrology. Removal of forests and creation of impervious surfaces prevents infiltration of water into the ground and creates rapid discharge of stormwater over the earth's surface or from stormwater pipes. Significant changes to hydrology include increased peak flows during the winter and lower summer base flows.

The proposed project will create increased impervious surfaces in the Miller Creek (approximately 106 acres), Walker Creek (approximately 6 acres), and Des Moines Creek (approximately 128 acres) watersheds. No increase in impervious surfaces is expected in the Gilliam Creek watershed. To minimize impacts to stream hydrology within these watersheds, stormwater management actions are proposed to reduce peak flow events. Detention facilities will be sized to meet King County Level 2 flow control standards. These standards require that flow duration of post-developed runoff will match the pre-developed flow duration for all flow magnitudes between 50 percent of the 2-year flow event and the 50-year flow event.

To protect Miller and Des Moines creeks from increased stormwater runoff, the Port will design STIA projects and retrofit existing airport areas to match peak flows and control the duration of erosive flow rates in the streams to pre-developed conditions. The Port will construct stormwater conveyance, detention, and treatment facilities to manage runoff from both newly developed project areas and existing airport areas. Projects designed to minimize hydrologic impacts include construction of stormwater detention ponds and wet vaults. Some BMP's employed to minimize the impacts of water quality (eg. Bioswales) and infiltration adjacent to the runways and in reconstructed areas of Miller Creek should reduce direct runoff compared to current conditions.

The Stormwater Management Plan prepared by the Port suggests that flow controls for the STIA projects will reduce peak flows in Miller, Walker, and Des Moines creeks downstream of the STIA discharges. The target flow regime was selected to achieve the flows required by regulations and to reduce peak flows in the stream channels. Reduced peak flows will reduce bank erosion and potentially reduce sedimentation and turbidity in the creeks and their estuaries. These actions are also predicted to enhance baseline hydrologic conditions in the streams and associated estuaries.

The Comprehensive Stormwater Management Plan that was submitted by the Port is currently being reviewed by King County and the Washington State Department of Ecology. It is uncertain if the detention facilities that are currently proposed are adequate to meet Level 2 flow control standards. If the project as implemented satisfies the Level 2 flow control standard, peak flows in Miller, Walker and Des Moines creeks will be improved and alterations in hydrology will not adversely impact chinook salmon or their critical habitat in the estuaries. However, if peak flows are not reduced, and the peak/base flow indicator may be further degraded. This indicator is currently "not properly functioning" in all three watersheds. Further degradation may adversely impact critical habitat in the Miller and Des Moines creek estuaries and require reinitiation of consultation.

The proposed project may result in reduced baseflows within Miller and Des Moines Creeks, although the BA predicts that post-project hydrology will match or improve on the existing baseline for Miller, Walker, and Des Moines creeks. Current baseflows in Miller and Des Moines Creeks are approximately 1.8 cfs and 2.4 cfs, respectively. A reduction of approximately 4 percent (0.07 cfs) in Miller Creek baseflows and 7 percent (0.17 cfs) in Des Moines Creek baseflows was projected by Pacific Groundwater Group (2000). Streamflow analyses conducted by Earth Tech, Inc. (2000) also predicted reduced streamflows for both Des Moines and Miller Creeks during the low flow periods of August and September. Stream flows for Walker Creek were predicted to increase during August and September, 0.008 cfs and 0.010 cfs, respectively, as a result of recharge from the fill recharge and secondary impervious recharge. No net change in 7-day/2-year low flow is anticipated for Walker Creek. For the 7-day duration/2-year frequency stream discharge, a deficit of 0.10 cfs for Miller Creek at the SR 509 crossing and 0.08 cfs for Des Moines Creek were predicted.

Measures to prevent or mitigate effects on low summer baseflows in Miller and Des Moines Creeks include incorporation of infiltration into stormwater detention facilities, managed release of stormwater from reserved storage and secondary recharge from biofiltration strips on the embankment. According to the low stream flow analysis, average August and September flows are predicted to increase and the 7-day low flows are expected to match pre-project conditions for Miller, Walker and Des Moines creeks. If these flows are met, changes in low flow hydrology will not adversely affect chinook salmon or their critical habitat. Several assumptions in the low flow analysis have been challenged by the ACC, including the inability to construct acceptable storage vaults, reduced infiltration from the IWS lagoons, unknown infiltration capacity and percolation properties of the embankment, potential subsurface flows in the reconstructed sections of Miller Creek, and loss of discharge and inter-basin transfer of water if IWS discharge is piped to the Renton treatment plant. These concerns suggest that low flow may actually be reduced following STIA actions. If lower flows do occur they may negatively impact resident fish and other aquatic species, but impact to chinook salmon will be discountable because chinook do not occur in these streams.

Wetland and stream habitat: The STIA projects will produce temporary and permanent effects to riparian and wetland habitats. Temporary construction impacts to stream and riparian habitat will be minimized by implementing the BMPs for erosional and sedimentation control.

Direct impacts to stream habitat caused by STIA projects include the filling of approximately 980 ft of Miller Creek. The existing stream channel influences the flow pattern in receiving waters, the amount of aquatic habitat available to macro-invertebrates, and detritus transport to the creek. This section of Miller Creek also supports resident fish including cutthroat trout and threespine stickleback but does not contain critical habitat for any listed species. This affected section of Miller Creek is an artificial (i.e., constructed ditch) stream channel adjacent to the Vacca Farm site that has been modified to support agricultural activities. Existing conditions are degraded because the natural creek was moved to its present location and constructed as a straight channel to improve drainage in the area for farming. The existing channel lacks spatial heterogeneity in streambed substrate, channel configuration, instream fish habitat and riparian vegetation. Ditching of this section of the Miller Creek channel has probably reduced macroinvertebrate habitat, detritus transport, and fish habitat compared to more natural channel reaches located downstream. Direct impacts from filling 980 ft of the stream channel would be a loss of surface water conveyance, and existing macroinvertebrate habitat and fish habitat.

The proposed project will fill 0.26 ac of Wetland 44 but no direct impacts are expected to occur to the Walker Creek channel or fish habitat. A culvert over Des Moines Creek on the Tyee Golf Course will be replaced, but this culvert does not occur in stream habitat used by listed species. No other culverts will be added to Miller, Des Moines, or Walker creeks.

Adverse impacts resulting from the filling of Miller Creek will be reduced through conservation measures designed to improve ecological functions in this reach relative to existing conditions. Conservation measures to minimize impacts include: 1) Relocating Miller Creek in a new channel that has a more natural, complex stream morphology and substrate, and 2) Establishing a native forested riparian zone to provide particulate trapping and sediment retention, optimal buffer stream temperatures, adequate shade for the stream, and a source of detritus and coarse woody debris to the downstream reaches. The net effect of relocating a reach of Miller Creek is expected to be an improvement in water quality and macro-invertebrate and fish habitat in the relocated reach and downstream portions of Miller Creek. Although there will be a temporary loss of function while the reconstructed stream develops natural functions, these alterations will not adversely impact chinook salmon or their critical habitat because there are no chinook salmon in the stream.

The STIA projects will result in direct permanent impacts (filling) to 18.3 ac of wetlands and temporary construction impacts to 2.2 ac of wetlands. Temporary impacts during construction include removal of wetland vegetation (native and non-native), potential sedimentation, and temporary use of wetland areas for construction stormwater management. Direct impacts to wetland functions due to STIA projects include loss of wildlife habitat and other ecological functions. Wetlands in the project area support native shrub and forest vegetation that provide habitat for songbirds, amphibians, and small mammals. Several wetland areas that are in the riparian zone of Miller Creek or Walker Creek are presumed to support fish habitat in the adjacent streams. These wetlands provide shade, detrital inputs, invertebrates, woody debris, and groundwater discharge to the creeks. The riparian wetlands located on groundwater seeps adjacent to Miller and Des Moines creeks provide base flow support functions and may help maintain stream temperatures during summer months. Many of the wetlands have limited stormwater storage capacity due to their small size, lack of direct connections to the streams, or topographic conditions that limit stormwater detention. The existing groundwater recharge function is also limited because most wetlands appear to be underlain by relatively compact soils that limit groundwater infiltration rates. Wetlands within the project area that occur on relatively flat areas and receive runoff from urban areas do function to improve water quality.

Conservation measures are proposed to avoid and minimize direct impacts to the biological and physical functions of on-site wetlands. These combined conservation measures include restoration and functional enhancement of a total of 19.7 ac of in-basin wetlands, as well as enhancement of 28.4 ac of riparian and wetland buffers. In addition, to mitigate for avian habitat that cannot be replaced in-basin due to wildlife hazards to aircraft operations, a total of 40.6 ac of restored or enhanced wetlands, and 15 ac of buffer enhancement will be created at the Auburn mitigation site. It is difficult to determine if these measures will completely mitigate for lost wetland functions, however, as chinook salmon do not occur in Miller Creek, no direct impacts to the species or their critical habitat will occur from stream relocation or wetland fill. Indirect effects to chinook will be insignificant because of the minimization and conservation measures to be implemented by the applicant.

Potential indirect impacts due to filling of wetlands by the MPU project include changes in hydrology to downslope wetlands and streams, reduction in the amount of wildlife habitat available for wetland species, and changes in water quality through removal of wetland area.

Indirect impacts to hydrology include changed hydrology in wetlands downslope of filled wetlands, as well as impacts to base flow in streams adjacent to filled wetlands. Indirect impacts to the hydrology of wetlands adjacent to the fill are not expected to be significant and will not significantly alter their hydrologic function. It is anticipated, however, that Section 404 permit conditions will require monitoring the hydrology of downslope wetlands to determine that sufficient hydrology is present to maintain the areas as wetland.

Several STIA projects are designed to avoid and minimize unavoidable impacts to wetlands. In-basin projects are proposed to restore wetland and stream functions, including the establishment of 48.06 ac of wetland enhancement and stream buffering that will be protected in perpetuity from future development. Other actions include grading to establish wetland hydrology, removing invasive non-native species, planting native wetland vegetation, and installing LWD. Mitigation actions also include removing certain existing land use conditions (e.g., paved surfaces, artificial landscaping and attendant nutrient and pesticide inputs, septic systems, and channel riprap) that degrade on-site wetland and aquatic habitat.

The buffer enhancement project will protect about 24 ac of riparian habitat along Miller Creek. Planting along the length of the buffer will vary depending upon the existing buffer condition. In sections of the buffer that are primarily lawn, areas will be planted with native trees and shrubs. Areas that contain some native and some non-native vegetation will be enhanced by either inter-planting native species to produce a continuous tree canopy or underplanting native shrubs beneath an existing canopy that lacks understory vegetation. Some areas that contain invasive species (such as Himalayan blackberry and Japanese knotweed) will be cleared, graded, and also inter-planted with native woody vegetation. The increased riparian buffer is expected to increase habitat quality for resident salmonids and other aquatic organisms in the Miller Creek basin.

To improve water quality and riparian habitat within the Des Moines Creek basin, approximately 4.5 ac of emergent wetland area, located within the existing and active Tyee Valley Golf Course, would be restored to a native shrub vegetation community. The enhancement would convert the existing turf wetland to a native shrub wetland community. Planting a native shrub community on the golf course would reduce chemical runoff reaching aquatic environments and fish populations in Des Moines Creek, increase nutrient removal and recycling in the riparian zone, and decrease wildlife attractants within 10,000 ft of the airfield.

Efforts to restore and enhance aquatic environments have generally been less successful than envisioned by their planners. Even if long term benefits result, there are often short term negative impacts as the new projects develop into natural systems. It seems likely that short term adverse impacts may occur in Miller Creek although the long term effects will probably be beneficial to most aquatic life in this ecosystem.

Chinook salmon will not be adversely affected by wetland and stream habitat projects because all wetland impacts occur in portions of the Miller and Des Moines creek basins that do not contain critical habitat for these species.

Conclusion

Effects of STIA projects were evaluated in terms of water quality, hydrology and habitat alterations for various locations within the action area. At several of these locations, chinook salmon do not occur. At other locations chinook occur seasonally or rarely. Consequently, the effects determinations are generally insignificant or discountable (Table 2).

TABLE 2. Summary of STIA Project Effects to Puget Sound Chinook Salmon

LOCATION	Fish Present	Water Quality	Hydrology	Habitat Alterations
Miller Creek	NO	Insignificant	Insignificant	Insignificant
Walker Creek	NO	Insignificant	Insignificant	Insignificant
Des Moines Creek	NO	Insignificant	Insignificant	Insignificant
Gilliam Creek	Rarely	Discountable	Discountable	Discountable
Green River (Mitigation site)	YES	Discountable	Discountable	Beneficial
Miller Creek Estuary	Seasonally	Insignificant	Insignificant	Insignificant
Des Moines Creek Estuary	Seasonally	Insignificant	Insignificant	Insignificant
Midway Sewer Outfall	Adults	Insignificant	Discountable	Discountable

After reviewing the current status of the Puget Sound chinook salmon, the environmental baseline for the action area, and the effects of the proposed STIA actions, the NMFS concludes that these actions may affect but are not likely to adversely affect Puget Sound chinook or their designated habitat.

Incidental Take

Section 9 of the Act and federal regulation pursuant to section 4(d) of the Act prohibit the take of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity

NMFS does not anticipate the proposed action will incidentally take Puget Sound chinook salmon. Therefore, reasonable and prudent measures are not necessary and appropriate. Furthermore, no terms and conditions are provided as incidental take is not anticipated.

Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information.

The following conservation recommendations are provided for FAA, the COE and the Port:

1. Monitor fish use, including spawning activities of salmonid species, in Miller and Des Moines Creeks to determine success of habitat enhancement and restoration activities.

2. Monitor macro-invertebrates in Miller and Des Moines Creek to evaluate the effectiveness of restoration activities. Samples should be collected near the restoration sites and near the mouths of the creeks to evaluate if basin-wide impacts are detected.

3. Evaluate the effectiveness of temporary erosion and sediment control measures.

4. Monitor instream flows in Miller, Walker and Des Moines Creeks to confirm that peak flows have been reduced and low flows have been maintained.

5. Where feasible, expand the buffers along Miller Creek to restore natural ecological functions in the riparian zone and at the land-stream ecotone.

6. Implement additional best management practices to reduce concentrations of Cu and Zn below the chronic toxicity levels for aquatic organisms.

7. Monitor storm water drains for Cu and Zn to confirm that the expected reductions actually occur.

8. Use mechanical methods to remove exotic vegetation and reduce pesticide use in riparian zones, golf course and any other areas that drain to the strormwater system or directly to surface streams.

Reinitiation Notice

This concludes informal consultation on the Master Plan Update Improvements Seattle-Tacoma International Airport Project. As provided in 50 C.F.R.§ 402.16 consultation must be reinitiated where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) any take occurs; (2) new information reveals effects of the action that may affect listed species in a way not previously considered; or (3) a new species is listed or critical habitat is designated that may be affected by the action). To reinitiate consultation, the FAA must contact the Habitat Conservation Division (Washington Branch Office) of NMFS.

The WDOE and the Army Corps of Engineers have not completed their review of the project at this time, therefore issuance of the NPDES permit, water quality certification (401), and Clean Water Act Section 404 permit have not occurred. The BA includes a number of best management practices that are proposed to meet state water quality standards. The BA acknowledges that additional measures may be necessary. The NMFS' review of the effects of the proposed action assumes that the criteria in the Washington State surface water quality standards will be met by the project at all times. Any future actions that may be taken to meet State surface water quality standards or Section 404 permit requirements need to be evaluated to determine if reinitiation of this consultation is necessary. The NMFS will consult on future federal actions that are not included in this consultation.

ESSENTIAL FISH HABITAT

Federal agencies are obligated, under Section 305 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 USC 1855(b)) and its implementing regulations (50CFR600), to consult with NMFS regarding actions that are authorized, funded, or undertaken by that agency, that may adversely affect Essential Fish Habitat (EFH). The MSA (§3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Furthermore, NMFS is required to provide the Federal agency with conservation recommendations that minimize the adverse effects of the project and conserve EFH. This consultation is based, in part, on information provided by the Federal agency and descriptions of EFH for Pacific coast groundfish, coastal pelagic species, and Pacific salmon contained in the Fishery Management Plans produced by the Pacific Fisheries Management Council.
The proposed action and action area are described in the BA. The action area includes habitats which have been designated as EFH for various life stages of 17 species of groundfish, and 4 coastal pelagic species (Table 2). Information submitted by FAA in the BA is sufficient for NMFS to conclude that the effects of the proposed actions are transient, local, and of low intensity and are not likely to adversely affect EFH in the long-term. NMFS also believes that the conservation measures proposed as an integral part of the actions would avert, minimize, or otherwise offset potential adverse impacts to designated EFH.

EFH Conservation Recommendations: The conservation measures that the FAA included as part of the STIA projects are along with those that NMFS recommends in the ESA Concurrence letter, adequate to minimize the adverse impacts from this project to designated EFH for the species in Table 3. It is NMFS' understanding that the FAA intends to implement the proposed activity with these built-in conservation measures that minimize potential adverse effect to the maximum extent practicable. Consequently, NMFS has no additional conservation recommendations to make at this time.

Please note that the MSA (§305(b)(4)(B)) requires the Federal agency to provide a written response to NMFS' EFH conservation recommendations within 30 days of its receipt of this letter. However, since NMFS did not provide conservation recommendations for this action, a written response to this consultation is not necessary.

This concludes EFH consultation in accordance with the MSA and 50CFR600. The FAA must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a manner that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600.920(k)).

Table 3. Species of fishes with designated EFH in the action area.

Groundfish Species	Sablefish *Anoplopoma fimbria*	**Coastal Pelagic Species**
Spiny Dogfish *Squalus acanthias*	Bocaccio *S. paucispinis*	anchovy *Engraulis mordax*
California Skate *R. inornata*	Brown Rockfish *S. auriculatus*	Pacific sardine *Sardinops sagax*
Ratfish *Hydrolagus colliei*	Copper Rockfish *S. caurinus*	Pacific mackerel *Scomber japonicus*
Lingcod *Ophiodon elongatus*	Quillback Rockfish *S. maliger*	market squid *Loligo opalescens*
Cabezon *Scorpaenichthys marmoratus*	English Sole *Parophrys vetulus*	
Kelp Greenling *Hexagrammos decagrammus*	Pacific Sanddab *Citharichthys sordidus*	
Pacific Cod *Gadus macrocephalus*	Rex Sole *Glyptocephalus zachirus*	
Pacific Whiting (Hake) *Merluccius productus*	Starry Flounder *Platichthys stellatus*	

If you have any questions regarding NMFS concurrence on ESA or conservation measures for EFH, please contact Tom Sibley at the Washington State Habitat Office (206) 526-4446.

Sincerely,

Donna Darm
Acting Regional Administrator

cc: Muffy Walker, ACOE
Nancy Brennen-DubbsFWS
A. Kenny, WDOE
E. Leavitt, Port of Seattle

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Table 1. Proposed Master Plan Update improvement projects at Sea-Tac Airport.

Project	Description
Runway and Taxiway Projects	
Property Acquisition, Street and Utility Vacation	Includes purchasing property and demolishing existing structures between existing Sea-Tac boundary west to Des Moines Memorial Drive and State Route (SR) 509. Required for third runway embankment fill and construction impact mitigation. Acquisition and demolition is also required for the south runway protection zone (RPZ).
Embankment Fill	Embankment for third runway, constructed using imported fill. Approximately 16.5 million cubic yards (cy) will be placed over a 5- to 7-year period. Existing roads and streets under the embankment footprint will be removed.
Interconnecting Taxiways	New connecting taxiways between existing runway and third runway. Project is located on existing airfield, requiring only minimal grading.
Runway 16X/34X	Paving of third runway after completion of embankment fill.
Extension of Runway 34R by 600 feet (ft)	Extend runway by 600 ft for improved warm weather and large aircraft operations. Project is located at the southern end of the east runway.
Additional Taxiway Exits on 16L/34R	Construction of new ramps to the existing terminal apron.
Dual Taxiway 34R	Improvements to taxiways serving the South Aviation Support Area (SASA) and south apron.
Runway Safety Areas (RSAs)	
Runway 34R Safety Fill	Extend runway safety fill to meet FAA standards.
RSAs 16R/16L	Extend safety fills by 1,000 ft to meet FAA standards.
Relocation of Displaced Threshold on Runway 16L	Airfield taxiway improvements. The runway threshold (i.e., the emergency landing pad at end of runway pavement) to be relocated onto new RSA.
Miller Creek Sewer Relocation	Relocate sewer for third runway embankment and runway safety fills. New sewer to run along alignment of new $154^{th}/156^{th}$ Street.

Project	Description
Borrow Sites	
Borrow Sites	Sources of fill for third runway embankment, located on Sea-Tac property south of the airport. Approximately 6.7 million cy[1] of material to be excavated from three sites and transported across airport property to the embankment.

FAA Navigation Aids (NAVAIDS)	
New Airport Traffic Control Tower	New air traffic control tower to be located in existing developed area near terminal.
Relocate Airport Surveillance Radar, Airport Surface Detection Equipment, NAVAIDS	Existing radar and navigation equipment will be relocated to allow construction of third runway.

Airfield Building Improvements	
New Snow Equipment Storage	New building to house snow removal equipment.
Weyerhaeuser Hangar Relocation	Relocate existing hangar on west side of airfield to allow construction of third runway. New hangar will be located near south end of third runway.

Terminal/Air Cargo Area Improvements	
Relocation of Airborne Cargo	Relocate existing cargo building from air traffic control tower site to north cargo area. Located in existing developed area near terminal.
Central Terminal Expansion	Passenger terminal remodel. Located in existing developed area at terminal.
South Terminal Expansion Project (STEP)	Passenger terminal remodel. Located in existing developed area to the south of the main passenger terminal.
Northwest Hangar Relocation	Relocate Northwest hangar to site now occupied by Delta hangar. Located in existing developed area.
Satellite Transit Shuttle System Rehabilitation	Remodel and upgrade underground transit system linking terminal to satellites.
Redevelopment of North Air Cargo	New or expanded air cargo facilities along Air Cargo Road at north end of airport.

Relocation of Airborne Cargo	Relocate existing cargo building from air traffic control tower site to north cargo area. Located in existing developed area near terminal.
Expansion of North Unit Terminal (North Pier)	Addition to new passenger terminal located north of existing terminal. Located in existing developed area (Doug Fox parking lot and airport access freeway).

Project	Description
New Airport Rescue and Fire Fighting Facility	Replaces facility displaced by new North Terminal. The new facility will be located to the north of the North Terminal.
Cargo Warehouse at 24th Avenue South	New air cargo facility located north of SR 518 on 24th Avenue South.
Westin Hotel	New hotel located immediately north of main passenger terminal. Located in existing developed area at terminal.
New Water Tower	Construct new water tower and piping in engineering yard south of South 160th Street in subbasins (Gilliam Creek watershed) served by stormwater outfalls 012 and 013.

Roads[2]	
Temporary SR 518 and SR 509 Interchanges	Temporary access ramps to serve construction of third runway embankment and runway safety fill; to be removed after project completion.
154th/156th Street Relocation	Relocate public roadway to allow construction of third runway embankment and runway safety fills. Existing road to be demolished.
154th/156th Street Bridge Replacement	Relocate existing South 156th Street bridge over Miller Creek to accommodate the third runway footprint and South 154th/156th Street relocation. In-water work associated with this project is limited to the removal of the existing bridge and bank restoration.
Improvements to Main Terminal Roads	Transportation circulation, seismic and other improvements to roadway systems serving terminal.
Improved Access and Circulation Roadway Improvements	Improvements to existing roadway system serving passenger terminal, garage, and air cargo facilities.
North Unit Terminal Roadways	Improvements to existing roadway system to serve the new North Terminal and garage.
Improvements to South Access Connector Roadway (South Link)	Improvements to existing roadway system serving passenger terminal, garage, and air cargo facilities. Will connect terminal and garage area to South Access roadway and SR 509 extension south of airport.

Project	Description
Parking	
Main Parking Garage Expansion	Expand parking facility at main passenger terminal on north and south sides (existing developed areas), and add floors to portions of existing garage.
The North Employees Parking Lot (NEPL), Phase 1	New parking facility for employees, located north of SR 518.
North Unit Parking Structure	Construction of new garage serving new North Terminal facility. Facility will be located at existing Doug Fox parking lot.

The South Aviation Support Area	
The SASA and Access Taxiways	New airport support facility for cargo and/or maintenance, located at the south end of the airport south of the Olympic Tank Farm and South 188th Street. Airplane access will be by new parallel taxiway constructed along Runway 34R.
Relocation of Existing Facilities to the SASA	Airport operation support facilities will be relocated to the SASA once SASA site development is completed. Many of these facilities must be relocated from their present locations due to main terminal expansion (i.e., STEP and North Terminal), including Northwest hangar, ground support equipment, ground and corporate aviation facilities, new airport maintenance building, and United maintenance complex.

Stormwater Facilities[3]	
Miller Creek Detention Facility Expansion	Expand the Miller Creek Detention Facility by 16.4 acre-ft to provide flow control retrofitting for existing Sea-Tac discharges to Miller Creek. All construction would take place in uplands, and would create free-draining detention volume.
SASA Detention Pond	Create regional stormwater detention pond for the SASA project and other sites. Pond is 33.4 acre-ft and discharges to Des Moines Creek.
NEPL Vault	A 13.9 acre-ft vault to retrofit the NEPL; discharges to Miller Creek via Lake Reba.
Third Runway Vaults and Ponds	Stormwater detention vaults and ponds at the north, west, and south sides of the airport, discharging to Miller, Walker, and Des Moines Creeks.

Third Runway Vaults and Ponds	Stormwater detention vaults and ponds at the north, west, and south sides of the airport, discharging to Miller, Walker, and Des Moines Creeks.
Sea-Tac Retrofit Facilities	Detention vaults or ponds to provide flow control retrofitting for existing Sea-Tac discharges to Des Moines Creek. Vaults to be constructed in combination with third runway facilities when possible.
Cargo Vault	Detention vault for North Cargo Facility (4.5 acre-ft discharging to Miller Creek via Lake Reba).

Natural Resources	
Miller Creek Relocation	Approximately 980 ft of Miller Creek immediately downstream of the Miller Creek Detention Facility will be relocated to accommodate third runway embankment and runway safety fill.
Miller Creek Buffer and Wetland Enhancement	Establish a 100-ft buffer (average) along approximately 6,500 linear ft of Miller Creek and riparian wetlands associated with Miller Creek within the acquisition area. Enhance approximately 7.4 acres of existing wetlands along the stream.
Miller Creek Floodplain and Wetland Restoration	Excavate approximately 9,600 cy from the Vacca Farm site adjacent to Miller Creek to compensate for approximately 8,500 cy of floodplain fill for third runway embankment and north safety fill. Restore and enhance approximately 17 acres of stream habitat, floodplain wetlands, aquatic habitat in Lora Lake, and buffers at Vacca Farm.

Miller Creek Relocation	Approximately 980 ft of Miller Creek immediately downstream of the Miller Creek Detention Facility will be relocated to accommodate third runway embankment and runway safety fill.
Miller Creek Instream Habitat Enhancement	Project 1: South of the Vacca Farm site, approximately 650 ft of channel. Remove rock riprap, footbridges, and trash. Place large woody debris (LWD) throughout this section of the stream. Plant riparian areas along the stream with native wetland and upland plant species. Project 2: Approximately 150 ft upstream of South 160th Street, approximately 235 ft[1] of channel. Install LWD in the stream channel, grade a small section of the west bank of the stream to create a gravel bench in the floodplain, remove two rock weirs to improve fish passage, and plant the upland area with native trees and shrubs. Project 3: Immediately downstream of South 160th Street, approximately 380 ft[1] of channel. Grade a section of the east bank, remove a rubber-tire bulkhead and install LWD in the stream and on its banks. Plant buffer areas with native trees and shrubs. Project 4: Miller Creek immediately upstream of 8th Avenue South, approximately 820 ft[4] of channel. Grade portions of both banks. Remove footbridges and portions of concrete block walls. Install LWD in the stream and on its banks. Plant buffer areas with native trees and shrubs. In addition to these specific enhancements, debris such as tires, garbage, and fences will be removed throughout the entire stretch of Miller Creek from the Vacca Farm site south to Des Moines Memorial Drive. In areas where access is readily available, LWD will be selectively placed throughout the stream to improve instream habitat conditions.
Drainage Channels Relocation	Relocate a minimum of 1,290 linear ft of drainage channels to accommodate the third runway embankment. Plant buffers along the drainage channels with native grass and shrubs.

Miller Creek Relocation	Approximately 980 ft of Miller Creek immediately downstream of the Miller Creek Detention Facility will be relocated to accommodate third runway embankment and runway safety fill.
Restoration of Temporarily Impacted Wetlands	Approximately 2.05 acres of wetland located west of the third runway embankment, north of relocated South 154th Street, and west of the Miller Creek relocation project, will be temporarily filled or disturbed during embankment construction. When construction activities are completed, remove fill material, restore pre-disturbance topography, and plant wetlands with native shrub vegetation.
Tyee Valley Golf Course Wetlands Enhancement and Des Moines Creek Buffer Enhancement	Restore approximately 4.5 acres of emergent wetland area and approximately 1.6 acres of buffer located within Tyee Valley Golf Course to a native shrub vegetation community. The enhancement actions would be integrated into plans to construct a Regional Detention Facility on the golf course[2] (King County Capital Improvement Project Design Team 1999). The enhancement would convert the existing turf wetland to native shrub wetland community. Enhance approximately 3.4 acres (average 100 ft wide) of buffer and 1.0 acre of existing wetland along Des Moines Creek.
Wetland Habitat (including Avian Habitat) near the Green River in Auburn	Restore wetland functions to a 67-acre parcel near the Green River in the City of Auburn. Create and/or restore approximately 17.2 acres of forest, 6.0 acres of shrub, 6.2 acres of emergent, and 0.60 acre of open-water wetland. Enhance protective buffers totaling about 15.90 acres.

1 Size modified from that originally stated in BA.

2 Temporary roads used to haul fill material from three on-site borrow areas to construction sites are included in the analysis of the borrow areas and are not listed here.

3 Des Moines Creek Basin Plan Committee may construct a Regional Detention Facility on Tyee Golf Course to provide regional flow control. This project would eliminate the need for Sea-Tac retrofit facilities described above. As this is a cumulative action subject to future federal action, it is not a Master Plan Update improvement.

4 Project length includes approximately 12 ft of instream work as part of driveway demolition, and 400 ft of riparian enhancement.

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Port of Seattle

Addendum #4 to Seattle-Tacoma International Airport Master Plan Final Environmental Impact Statement and Final Supplemental Environmental Impact Statement

Borrow Source Areas 3 and 4

and the

Federal Aviation Administration's Incorporation of NEPA Reevaluation Document

POS SEPA No. 01-16
August 10, 2001

AR 004560

Addendum #4 to the Seattle-Tacoma International Airport Master Plan Final Environmental Impact Statement and Final Supplemental Environmental Impact Statement for Borrow Source Areas 3 and 4 and the Incorporation of the Federal Aviation Administration's NEPA Reevaluation Document

Addendum to: Seattle-Tacoma International Airport Master Plan Final Environmental Impact Statement (FEIS) and Final Supplemental Environmental Impact Statement (FSEIS). The Seattle-Tacoma International Airport Master Plan FSEIS was issued by the Port of Seattle on May 13, 1997, following the provisions of the Washington State Environmental Policy Act (SEPA) under Chapter 43.21C. Revised Code of Washington (RCW), Chapter 197-11, Washington Administrative Code (WAC), and Resolution 3028, Port of Seattle, SEPA Policies & Procedures. The Seattle-Tacoma International Airport Master Plan FSEIS is available for review at the Port of Seattle Bid Desk, Pier 69, 2711 Alaskan Way, Seattle, Washington OR Port of Seattle Aviation Planning, 3rd Floor, Terminal Building, Sea-Tac Airport, 8:00 AM to 4:30 PM weekdays.

Name of Project: Borrow Source Areas 3 and 4 and the Incorporation of the Federal Aviation Administration's NEPA Reevaluation Document

Project Sponsor: Port of Seattle, P.O. Box 1209, Seattle, WA 98111

I. PROJECT DESIGN CHANGES TO BORROW AREAS 3 AND 4.

Background: The Port of Seattle issued the Final EIS for the proposed Master Plan improvements in February 1996, which was followed by a Supplemental EIS in 1997. The FSEIS for this proposal was issued on May 13, 1997 pursuant to WAC 197-11-340. The FEIS/FSEIS included a description of borrow source areas proposed for excavation to provide material for the proposed new third runway embankment. The FEIS/FSEIS indicated the Borrow Areas would likely be used to the maximum extent possible.

Subsequent to the issuance of the FEIS/FSEIS, the Port held discussions with regulatory agencies and conducted additional technical analysis reviews, resulting in several minor proposed modifications to the borrow source areas. The quantity of material available in the borrow areas was less than reported in the FEIS/FSEIS and the cut depth elevations were higher than will be required to remove the material. The relative elevations between the cut depths and the underlying soil layer or water table remain as stated in the FEIS/FSEIS. Thus, although the actual cuts will be deeper than reported in the FEIS/FSEIS, the modified elevations do not alter the environmental analysis or expected impacts for the project.

New project information from the additional technical analysis reviews indicates that the project refinements will result in environmental benefits and will not result in any unanalyzed probable significant adverse impacts.. As described below, the net result of the project modifications are that the use of Borrow Areas 3 and 4 are likely to cause less environmental impact than indicated in the FEIS/FSEIS. This Addendum supplements and amends environmental evaluations presented in the original FEIS/FSEIS to reflect minor modifications to the project as described in those documents.

Summary of Revisions to The Future Conditions - Borrow Requirements and Excavation and Fill Placement sections of the FEIS/FSEIS (FSEIS, Chapter IV.19.(3)(B)(1. and 2.): Portions of the FEIS/FSEIS are updated to reflect changes as indicated in Table 1 and are described in more detail in the text.

Table 1. Borrow Area Sites 3 and 4 Revision Summary

Borrow Site 3 Information		
Original FEIS/FSEIS Master Plai Proposal	**New Addendum Proposal**	**Difference In Proposals**
Footprint of excavation area is 60 acres and fully excavated	Footprint of excavation area is 48 acres 23 acres excavated	Footprint and excavated area reduced in new proposal
Volume of excavated material is 2.9 MCY	Volume of excavated material is 1.0 MCY	Volume of excavated material reduced in new proposal
Cut depth is 0 to 55 feet	Cut depth is 15-100 feet	Cut depths deeper in new proposal
Wetlands proposed for excavation are 2.35 acres	Wetlands are protected within 50-foot buffer	Wetlands protected within 50-foot buffer in new proposal
Borrow Site 4 Information		
Original FEIS/FSEIS Master Plai Proposal	**New Addendum Proposal**	**Difference In Proposals**
Footprint of excavation area is 40 acres maximizing excavation onsite	Footprint of excavation area is 40 acres with 34 acres excavated	Excavated area reduced in new proposal
No material excavated from SR 509 corridor	Material excavated from SR 509 corridor	Material excavated from SR 509 Corridor in new proposal
Volume of excavated material is 0.3 to 2.2 MCY	Volume of excavated material is 1.3 MCY	Volume of excavated material Reduced in new proposal
Cut depth is 15-20 ft	Cut depth is 15-90 ft	Cut depth is deeper in new proposal
Topsoil management plan not included in FSEIS	Topsoil management plan Included	Topsoil management plan included in the new proposal
Property buffers are 30 ft.	Property buffers are 50 ft.	Property buffer expanded in new proposal

Borrow Area 3

Since the issuance of the FEIS/FSEIS, the proposed amount of excavation of Borrow Area 3 has been reduced. Excavation of Borrow Area 3 will not include the area south of S. 208th Street, and it will not include 2.35 acres of wetlands north of S. 208th Street that would have been eliminated under the original borrow area proposal. A 50-foot buffer will remain between the excavation and the wetland. A minimum 50-foot-wide vegetation buffer from adjacent property lines also will be used to minimize impacts to adjoining land uses.

Approximately 23 acres of the 48-acre site will be excavated. An estimated 1.0 million cubic yards of material could be obtained from Borrow Area 3. The estimated quantity is based upon a maximum cut of elevation that is 10 feet above the water table or down to the pre-Vashon drift. The excavation depths will vary from approximately 0 to 15 feet at the south side and 100 feet at the north side.

Borrow Area 4

Approximately 34 acres of the 40-acre site will be excavated. A minimum 50-foot-wide vegetation buffer from adjacent property lines will be maintained to minimize impacts to adjacent land uses. An estimated 1.3 million cubic yards of material could be obtained from Borrow Area 4. The quantity assumes material would be excavated from within the SR 509 corridor. The estimated quantity is based upon a maximum cut of 10 feet above the water table or down to the pre-Vashon drift. The excavation depths will vary from approximately 0 to 15 feet at the east side and 90 feet at the west side.

Since publication of the FEIS/FSEIS, soil sampling identified slightly elevated levels of arsenic present in the topsoil of Borrow Area 4 related to windblown particulates from the former Asarco smelter in Tacoma. Surface deposition of windblown arsenic originating from the former Asarco smelter is a regional issue and impacts expected at Borrow Area 4 would be similar to those experienced by other undeveloped sites in the vicinity. There is no indication that the presence of arsenic in the topsoil poses an environmental health threat on a non-residential site such as Borrow Area 4. During borrow excavation, the Port proposes to develop a plan to manage the topsoil in an environmentally protective manner. This plan would include reuse of the top one foot of soil as part of the reclamation of Borrow Area 4. The topsoil would be temporarily stockpiled in or adjacent to the Borrow Areas. Following excavation of the underlying material for the embankment work, the stockpiled topsoil would be replaced.

Impacts and Mitigation: The FEIS/FSEIS described anticipated environmental consequences and proposed mitigating measures for both Borrow Areas 3 and 4. This Addendum supplements and amends environmental evaluations presented in the FEIS/FSEIS and new information regarding revisions to Borrow Areas 3 and 4 is presented.

The FEIS/FSEIS and the current proposal are consistent in that the lower limit of the excavation will be a maximum cut of 10 feet above the water table or to the pre-Vashon drift across each of the Borrow Areas. The cut depth indicated in the FEIS/FSEIS for Borrow Areas 3 and 4 was modified.

While the current proposal differs from that described in the FEIS/FSEIS by proposing excavation to a deeper elevation and by proposing extraction of materials from the Washington State Department of Transportation's SR 509 right-of-way, these variances are not expected to create any significant environmental impacts over and above those addressed in the FEIS/FSEIS documents.

The change in cut depths, and reliance on access to the WSDOT-ROW to maximize the amount of extractable material from the borrow areas are both consistent with general assumptions reported in the FEIS/FSEIS.

The new estimated quantity of material available for excavation is less, the area of surface disturbance is less, the lower limit of excavation remains the same, and several wetlands will be preserved by the new proposal. The variations are not expected to result in any additional or new environmental impacts to wetlands or groundwater. In most cases, the impacts from the new proposal would diminish from levels estimated by the FSEIS, especially for surface impacts and wetlands.

The topsoil management plan will mitigate impacts to the environment resulting from excavation of the topsoil containing low levels of arsenic. The plan will adhere to applicable local, state and federal guidelines and environmental regulations.

II. INCORPORATION BY REFERENCE OF THE FEDERAL AVIATION ADMINISTRATION'S NEPA REEVALUATION DOCUMENT (*APPENDIX A REEVALUATION OF AIRPORT ACTIVITY AND CHANGES TO THE MASTER PLAN UPDATE AT SEATTLE-TACOMA INTERNATIONAL AIRPORT*) FOR PURPOSES OF THE STATE ENVIRONMENTAL POLICY ACT ("SEPA") RCW CH. 43.21C.

Background: The Port has reviewed the document entitled *Appendix A Reevaluation of Airport Activity and Changes to the Master Plan Update at Seattle-Tacoma International Airport,* the NEPA Reevaluation Document that has been published by the Federal Aviation Administration ("FAA") pursuant to the National Environmental Policy Act (("NEPA") 42 U.S.C. 4321 *et seq*.). This is a document that appends the Record of Decision: Environmental Reevaluation For Master Plan Update Development Actions, Sea-Tac International Airport.

The Port hereby incorporates by reference for purposes of SEPA all of the analysis, findings, and conclusions set forth in the Reevaluation Document.

This incorporation by reference is done pursuant to RCW 43.21C.110, WAC 197-11-600(4)(b) and (c), and WAC 197-11-635:

The complete title of the Reevaluation Document is: *Appendix A Reevaluation of Airport Activity and Changes to the Master Plan Update at Seattle-Tacoma International Airport.*

The content of the Reevaluation Document is summarized as follows:

The FAA reevaluated the continued validity of the FEIS/FSEIS in light of the following events and circumstances that occurred since the FSEIS was issued in May 1997:

- Variance between actual activity levels at the airport and the levels forecast in the FSEIS. In addition, the implications of the FAA's Terminal Area Forecast were considered.

- New information available since publication of the FSEIS including additional wetlands, national listing of certain species pursuant to the Endangered Species Act, and preparation of a Part 150 Noise Compatibility Planning Study.
- Modifications to the Master Plan Update projects.
- Cumulative impacts of project modifications and changes in the surrounding environs.

Impacts and Mitigation: Based on this reevaluation, the FAA concluded that the events and circumstances are not significant, are not substantially greater than what had been reported previously, and do not warrant the preparation of a Supplemental EIS.

Copies of the Reevaluation Document are available to members of the public for inspection at the following location:

Federal Aviation Administration
Airports Regional Office, Room 540
1601 Lind Ave, SW
Renton, Washington 98055-4056

Summary: The current set of FEIS/FSEIS documents have analyzed the known range of potentially significant environmental impacts potentially associated with the new information and project changes to the Master Plan Update project components that have occurred since issuance of the FEIS/FSEIS.

The FAA's NEPA Reevaluation Document has adequately analyzed the new information and project changes described in that document.

SEPA Review: The Port of Seattle has reviewed the new information and proposed project changes for Borrow Areas 3 and 4, and it has determined that the new information and minor changes are within the scope of the original project; that no additional significant, adverse environmental impacts are likely to result from the new information and project changes; that further supplemental environmental analysis is not required under SEPA.

The Port has also reviewed the FAA's NEPA Reevaluation Document and it concurs with the FAA's conclusion that no significant, adverse environmental impacts have been identified from the new information presented or are likely to occur from the project changes that are described in that document. Therefore, further supplemental environmental analysis is not required under SEPA.

Date Addendum Issued: August 13, 2001

SEPA Lead Agency: Port of Seattle

Contact Person: David McCraney, Environmental Program Manager, Port of Seattle, Health, Safety & Environmental Services, P.O. Box 1209, Seattle, WA. 98111. Telephone: 206/728-3193.

SEPA Responsible Official: Michael Feldman, Director, Aviation Facilities, Port of Seattle, P.O. Box 68727, Seattle, WA 98168, (206) 439-7706.

Michael D. Feldman
Signature

August 10, 2001
Date

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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
P.O. Box 47600 • Olympia, Washington 98504-7600
(360) 407-6000 • TDD Only (Hearing Impaired) (360) 407-6006

September 21, 2001

REGISTERED MAIL

Port of Seattle
Attn: Ms. Elizabeth Leavitt
17900 International Blvd., Suite 402
Seattle-Tacoma International Airport
SeaTac, WA 98188-4236

Dear Ms. Leavitt:

Re: Water Quality Certification for U.S. Army Corps of Engineers Public Notice 1996-4-02325 (Amended-1); Construction of a Third Runway and related projects at the Seattle-Tacoma International Airport (STIA) in the Miller, Walker, and Des Moines Creek watersheds and in wetlands at the Seattle-Tacoma International Airport, located within the vicinity of the city of SeaTac, King County, Washington; and in wetlands at the mitigation site in Auburn, King County, Washington.

The public notice from the U.S. Army Corps of Engineers (Corps) for proposed work has been reviewed. On behalf of the state of Washington, we certify that the work proposed in the Port of Seattle's (the Port's) revised Joint Aquatic Resource Permit Application (JARPA) dated October 25, 2000, the Corps' public notice and the Department of Ecology's (Ecology's) public notice complies with applicable provisions of Sections 301, 302, 303, 306 and 307 of the Clean Water Act, as amended, and other appropriate requirements of state law. This letter also serves as the state response to the Corps. This letter also serves as notification that Ecology has rescinded Order Number 1996-4-02325 issued on August 10, 2001 and replaced it with Order Number 1996-4-02325 (Amended-1) issued on September 21, 2001.

Pursuant to Section 307(c)(3) of the Coastal Zone Management Act of 1972 as amended, Ecology concurs with the Port's certification that this work is consistent with the approved Washington State Coastal Zone Management Program. This concurrence is based upon the Port's compliance with all applicable enforceable policies of the Coastal Zone Management Program, including Section 401 of the Federal Water Pollution Control Act.

Work authorized by this certification is limited to the work described in the October 25, 2000, JARPA, the Corp's Public Notice, and the plans submitted by the Port to Ecology for review and written approval.

This certification shall be withdrawn if the Corps does not issue a Section 404 permit. It shall also be withdrawn if the project is revised in such a manner or purpose that the Corps or Ecology determines the revised project must obtain new authorization and public notice. The Port will

then be required to reapply for state certification under Section 401 of the Federal Clean Water Act.
This certification is subject to the conditions contained in the enclosed Order and to the water quality and aquatic resource related conditions of the following permits and approvals:

- The Hydraulic Project Approval (HPA) be issued by the Washington State Department of Fish & Wildlife (WDFW).
- NPDES permit #WA-002465-1, issued by the Department of Ecology on February 20, 1998 and modified on May 29, 2001.
- NPDES General Stormwater Permit for Construction Activity #SO3-00491 issued by the Department of Ecology on April 4, 2001.

If you have any questions, please contact Ann Kenny at (425) 649-4310. Written comments can be sent to her at the Department of Ecology, Northwest Regional Office, 3190 160th Avenue SE, Bellevue, Washington, 98008-5452. The enclosed Order may be appealed by following the procedures described in the Order.

Sincerely,

Gordon White

Gordon White
Program Manager
Shorelands and Environmental Assistance Program

GW:AK
Enclosure
cc: Michelle Walker, Corps of Engineers
Gail Terzi, Corps of Engineers
Tony Opperman, WDFW
Tom Sibley, NMFS
Nancy Brennan-Dubbs, USFWS
Joan Cabreza, EPA
Kimberly Lockard, Airport Communities Coalition

IN THE MATTER OF GRANTING A WATER QUALITY CERTIFICATION TO: the Port of Seattle, in accordance with 33 U.S.C. 1341 FWPCA § 401, RCW 90.48.260 and WAC 173-201A.	**ORDER #1996-4-02325 (Amended -1)** Construction of a Third Runway and related projects. Components of the project include construction of a 8,500-foot-long third parallel runway with associated taxiway and navigational aids, establishment of standard runway safety areas for existing runways, relocating S. 154th Street north of the extended runway safety areas and the new third runway, development of the South Aviation Support Area and the use of on-site borrow sources for the third runway embankment.

TO: Port of Seattle
Seattle-Tacoma International Airport
Attn: Elizabeth Leavitt
17900 International Blvd., Suite 402
SeaTac, WA 98188-4236

The Port of Seattle (Port) requested a water quality certification from the state of Washington for the above-referenced project pursuant to the provisions of 33 U.S.C. 1341 (FWPCA§ 401). The request for certification was made available for public review and comment through the U.S. Army Corps of Engineer's Second Revised Public Notice No. 1996-4-02325 dated December 27, 2000, as amended by the Corps' Amendment and Erratum to the Second Revised Public Notice dated January 17, 2001. Ecology issued a 401 certification for this project on August 10, 2001. Ecology has decided to amend that certification. Accordingly, Ecology hereby rescinds Order Number 1996-4-02325 and replaces it in its entirety with Order Number 1996-4-02325 (Amended-1).

The Third Runway site and related Master Plan Update projects and on-site mitigation are located in Sections 4, 5, and 9, Township 22N, Range 4E and Sections 20, 21, 28, 29, 32, 33, Township 23 N, Range 4E in King County. Offsite mitigation will be located in Section 31, Township 22N, Range 5E in King County. The project areas, on-site mitigation and the proposed offsite mitigation are located within Water Resource Inventory Area 9. The projects covered by this Order are described in detail in the December 27, 2000 Public Notice issued by the U.S. Army Corps of Engineers, the October 25, 2000 Joint Aquatic Resource Permit Application (JARPA) and in the plans approved by Ecology as a part of this Order.

For purposes of this Order, the term "Port" shall mean Port of Seattle and its agents or contractors.

Work authorized by this Order is limited to the work described in the October 25, 2000, JARPA, as amended, unless modified by this Order or by conditions contained in other permits sought for the Master Plan Update Improvement projects.

AUTHORITIES:

In exercising authority under 33 U.S.C. 1341 and RCW 90.48.260, Ecology has investigated this application pursuant to the following:

A. Conformance with applicable water quality-based, technology-based, and toxic or pretreatment effluent limitations as provided under 33 U.S.C. Sections 1311, 1312, 1313, 1316, and 1317 (FWPCA Sections 301, 302, 303, 306, and 307);

B. Conformance with the state water quality standards as provided for in Chapter 173-201A WAC, and authorized by 33 U.S.C. 1313 and Chapter 90.48 RCW, and with other appropriate requirements of state law; and,

C. Conformance with the requirement to use all known, available and reasonable methods to prevent and control pollution of state waters as provided by RCW 90.48.010.

WATER QUALITY CERTIFICATION CONDITIONS:

In view of the foregoing and in accordance with 33 U.S.C. 1341, RCW 90.48.260 and Chapter 173-201A WAC, by this Order water quality certification is granted to the Port, subject to the following conditions:

A. **Water Quality Standard Conditions:**

1. Water Quality Criteria

Des Moines Creek (WA-09-2000), Miller Creek (WA-09-2005) and Walker Creek (1223370474523) are Class AA waters of the state. Certification of this proposal does not authorize the Port to exceed applicable state water quality standards (173-201A WAC) or sediment quality standards (173-204 WAC). Water quality criteria contained in WACs 173-201A-030(1) and 173-201A-040 shall apply to this project, unless otherwise authorized by Ecology. This Order does not authorize temporary exceedances of water quality standards beyond the limits established in WAC 173-201A-110(3). Furthermore, nothing in this Order shall absolve the Port from liability for contamination and any subsequent cleanup of surface waters or sediments occurring as a result of project construction or operations.

Des Moines Creek has been identified on the current FWCPA Section 303(d) list as exceeding state water quality standards for fecal coliform. This project shall not result in further exceedances of this standard.

2. Instream/Shoreline Work Monitoring Plan

a) The Port shall submit a monitoring plan for each in-water or shoreline construction project. The monitoring plan shall be submitted to Ecology for review and approval at least thirty (30) days prior to the start of construction. No construction shall begin until the Port receives written approval of the monitoring plan from Ecology.

b) All monitoring will be reviewed for compliance with WAC 173-201A.

c) Port staff or contractors qualified to monitor for water quality compliance shall be on-site during project construction to carry out monitoring and inspect erosion and sedimentation control measures in order to ensure that water quality standards are not exceeded.

d) In the monitoring plan, the Port shall demonstrate to Ecology that any mixing zone is minimized in conformance with WAC 173-201A-100(6).

e) At a minimum, the monitoring plan shall include the measurement of turbidity and pH at an agreed point upstream of the point of in-water work or shoreline work and an agreed downstream point not to exceed 100 feet. The monitoring method shall be by a portable turbidimeter and a pH meter following the prescribed maintenance, operating, and calibration procedures in the instrument's instruction manuals. Alternatively, a grab sample can be analyzed by a laboratory accredited under the provisions of Accreditation of Environmental Laboratories, Chapter 173-50 WAC.

f) If a visual sheen is observed the Port shall sample for oil and grease.

The Minimum Detection Level (MDL) for oil and grease is 0.2 mg/L using trichlorotrifluoroethane extraction and gravimetric analysis using EPA Method 413.1. The quantitation level (QL) for oil and grease is 1.0 mg/L (5 x MDL). An equivalent method is Method 1664 using normal hexane (n-hexane) as the extraction solvent in place of 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113; Freon-113). An equivalent method is total petroleum hydrocarbons with a MDL of 0.1 mg/L using Gas Chromatography and Flame Ionization Detector (FID) and Method WTPH-Dx Diesel (WTPH-D) from the Washington State Department of Ecology Method WTPH-D. The quantitation level (QL) for TPH-Dx is 0.5 mg/L (5 x MDL).

g) If monitoring indicates turbidity standards are not being met at the boundary of the mixing zone, measures shall immediately be taken to reduce turbidity rates, such as slowing the rate of work, placement of additional sediment curtains, etc. A field log in which the results from the turbidity sampling have been recorded shall be maintained at the project site. The field log shall be made available to Ecology staff upon request.

h) Monitoring results shall be submitted every other month to Ecology's Federal Permit Manager, SeaTac Third Runway.

B. **Permit Duration:**

1. This Order shall be valid during construction of the project. The following provisions of this Order shall be valid during long-term operation and maintenance of the project:
   a) In Condition D, Wetland, Stream and Riparian Mitigation, as follows: The mitigation areas to be protected by restrictive covenants, and the Final Natural Resource Mitigation Plan as amended, shall remain in effect in perpetuity.

   b) In Condition D(7), provisions regarding wetland, stream, and riparian mitigation monitoring and reporting shall remain in effect as specified therein.

   c) In Condition E (3), the Surface Water and Ground Water Monitoring plan shall remain in effect as specified in that plan but in no event for a duration less than eight (8) years.

   d) In Condition F (1), the plan to monitor potential contaminant transport to soil and groundwater via subsurface utility lines shall remain in effect as specified in that plan but in no event for a duration less than eight (8) years.

   e) In Condition I, Conditions for Mitigation of Low Flow Impacts, as follows: The low streamflow facilities, and the revised low streamflow plan as amended, shall remain in effect in perpetuity.

   f) In Condition J, Operational Stormwater Requirements, as follows: Those provisions of this condition, including the Comprehensive Stormwater Management Plan, that are incorporated into and superceded by any future Ecology-approved NPDES permit for the Seattle-Tacoma International Airport (STIA), shall be superceded as determined in that permit. Any conditions not incorporated into a future Ecology-approved NPDES permit for STIA shall remain in effect as provided in this condition.

2. The Port shall reapply with an updated JARPA if **seven years** elapse between the date of the issuance of this Order and completion of the project construction and/or discharge for which the federal license or permit is being sought.

3. The Port shall submit an updated application to Ecology if the information contained in the October 25, 2000 JARPA is altered by subsequent submittals to the federal agency and/or state agencies. Within 30 days of receipt of an updated application Ecology will determine if a modification to this Order is required.

4. Any future construction-related activities that could impact waters of the state at this project location, emergency or otherwise, that are not defined in the October 25, 2000 JARPA, this Order, or have not been approved in writing by Ecology, are not authorized by this Order. Such proposed actions shall be reviewed with Ecology for its written approval prior to implementation if the activity requires §401 certification or is otherwise within Ecology's statutory authorization.

C. **Notification and Reporting Requirements:**

1. Notification shall be made to Ecology's Federal Permit Manager, SeaTac Third Runway at 425-649-4310, 425-649-7098 (Fax), mail: 3190 160th Avenue SE, Bellevue, WA 98008 or by e-mail at aken461@ecy.wa.gov for the following activities:

   a) at least thirty (30) days prior to the pre-construction meeting to review environmental permits and conditions,

   b) at least ten (10) days prior to starting construction of each of the projects identified in Table A-3 (Comprehensive Stormwater Management Plan, Volume 2) and each of the mitigation sites identified in the Natural Resource Mitigation Plan, and

   c) within seven (7) days after the completion of construction of each of the projects identified in Table A-3 (Comprehensive Stormwater Management Plan, Volume 2) and each of the mitigation sites identified in the Natural Resource Mitigation Plan.

NOTE: The required notifications shall include the Port's name, project name, project location, the number of this Order, the name of contractor and any subcontractor, contact and contact's phone number.

2. The Port shall ensure that all appropriate Project Engineer(s) and the Lead Contractor(s) at the project site and/or mitigation sites have read and understand relevant conditions of this Order and all permits, approvals, and documents referenced in this Order.

   a) The Port shall provide to Ecology a signed statement, **Attachment A,** from each Project Engineer(s) and Lead Contractor(s) that they have read and understand the conditions of this Order and the above-referenced permits, plans, documents and approvals.

   b) These statements shall be provided to Ecology no less than seven (7) days before each Project Engineer or Lead contractor begins work at the project or mitigation sites.

3. All reports, plans, or other information required to be submitted by this Order shall be submitted in triplicate to Ecology's Federal Permit Manager, SeaTac Third Runway, at 3190 160th Avenue SE, Bellevue, WA 98008-5452.

4. Documents required to be submitted to Ecology for review and/or approval by this Order shall be submitted to Ecology by the time specified in this order. Failure to submit documents by the required time may result in the revocation of this Order. The Port may, on a case-by-case basis, submit a written request for an extension of the specified submittal deadline for a document. Ecology will consider the reasonableness of the

request for an extension and may grant an extension for a period of time it deems appropriate. **Ecology will provide any such extension to the Port in writing only.**

No document, report or plan required by this Order shall be deemed approved until the Port receives written verification of approval from Ecology.

D. **Wetland, Stream and Riparian Mitigation:**

1. Required Mitigation: Mitigation for this project shall be completed as described in the following documents with the following additions and clarifications:

- the Final Natural Resource Mitigation Plan (NRMP), Master Plan Update Improvements, STIA, dated December 2000 (Parametrix, Inc.).
- Appendixes A-E, Design Drawings, Natural Resource Mitigation Plan, STIA, dated December 2000 (Parametrix, Inc.).
- the Revised Grading and Planting Plan for the Auburn Wetland Mitigation site dated June 28, 2001 (Parametrix, Inc.).
- the revised NRMP performance standards found in Tables 4.2-1, 4.2-2, 5.1-7, 5.2-3, 5.2-8, 5.2-12, 5.2-16, 5.3-2, 5.3-6, and 7.7-1 received July 31, 2001 (Parametrix, Inc.).
- the revised Borrow Site Three plan sheets and drawings dated June 2001 and received by Ecology on June 18, 2001 (Hart Crowser).

The Port shall amend and/or clarify the documents identified in Condition D.1 as follows:

a) The Port shall increase the duration of monitoring from ten (10) to fifteen (15) years.

b) Table 4.2-1 of the NRMP (July 31, 2001) outlines the performance standards for vegetation cover by vegetation zone and monitoring year. A note shall be added to the table that states: "Invasive plant species cover will be monitored during all monitoring years."

c) In addition to the non-native invasive species listed in Table 4.2-2 of the NRMP (July 31, 2001), hedge bindweed *(Convolvulus sepium),* giant knotweed *(Polygonum sachalinense)* and evergreen blackberry *(Rubus laciniatus)* shall be monitored and controlled in the mitigation sites.

d) All performance standards addressing cover of non-native plants shall read: "Cover of non-native invasive species will be no greater than 10% in any year in newly planted or enhanced areas."

e) Table 5.1-7 of the NRMP (July 31, 2001) states that shade cloth will be placed over the new channel. The Port shall provide a map of the location for the shade cloth, details on how it will be installed, and a schedule of installation and removal.

f) The Port shall provide Ecology with written documentation of the implementation of any of the contingency measures and adaptive management measures set forth in the NRMP. Temporary erosion and sedimentation measures approved by Ecology shall remain in effect for all adaptive management measures or contingency measures implemented. Any problems identified throughout the mitigation sites shall be immediately corrected. Implementation of corrective actions shall be done within the confines of the contingency measures identified in the NRMP. All contingency measures shall be implemented in a manner such that they do not exceed state water quality standards.

g) The Port shall monitor hydrologic conditions of all wetlands downslope of the Third Runway embankment in the Miller, Walker and Des Moines Creek sub-basins. Hydrologic monitoring using piezometers and shallow hand dug soil pits in undisturbed wetlands downslope of the Third Runway embankment shall be conducted with sufficient frequency to determine wet season trends. The Port shall immediately begin conducting twice-monthly hydrologic monitoring during the wet season, November through May, and shall continue such monitoring for at least three (3) years after completion. Maps of sample locations and vegetation in the surrounding areas, observation of stressed vegetation, any adaptive management implemented in the surrounding areas, comparison to baseline data, and conclusions shall be documented and submitted to Ecology on a monthly basis during that period. At the end of each water year, the Port shall complete a trends analysis with proposed contingency measures identified and a schedule for completion of proposed contingency measures.

h) Existing wetland and mitigated wetland boundaries (including all areas down slope of the Third Runway embankment, Vacca farm, the borrow sites, and the Auburn mitigation site) shall be delineated at years five (5), ten (10), and fifteen (15). A licensed survey crew shall survey the wetland points established. The delineation map and comparisons to previous delineation maps shall be furnished to Ecology by December 31st for each of the years in which a delineation is conducted. If the delineation shows the wetland boundaries have decreased then additional in-basin mitigation may be required by Ecology.

i) Final performance standards for the replacement drainage channel shall read: "Construct the replacement channel to convey all storm events equal to or less than the 100-year, 24-hour design storm and seepage water collected by the embankment drains layer and adjacent areas." (Revised Performance Standards, Table 5.2-12 NRMP)

j) Revised Table 5.2-12 of the NRMP (July 31, 2001) proposes a performance standard that monitors the change in plant species in undisturbed wetlands, where the hydrology is being replaced through inputs from the replacement drainage channel. Emergent non-invasive plants provide a better indicator for general plant species trends over time than trees and shrubs because typically their root structures are shallower, and subsequently respond to hydrologic changes more quickly. The Port shall amend the monitoring condition in Table 5.2-12 to read: "Wetland indicator status (WIS) of the dominant noninvasive plant species shall not differ from pre-project conditions during or at the end of the monitoring period. Each vegetative strata (trees, shrubs and emergents) shall be assessed separately, and have separate conclusions. Statistically valid sampling procedures will be employed to monitor theses potential changes, in all areas where there is a potential to change the post construction hydrology (down slope of the embankment, and the borrow sites). WIS status of the vegetation will be calculated as described in the 1987 USACE or Washington State Department of Ecology delineation manuals."

k) In all areas where soil saturation is being monitored the performance standards shall include the following conditions: "Other wetlands with predominantly mineral soils shall have groundwater within the upper 10 inches from at least March to mid-April in years of normal rainfall."

l) Soils stockpiled for mitigation purposes for over one year require the reintroduction of naturally occurring microbes, prior to use in mitigation sites. This shall be accomplished through introduction of soils microbial inoculants, or through introduction of well decomposed organic matter.

m) The Port shall redevelop the sample data sheets to meet all the monitoring requirements set forth this order.

n) <u>Auburn Mitigation Site</u>- Emergent marsh plants shall be planted with rhizomes 12" on center (o.c.) instead of the 18" o.c. currently specified. Areas that are designated for hydroseeding that have visible surface water at the time of planting those areas shall be planted with plugs. Routine maintenance, such as, weeding, removal of non-native species, and watering, shall occur at least twice a year in all areas and more often in areas if needed. The maintenance crew shall be overseen by a wetland biologist to assist with identifying invasive species and identifying problem areas.

o) <u>Vacca Farm Mitigation Site</u>- Revised Table 5.1-7 of the NRMP (July 31, 2001) Final performance standards shall have a note added that reads: "Observable surface flow must be present in the created channel at all times."

p) Contingency measures and additional monitoring of the mitigation areas shall be required by Ecology if wetland monitoring reveals that vegetation establishment or wildlife use of the wetland is not sufficient to meet the success standards. Additional monitoring may be required beyond the fifteen (15) year period if mitigation success is not achieved within the fifteen (15) year monitoring period.

q) The wetland mitigation planting plan shall be field inspected by Parametrix, Inc. or another qualified wetland consulting firm during construction and planting to ensure proper installation.

r) The boundaries of the mitigation area and buffers shall be permanently marked with stakes at least every 100 feet or with construction fencing. The marking shall include signage that clearly indicates that mowing and fertilizer/pesticide applications are prohibited within mitigation areas.

s) Ecology and the U.S. Army Corps of Engineers shall be notified a minimum of three days in advance of field monitoring work by the Port. Ecology or its designee shall be allowed access to all mitigation sites for the entire monitoring period.

2. Restrictive Covenants:

The Port shall place restrictive covenants on the deeds for the following mitigation sites: Miller Creek Mitigation Area; Miller Creek/Lora Lake/Vacca Farm Wetland and Floodplain Mitigation Area; Tyee Valley Golf Course Mitigation Area; Auburn Wetland Mitigation Area; and Des Moines Creek Mitigation Area (June 28, 2001, Foster, Pepper and Shefelman). The Port shall record the restrictive covenants with King County no later than sixty (60) days after the issuance by the U.S. Army Corps of Engineers of the Section 404 required for construction of the Master Plan Update projects.

Any changes to the restrictive covenants shall require written approval by Ecology.

Violation of any term of the restrictive covenants shall be considered a violation of this Order.

3. Submittal of a Revised Mitigation Plan

The Port shall submit to Ecology for its review and written approval a revised NRMP which includes the changes or additions required by this Order for review and written approval no later than December 31, 2001. The revised NRMP shall include revised plan sheets that address the corrections required in **Attachment B**.

If, after revision of the NRMP required by this Order, the Port submits a further revised NRMP to the U.S. Army Corps of Engineers for review, the Port shall simultaneously submit the same revised NRMP to Ecology for its review and written approval. No fill shall be placed in waters of the state until the revised NRMP submitted to the U.S. Army Corps of Engineers has been approved by Ecology.

A Final NRMP shall be prepared and submitted to Ecology within three months after a Section 404 permit has been issued by the U.S. Army Corps of Engineers.

4. Mitigation for Temporary Impacts

The December 2000 NRMP indicates that up to 2.05 acres of wetlands will be affected by the construction of temporary stormwater management ponds and other construction impacts (p. 4-8 and other). Approximately 1.25 acres will result from the construction of the stormwater ponds in the Miller Creek basin. Ecology has determined that the impacts characterized as "temporary" in the NRMP are not temporal in nature because they will last for longer than a one-year period. The agency considers these impacts to be permanent and has determined that additional in-basin mitigation is necessary in the Miller Creek basin. Additional mitigation is necessary in order to mitigate for hydrologic, water quality and general habitat impacts that will result from the "temporary" impacts. In-basin mitigation is necessary to provide a "temporal lift" of wetland water quality and general habitat functions.

In order to compensate for these unmitigated impacts in the Miller Creek basin, the Port shall prepare a mitigation plan for submittal to Ecology for its review and written approval. A conceptual plan shall be submitted to Ecology for review and written approval by November 9, 2001. Upon receipt of Ecology's written approval of the mitigation plan, the Port shall amend the NRMP to incorporate the approved mitigation plan. The plan must contain the following elements:

a) The wetland/riparian zone comprised of Wetlands A17b/c/d (Wetland A17 Complex) and "Water D" shall be added to the wetland and buffer restoration/enhancement on Miller Creek. This area is depicted in **Attachment C** titled "Wetland A17 Complex". A 100-foot buffer shall be placed to envelop this system. Wetlands A17b/c/d comprise a total of 2.64 acres and "Water D" totals 0.16 acres for a combined total of 2.80 acres (not including the buffer). The buffer shall be averaged, similar to the buffer on Miller Creek. The buffer area may include location of the airport detection system (ADS) to the extent that its footprint has been minimized to the extent practicable.

b) The plan shall use the same goals and performance standards as the NRMP approved by this Order.

c) The plan shall evaluate the feasibility of improving the hydrologic connection of the Wetland A17 Complex to Miller Creek via "Water D", including but not limited to removing the underground pipe. If it is feasible to improve the hydrologic connection of the Wetland A17 Complex to Miller Creek via "Water D", the Port shall include a plan for improving the connection in its submittal.

d) Homes, driveways, concrete, fill, septic systems and other unsuitable material with be removed from Wetlands A17b/c/d, in a manner that meets the treatment protocol established for the Miller Creek restoration in the NRMP.

e) The plan shall develop a buffer restoration and re-vegetation plan for this area that meets the treatment protocol for the Miller Creek restoration in the NRMP. This shall include the removal of invasive species, and replanting of appropriate native species.

f) The plan shall evaluate the potential for wetland restoration, creation and enhancement within this new mitigation zone. This shall include evaluation of the reconnection of Wetlands A17b and A17c by removal of the road between them and removal of the road that separates Wetlands A17a and A17b. Ecology recognizes the need for an access road to the TRACON facility between Wetlands A17c and A17d.

g) The buffer shall be joined with the buffer on Miller Creek to the south.

h) A restrictive covenant shall be drafted for this additional mitigation area. The restrictive covenant shall be consistent with other restrictive covenants established for this project. The Port shall record the restrictive covenants with King County no later than sixty (60) days after the issuance by the U.S. Army Corps of Engineers of the Section 404 required for construction of the Master Plan Update projects.

5. Borrow Site One –

The performance standards for Borrow Site One in Table 5.3-6 of the NRMP (July 31, 2001) allow for monitoring of the wetland hydrology. The evaluation approach shall compare the shallow groundwater data collected to data collected pre-construction. Wetlands 48, B15, 32, B12, B4, and B1 shall be evaluated using this approach. The Port shall provide to Ecology bi-monthly hydrologic monitoring during the wet seasons, November through May, for at least three (3) years after completion. Maps of sample locations and vegetation in the surrounding areas, observation of stressed vegetation, any adaptive management implemented in the surrounding areas, comparison to baseline data, and conclusions shall be documented and submitted to Ecology on a monthly basis during that period. At the end of each water year the Port shall complete and submit to Ecology a trends analysis with proposed contingency measures identified and a schedule for completion of the proposed contingency measures.

6. Borrow Site Three- The following conditions apply to Borrow Site 3:

   a) The site plan from Hart Crowser titled Post Reclamation Topographic detail Borrow Area 3 Wetland Protection Swale HNTB revision (June 15, 2001 Draft) shows a flow dispersal trench overlapping with a small portion of Wetland 29. The flow dispersal trench shall not be constructed so that it is in the wetland.

   b) The wetland protection swale shall be lined (with HDPE or other similar liner material) where necessary to minimize infiltration of captured seepage water through the bottom of the swale (as described in Hart Crowser 2000b Sea-Tac Airport Third Runway – Borrow Area 3 Preservation of Wetlands; memorandum from Michael Kenrick and Michael Bailey (Hart Crowser) to Jim Thomson (HNTB) on wetland hydrology and proposed drainage swale design (October 20, 2000)).

   c) Excess water from the stormwater overflow structure shall be diverted away from the wetland protection swale to a stormwater detention pond (as described in Hart Crowser 2000b Sea-Tac Airport Third Runway – Borrow Area 3 Preservation of Wetlands; memorandum from Michael Kenrick and Michael Bailey (Hart Crowser) to Jim Thomson (HNTB) on wetland hydrology and proposed drainage swale design (October 20, 2000)).

   d) The Port shall monitor hydrologic conditions of wetlands remaining in and adjacent to the borrow sites. Hydrologic monitoring using piezometers and shallow hand dug soil pits in undisturbed wetlands associated with Borrow Site Three shall be conducted with sufficient frequency to determine wet season trends. Special emphasis shall be given to the area near where the drainage swale discharges into Wetland 29, to provide an early indication of hydrologic duress to plants in the wetland. The Port shall provide to Ecology bi-monthly hydrologic during the wet seasons, November through May, before construction and for at least three (3) years after completion. Maps of sample locations and vegetation in the surrounding areas, observation of stressed vegetation, any adaptive management implemented in the surrounding areas, comparison to baseline data, and conclusions shall be documented and submitted to Ecology on a monthly basis during that period. At the end of each water year the Port shall complete and submit to Ecology a trends analysis with proposed contingency measures identified and a schedule for completion of the proposed contingency measures.

   e) The wetland protection swale shall be inspected and maintained at a minimum frequency of two (2) times per year. Swale maintenance shall include adjustment of flow control weir boards to provide appropriate flows to Wetland 29, and removal of vegetation or fill in the swale which may interfere with the seepage collection and diversion functions of the swale. The weir shall be calibrated so that flow rates can be observed at any time.

f) **Increased Buffer Area**: In order to protect the hydrologic functions, and hydrology supporting Wetlands 29, 30, B5, B6, B7, and B9, all areas up slope of the wetlands within the property shall be included in the wetland buffer. Additionally, the Port shall ensure protection of hydrology to Wetlands 29, 30, B5, B6, B7, and B9 from future development. The wetland protection swale shall also be included in a restrictive covenant, with 25 foot buffers on either side of the swale. Those areas are depicted in **Attachment D (Revised)**, Borrow Area 3 Wetland Buffer. A restrictive covenant shall be drafted for this additional buffer area. The restrictive covenant shall be consistent with other restrictive covenants established for this project. The Port shall record the restrictive covenants with King County no later than sixty (60) days after the issuance by the U.S. Army Corps of Engineers of the Section 404 required for construction of the Master Plan Update projects. This condition applies only to property currently owned by the Port.

g) The performance standards in Table 5.3-6 of the NRMP (July 31, 2001) allow for monitoring of the surface water in Wetland 30. The evaluation approach states that shallow groundwater monitoring wells will be used. The evaluation approach shall be changed to provide that surface water depths are measured monthly during the period from December through April, and the monitoring results compared to pre-construction data.

7. Wetland, Stream and Riparian Mitigation Monitoring and Reporting:

   a) Monitoring of all wetland mitigation sites identified in the December 2000 NRMP and the June 2001 Auburn Grading and Planting Plan, as revised below, shall be incorporated into the Final NRMP submitted to Ecology.

      i) Monitoring shall be completed at least yearly for a fifteen (15) year period with initial monitoring starting after the first growing season after installation of plants. If at any point during the monitoring period the results of monitoring show that the success criteria established in the plan are not being met, Ecology may require corrective action, additional monitoring, and additional mitigation.

      ii) The Port shall prepare and submit annual monitoring reports to Ecology's Federal Permit Manager, SeaTac Third Runway, Northwest Regional Office, 3190 160th Avenue SE, Bellevue, WA 98008-5452 no later than December 31st of each year following the first year of the mitigation site work. Each year's monitoring report shall include photographic documentation of the project taken from permanent reference points. The Port shall identify and incorporate permanent reference points into the Final NRMP.

iii) As-Built Report: An as-built report documenting the final design of all wetland mitigation sites shall be prepared when the initial planting is completed. The report shall include the following:

- final site topography;
- photographs of the area taken from established permanent reference points;
- a planting plan showing species, densities, sizes, and approximate locations of plants, as well as plant sources and the time of planting;
- habitat features (snags, large woody debris, etc) and their locations;
- drawings in the report shall clearly identify the boundaries of the project;
- locations of sampling and monitoring sites; and
- any changes to the plan that occurred during construction.

The As-Built Report shall include detailed plans showing locations of all monitoring transects and locations. All vegetation sampling and analysis shall employ statistically valid sampling and analysis procedures during each of the monitoring events. Monitoring reports shall show all sampling locations, discuss trends and changes, discuss success in achieving performance standards or other implementation difficulties, provide remedies to address implementation problems, and set forth a timeline for their resolution. Supporting data and calculations shall be maintained by the contractor and made available to Ecology upon request.

iv) The As Built Report shall be sent to Ecology's Federal Permit Manager, SeaTac Third Runway within sixty (60) days of completing the mitigation site.

v) Any proposed changes to the wetland mitigation and monitoring protocol established in the NRMP and as revised by this Order, must be approved in writing by Ecology prior to implementation of any changes.

E. **Conditions for Acceptance of Fill to be used in Construction of the Third Runway and Associated Master Plan Update Improvements:**

The use of imported fill for projects for which the §404 permit was sought, e.g., Third Runway, Runway Safety Areas, South Aviation Support Area, and other appropriate Master Plan Update Improvements as determined by Ecology (Port 404 Projects) may result in impacts to wetlands or other waters of the state. To ensure compliance with measures designed to minimize potential impacts, the Port shall submit borrow site clean fill certification documentation described in the following sections to Ecology for review and written approval prior to fill placement.

1. Fill Documentation/Fill Criteria/Fill Source

The Port shall adhere to the following conditions to ensure that the fill placed for Port 404 Projects does not contain toxic materials in toxic amounts, thereby preventing the introduction of toxic materials in toxic amounts into waters of the state which includes wetlands.

a) Documentation
No later than five (5) business days prior to accepting any fill materials for use on Port 404 Projects, the Port shall submit to Ecology's Federal Permit Manager, SeaTac Third Runway, documentation certifying that the proposed fill source meets the criteria of this Order. The documentation shall contain an environmental assessment of the fill source and shall verify that excavated soil from the proposed fill source complies with the fill criteria set forth below. Findings of the environmental assessment are subject to the review of Ecology. Ecology reserves the right to disapprove fill materials following review of the Port's supporting documentation and a determination that the fill criteria were not met. In the event of such disapproval, Ecology reserves its rights to enforce the terms of the Order and require appropriate remedial measures.

The environmental assessment shall be conducted by an environmental professional in general conformance with the American Society for Testing and Materials Standard (ASTM) E 1527-00 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, and E 1903-97 Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process. At minimum, the document shall contain the following information:

i) Fill Source Description: Provide a description/location of the fill source, general characteristics of the fill source and vicinity, current use, and a site plan identifying the extent of the excavation, project schedule and the estimated quantity of fill to be transported to Port 404 Projects.

ii) Records Review: Obtain and review environmental records of the proposed fill source site and adjoining properties. In addition to the standard federal and local environmental record sources, the following Ecology environmental databases shall be reviewed:

- Confirmed & Suspected Contaminated Site Report
- No Further Action Site List
- Underground Storage Tank List
- Leaking Underground Storage Tank List
- Site Register.

Records review shall also contain historical use information of the fill source and the surrounding area to help identify the likelihood of environmental contamination.

iii) Site Reconnaissance: Documentation of visits to each site that identifies current site use and site conditions to assist in identifying the likelihood of environmental contamination and/or the potential migration of hazardous substances onto the site from adjoining properties.

iv) Fill Source Sampling: Collect and analyze fill materials for the potential contaminant(s) identified in the Phase I Environmental Site Assessment. At a minimum, fill materials from each fill source shall be analyzed for the following hazardous substances

- Total Antimony
- Total Arsenic
- Total Beryllium
- Total Cadmium
- Total Chromium[1]
- Total Copper
- Total Lead
- Total Mercury
- Total Nickel
- Total Selenium
- Total Silver
- Total Thallium
- Total Zinc
- NWTPH-HCID

1 Chromium (VI) shall be analyzed if the results of the Phase I Environmental Site Assessment show a likelihood of Chromium (VI) contamination.

For fill source characterization, the following table presents the **minimum** sampling schedule for fill sources with no likelihood of environmental contamination.

Cubic Yards of Soil	**Minimum Number of Samples**
<1,000	2
1,000 – 10,000	3
10,000 – 50,000	4
50,000 – 100,000	5
>100,000	6

Samples shall be collected at locations that are representative of the fill destined for Port 404 Projects.

For fill sources with suspected contamination identified by the Phase I Environmental Site Assessment or with complex site conditions, please consult with Ecology's Federal Permit Manager, SeaTac Third Runway for the appropriate sampling requirements.

b) Fill Criteria

The results of the Phase II Environmental Site Assessment sampling and testing shall be compared to the fill criteria to determine the suitability of the fill source for Port 404 Projects.

The following table establishes the fill criteria limitations for the hazardous substances identified in Section E1(a)(iv) of this Order.

Hazardous Substances	Fill Criteria **mg/kg**[2]
Antimony	16
Arsenic	20
Beryllium	0.6
Cadmium	2
Chromium[3]	42/2000
Copper	36
Lead[4]	220/250
Mercury	2
Nickel[5]	100/110
Selenium	5
Silver	5
Thallium	2
Zinc	85
Gasoline	30
Diesel[6]	460/2000
Heavy Oils	2000

2 mg/kg ≡ milligrams per kilogram

3 Fill with total chromium concentrations greater than 42 mg/kg and less than 2000 mg/kg may be placed to within six feet of the ground surface. No fill with total chromium concentrations greater than 42 mg/kg may be placed within the first six feet of the embankment. No fill with chromium (VI) concentrations greater than 19 mg/kg may be placed within the embankment.

4 Fill with total lead concentrations greater than 220 mg/kg and less than 250 mg/kg may be placed to within six feet of the ground surface. No fill with total lead concentrations greater than 220 mg/kg may be placed within the first six feet of the embankment.

5 Fill with total nickel concentrations greater than 100 mg/kg and less than 110 mg/kg may be placed to within six feet of the ground surface. No fill with total nickel concentrations greater than 100 mg/kg may be placed within the first six feet of the embankment.

6 Fill with diesel range organics concentrations greater than 460 mg/kg and less than 2000 mg/kg may be placed to within six feet of the ground surface. No fill with diesel range organics concentrations greater than 460 mg/kg may be placed within the first six feet of the embankment.

For hazardous substances other than those identified in the above fill criteria table that have been identified in the Phase II Environmental Site Assessment, the Port shall consult with Ecology's Federal Permit Manager, SeaTac Third Runway for the applicable fill criteria.

As an alternative to applying the limitations listed above for the material within the top six feet of the existing ground surface and/or within the first six feet of the embankment (as noted in footnotes two through six above), the Port may construct a "drainage layer cover" (that layer immediately above the drainage layer of the embankment) that will measure at least forty (40) feet thick at the face of the embankment and will reduce in height to the east at a rate of two (2) percent. The fill criteria listed above for the first six feet of the embankment will apply to the drainage layer cover. If proposed fill (for either the drainage layer cover or the rest of the embankment or other Port 404 Projects) does not meet the fill criteria in Condition E.1.(b), the Port can demonstrate the suitability of that fill by employing a Synthetic Precipitation Leaching Procedure (SPLP), SW-846 Method 1312. SPLP testing shall conducted in accordance with the SPLP work plan, **Attachment E**, or as amended in the future. Where the Port utilizes the SPLP method to demonstrate the suitability of fill, SPLP test results shall be provided to Ecology at least ten (10) business days prior to fill placement. As per Condition E.1.(a), Ecology reserves the right to disapprove the use of fill analyzed under the SPLP method.

c) Fill Sources
Fill materials for Port 404 Projects shall be limited to the following three sources:

i) State-certified borrow pits
ii) Contractor-certified construction sites
iii) Port of Seattle-owned properties.

d) Prohibited Fill Sources
The following fill sources are prohibited for use on Port 404 Projects:

- Fill which consists in whole or in part of soils or materials that are determined to be contaminated following a Phase I or Phase II site assessment.

- Fill which consists in whole or in part of soils or materials that were previously determined to be contaminated by a Phase I or Phase II site assessment and have been treated in some manner so to be considered re-mediated soils or fill material.

2. As-Built Documentation

The Port shall provide to Ecology for review monthly summaries of:

- Names and locations of fill sources placed for the previous month
- Quantities of fill materials from these fill sources
- Locations and elevations of fill source materials placed within the Port 404 Projects.

Ecology may require additional compliance conditions and/or corrective actions upon Ecology's review of the as-built documents. The monthly summaries shall be provided to Ecology no later than fifteen (15) days following the last day of the month.

3. Post Construction Monitoring
The Port shall monitor runoff and seepage from Port 404 Projects where fill is placed for compliance with applicable Washington State surface water criteria. Ground water down-gradient from the fill area shall be monitored for compliance with applicable ground water criteria.

Within 60 days after the issuance of the 401 Water Quality Certification for the Master Plan Update Improvements, the Port shall submit to Ecology for review and written approval a Surface Water and Ground Water Monitoring Plan. The monitoring plan shall be designed to detect impacts of the fill embankment to the receiving water and to the ground water during fill placement and post fill placement. In the event monitoring detects exceedances of the water quality criteria in either surface or ground water; Ecology may revise the fill criteria and/or require corrective action.

F. **Conditions to Prevent Transport of Contaminants:**

1. All Master Plan Update Improvements and all associated utility corridors shall be constructed in a manner that will prevent the possible interception of contaminated groundwater originating from the Airport Maintenance and Operations Area or other potentially contaminated Seattle-Tacoma International Airport (STIA) areas. The Port shall submit to Ecology proposed construction BMPs to prevent interception of contaminated groundwater by utility corridors and a plan to monitor potential contaminant transport to soil and groundwater via subsurface utility lines at the STIA and submit it to Ecology for review and written approval no later than November 9,

2001. The plan shall be submitted to Ecology's Federal Permit Manager, SeaTac Third Runway.

2. The Port shall have staff trained in the detection of hazardous materials and contaminated soils or water inspect on a regular basis all areas where there is clearing and grading, or construction under way by Port contractors or employees. If hazardous materials or contaminated soils or other indications of contamination are discovered the Port shall immediately cease construction in the suspect area, secure the site and clean up the area in accordance with the Model Toxics Control Act (MTCA), Chapter 70.105d RCW, the Hazardous Waste Management Act, Chapter 70.105 RCW, and with generally accepted best management practices.

3. The Port shall administer and periodically update the contaminant database and contaminant maps and figures for the STIA. The database shall be updated as new information is received. The maps and figures shall be updated annually and delivered to Ecology's Federal Permit Manager, SeaTac Third Runway in a report of findings for review. Maps and figures shall be similar to the maps and figures shown in the Port's "Analysis of Preferential Ground Water Flow Paths Relative to Proposed Third Runway," dated June 21, 2001.

4. The Port shall collect all new environmental data generated by construction activities, cleanup actions, or any other environmental investigations of soil and groundwater throughout the STIA. The information shall be used to update the contaminant database. The Port, airport tenants, and other entities conducting environmental investigations shall continue to provide reports of ongoing cleanup actions and any new contamination discovered to Ecology as required by the MTCA.

G. **Dam Safety Requirements:**

1. All facilities identified in Table 3-1 of the Comprehensive Stormwater Management Plan (CSMP) that meet the requirements of Chapter 173-175 WAC (Dam Safety Regulations) shall obtain a Dam Safety Permit from Ecology prior to commencement of construction. If any stormwater facilities identified in the CSMP change during final design such that they meet the requirements of Chapter 173-175 WAC, those facilities shall obtain a Dam Safety Permit from Ecology prior to commencement of construction.

H. **Conditions for Upland Construction Activities:**

1. During construction the Port shall comply with all stormwater requirements within the National Pollutant Discharge Elimination System (NPDES) Permit No. WA-002465-1 as modified on May 29, 2001 for this project.

2. The project shall be clearly marked/staked prior to construction. Clearing limits, travel corridors and stockpile sites shall be clearly marked. Sensitive areas to be protected from disturbance shall be delineated and marked with brightly colored construction fence, so as to be clearly visible to equipment operators. All project staff shall be trained to recognize construction fencing that identifies sensitive areas boundaries (wetlands, streams, riparian corridors, buffers, etc.). Equipment shall enter and operate only within the delineated clearing limits, corridors and stockpile areas.

3. The Port shall follow and implement all specifications for erosion and sediment control specified in the Stormwater Pollution Prevention Plan (SWPPP) and/or Erosion and Sediment Control (ESC) plan as required in the NPDES permit. The erosion control devices shall be in place before starting construction and shall be maintained, so as to be effective throughout construction.

4. Stormwater Detention for New Outfalls: Any new diversion ditch or channel, pond, trap, impoundment or other detention or retention BMP constructed at the site for treatment of stormwater shall be designed, constructed, and maintained to contain and provide treatment for the peak flow for the ten (10)-year 24 hour precipitation event estimated from data published by the National Oceanic and Atmospheric Administration.

5. The Port shall periodically inspect and maintain all erosion control structures. Inspections shall be conducted no less than every seven (7) days from the start of the project to final site stabilization. Daily inspections of sedimentation ponds shall occur during wet seasons. Additional inspections shall be conducted after rainfall events greater than 0.5 inches per 24-hour period, to ensure erosion control measures are in working condition. These inspections shall be conducted within 24 hours after the event. Any damaged structures shall be repaired immediately. If it is determined during the inspection that additional measures are needed to control stormwater and erosion, such measures shall be implemented immediately. Inspections shall be documented in writing and shall be available for Ecology's review upon request.

6. Wash water containing oils, grease, or other hazardous materials resulting from wash down of equipment or working areas shall not be discharged into state waters except as authorized by an NPDES permit or state waste discharge permit.

7. Machinery and equipment used during construction shall be serviced, fueled, and maintained on uplands in order to prevent contamination to surface waters.

8. Grading/Construction in Borrow Areas: The depth of the excavation at the borrow areas shall be limited to a depth ten (10) feet above the maximum seasonal groundwater table. The maximum seasonal ground water table shall be determined by

the monitoring wells on Port property. Depth of excavation and maximum seasonal ground water elevations shall be submitted annually to Ecology's Federal Permit Manager, SeaTac Third Runway.

I. **Conditions for Mitigation of Low Flow Impacts:**

1. Ecology has reviewed and approved the December 2000 Low Streamflow Analysis and the Summer Low Flow Impact Offset Facility Proposal dated July 23, 2001. In order to ensure clarity, within 45 days of receipt of this Order the Port shall submit a revised plan integrating the Low Streamflow Analysis and Summer Low Flow Impact Offset Facility Proposal into a single document that addresses the following issues:

   a) General:

      i) The revised plan shall be stamped by a licensed professional civil engineer.
      ii) All supporting documents shall be clearly labeled and included in a technical appendix and/or on one clearly labeled CDROM. Only those files which directly correspond to results presented in the report should be included.
      iii) The plan shall include a specific section discussing the accuracy of the calibration in predicting low flows at upper stream gauges, and a statement of adequacy of the calibrations for the purpose of low flow simulation.
      iv) Revised conceptual drawings for reserve storage vaults shall be submitted that include any changes required by this Order and that include details on how constant discharge will be maintained in reservoirs with variable hydraulic head pressures. Reserve vault inlets and outlets shall be configured so that water is added/discharged from the middle of the reserve storage depth in order to avoid disturbing sediments and/or floatables that could be present in the reserve vault. In order to ensure that reserve water is well aerated, reserve storage vaults shall include open ventilation consistent with King County Surface Water Design Manual wetvaults. Mechanical aeration shall be provided if grating is not feasible. Conceptual drawings shall include detail on reserve water outfalls. Where feasible, outfalls shall discharge directly to wetlands that are adjacent (in hydrologic continuity) to streams rather than directly to streams.
      v) A final Operations and Maintenance Plan shall be included in the revised plan. The Operations and Maintenance plan section of the report shall require the release of any water remaining in the reserve vaults during the month of November or until substantial rains occur. The Operations and Maintenance Plan shall address management of accumulated sediments in reserve storage vaults. All accumulated sediments shall be disposed of in

an appropriate upland disposal site.

vi) The revised plan shall include a monitoring protocol to determine whether placement of the Third Runway embankment fill and other fill used for Master Plan Update Improvements meets fill specifications for type of material, meets specifications for compaction rates, and meets assumption for infiltration rates.

vii) The revised plan shall include contingency measures to offset reduced recharge in the event the Third Runway embankment fill and other fill used for Master Plan Update Improvements does not meet performance standards for infiltration rates.

viii) The revised plan shall include information demonstrating that low flow mitigation (vault releases) can be conveyed to streams without being lost to soil.

ix) The Port shall develop a pilot program to test one reserve stormwater vault for performance. The Port shall include a proposal for a pilot in the revised plan. The pilot shall be completed within three years after receipt of the Section 404 permit from the U.S. Army Corps of Engineers.

x) The revised plan shall identify and analyze all direct or indirect impacts to wetlands as a result of low flow impacts and the proposed low flow mitigation. The revised plan shall contain contingencies to mitigate for impacts to wetlands if wetland impacts are identified as a result of monitoring.

b) Des Moines Creek-

i) The revised plan shall provide data comparing the existing simulation of low flows against the Tyee Golf Course weir gauge data. The Port shall provide representative hydrographs, associated discussion and statement of adequacy of the calibration for simulating low flows.

ii) SDS3 vault design (sheet C141) indicates that not all inlet pipes are tributary to the reserve storage vault. The revised plan shall factor into the vault filling calculations the effects of having a reduced tributary area.

iii) SDS4 vault design (sheet 139) shall be reconfigured to show the vault inlet pipe at a lower elevation. A note similar to the one found on exhibit C131 should be included here. The Port shall evaluate the feasibility of providing reserve storage only in the SDS3 vault.

c) Walker Creek-

i) In place of the Port's proposal to line 3.5 acres of filter strip within the SDW2 subbasin, the Port's revised plan shall provide that low flow mitigation water for Walker Creek will be obtained from the collection of winter runoff from the 69 acres of impervious surface being added in the

Walker Creek non-contiguous groundwater basin. Reserve stormwater collected from this area may be stored in either the proposed 15-acre foot vault in Walker Creek or in the SDS3 vault. If, within thirty (30) days of receiving this order, the Port submits to Ecology information demonstrating that another feasible and implementable alternative exists, Ecology will review the alternative and consider amending this Order to allow implementation of the alternative.

ii) The current proposal for Walker Creek assumes no contribution from the Third Runway embankment fill. If the revised plan includes a reinstatement of the Third Runway embankment model, the area of the fill embankment tributary to Walker Creek shall be verified and modeled accordingly.

d) Miller Creek-

i) The revised plan shall verify whether the 1991 impact number is 0.11cfs or 0.12cfs. Unless shown otherwise, Ecology shall presume that 0.12cfs is the correct number.
ii) The revised plan shall include the correct "Low Flow Miller 91-94.xls" file and back-up data that produce a future 1991 7-day low flow of 0.67cfs shall be included on CDROM.
iii) The revised plan shall include documentation that clarifies whether the existing (1994) condition 1991 low flow is 0.784cfs as was used in electronic files or 0.79cfs as was presented in the July 23, 2001 memorandum.
iv) The revised plan shall correct the impervious acreage figures provided for the new North Employees Parking Lot (NEPL) vault to reflect 26.29 acres of impervious (Miller 2006 HSPF model), rather than 32.31 acres.
v) The Port shall evaluate orifice sizing and determine whether a change in orifice size and/or a reduction in the number of reserve stormwater vaults is warranted. The revised plan shall evaluate vault locations for feasibility and special design considerations (e.g., upstream spill control, oil controls, downstream compost filters, etc.) to ensure that reserve stormwater from the NEPL and cargo vaults will receive adequate treatment to ensure water quality.
vi) The revised plan shall include BMPs developed to ensure infiltration into the Third Runway embankment rather than into the Third Runway embankment conveyance system.
vii) The revised plan shall include revised Grading and Drainage sheets 129 and 130. The revised sheets shall clarify the flow in the collection swales.
viii) Revised conceptual drawings, and supporting analysis, shall be submitted with the revised plan that address water quality concerns for the NEPL and Cargo reserve storage areas.

e) Monitoring and Reporting Requirements: The revised plan shall develop a comprehensive monitoring protocol that, at a minimum, addresses the following elements:

i) Collection of stream gage data and an evaluation/correlation to expected flow rates established by the model.
ii) Water quality sampling and reporting. Water quality shall be tested at vault outflow and instream at a point 100 feet downstream of the outflow.
iii) Metering of water from vaults.
iv) Infiltration rate sampling and monitoring to evaluate performance of the fill.
v) Contingency if water quality in vaults does not meet water quality criteria (e.g., additional treatment, other source, flocculation, coalescing oil water separator, etc.).
vi) Instream biologic monitoring shall occur in Des Moines, Miller and Walker Creeks to assess the impacts of the Port's low flow offset proposal. The Port shall develop an instream monitoring protocol that shall at a minimum include the following elements:

- Existing low-flow conditions of Des Moines, Miller and Walker Creek will be evaluated by conducting Benthic Index of Biotic Integrity (BIBI) monitoring (Karr and Chu 1999). Monitoring shall occur four times per year and shall continue through year five (5) after construction and then yearly until completion of the fifteen (15)-year monitoring period. In addition to the BIBI monitoring required above, the Port shall develop a that monitors at a minimum temperature, turbidity, channel morphology, substrate quality, type and amount of large woody debris and other habitat features, riparian habitat cover and fish use. Representative stream channel cross-sections shall be utilized. Information must be synthesized to determine how these elements may be impacting overall stream health.

- Mitigation during the proposed period appears to effect low flow frequencies during June and July. Monitoring shall specifically address potential adverse impacts to fish or aquatic biota during June and July. If monitoring shows an adverse effect during this time period the Port shall implement contingencies to address the impact (such as providing additional mitigation water during June and July).

J. Operational Stormwater Requirements:

1. Approved Stormwater Plan: The Comprehensive Stormwater Management Plan (CSMP), Volumes 1 through 4, December 2000 as revised by the July 2001 Replacement pages is the approved stormwater management plan for this project. It shall be implemented in its entirety. No changes to the CSMP

shall be made without prior review and written approval from Ecology.

a) The Port shall provide Ecology with draft proposed changes to the Plan no later than 60 days prior to the date it seeks to implement a change to the .

b) The Port shall implement the project in accordance with the schedule provided in Table A-3 (July 2001). Any changes to the schedule must be reviewed and approved in advance by Ecology. The Port shall provide Ecology with a draft revised schedule no later than 60 days prior to the date it seeks to implement the change to the schedule. The following facilities/projects listed in Table A-3 (July 2001) do not yet have approved stormwater treatment facilities, proposed: expansion of NEPL to 6000 stalls, additional taxiway exits on 16L/34R, additional expansion of main parking garage, additional expansion of NEPL, expansion of North Unit parking structure, SR 509 extension/South Access, ASDE, and NAVAIDS. If the Port decides to build any of these facilities/projects the Port must submit conceptual drawings that meet the performance standards of the CSMP to Ecology no later than sixty (60) days prior to the date it seeks to commence construction.

c) Retrofitting of stormwater management facilities at the STIA shall occur at a rate commensurate with the construction of new impervious surface at the STIA. For every ten (10) percent of new impervious surface added at the project site, the Port must demonstrate that twenty (20) percent of retrofitting has occurred unless demonstrated that a twenty (20) percent rate isn't feasible. The Port shall document the implementation of retrofitting in quarterly progress reports. The Port shall develop and submit for review and written approval a schedule of construction of stormwater management facilities within 60 days after receipt of the Section 404 permit from the U.S. Army Corps of Engineers. Where the project schedule in the Stormwater Management Plan (including Table A-3) conflicts with this condition, the Port and Ecology shall discuss an appropriate retrofit schedule.

d) Nothing in this Order shall be deemed to prohibit continued participation by the Port in planning efforts to establish regional detention facilities for Des Moines or Miller Creek. The Port may request to amend this Order and the Comprehensive Stormwater Management Plan if it decides to route stormwater to future regional detention facilities and it is demonstrated that under future build-out conditions the combination of on-site and regional flow controls will achieve the performance goals of the CSMP and the corresponding basin plan. If the Port decides to participate in future regional detention facilities, the Port shall submit documentation to Ecology that substantiates that Regional Detention Facilities will be constructed and that the Port may legally route stormwater to a RDF before Ecology will allow a change to the CSMP.

2. Discharge of operational stormwater to state receiving waters:

a) No stormwater generated by operation of new pollution generating impervious surfaces of projects for which the §404 permit was sought (excluding surfaces not to be included in the airport NPDES permit, e.g., South 154th Street which is a City of SeaTac facility) shall be discharged to state receiving waters until a site specific study, e.g., a Water Effects Ratio Study (WERS), has been completed and approved by Ecology and appropriate limitations and monitoring requirements have been established in the Port's NPDES permit. The study may use existing impervious surfaces as a surrogate for future new impervious surfaces, and it shall be submitted to Ecology for review and written approval. The Port shall consult with Ecology's Northwest Regional Office Water Quality Program's SeaTac NPDES Manager to determine an appropriate time for submittal of the study.

b) All stormwater discharges from the project shall be in compliance with state of Washington surface water quality standards (Chapter 173-201A WAC), sediment management standards (Chapter 173-204 WAC) and ground water quality standards (Chapter 173-200 WAC).

c) The Port shall design, construct, operate, and maintain stormwater treatment facilities to ensure that discharges shall not result in exceedances of state water quality criteria in receiving waters. Ecology may require changes to the approved CSMP as a part of future NDPES permits.

d) If monitoring indicates a need for additional BMPs, the Port may propose other BMPs for stormwater treatment if it can be demonstrated that they will result in stormwater discharges that meet the state water quality standards. Any proposed changes are subject to review and written approval by Ecology.

e) The Port shall submit the final stormwater treatment and flow control facility designs to Ecology for review and written approval 60 days prior to the start of construction of the facilities. During final design the Port shall evaluate the likelihood that stormwater facilities will intercept groundwater and make modifications to the designs so as to either prevent the interception of groundwater or increase facility sizing to accommodate the groundwater. If facility sizes increase the Port shall evaluate potential impacts to wetlands and other waters of the state and whether the increase facility size triggers Dam Safety requirements under Chapter 173-175 WAC.

f) Within 180 days of issuance of this Order the Port shall submit to Ecology for review and written approval a Stormwater Facilities Operation and Maintenance Plan which addresses maintenance and operation of all STIA stormwater facilities approved by this Order. For the purpose of meeting this condition the Port may submit other existing documents or updates of other existing documents that meet this requirement. The Port shall identify methods to prevent overtopping of stormwater facilities and the Industrial Wastewater Treatment System to streams during design storm events.

K. **Construction Stormwater Limitations and Monitoring Requirements:**

1. Stormwater Pollution Prevention Plans shall be prepared in conformity with the Construction Stormwater/Dewatering requirements the NPDES permit.

2. Limitations

Stormwater discharges shall not cause a visible change in turbidity, color, or cause a visible oil sheen in the receiving water from any stormwater detention or retention pond.

3. Stormwater Monitoring Schedule for Construction Stormwater Discharges

The Port shall monitor each stormwater outfall discharge according to the following schedule:

a) Turbidity and pH:

i) The Port shall monitor turbidity and pH in any surface water discharge from construction sites within 24 hours after any storm event of greater than 0.5 inches of rain per 24-hour period. The storm events shall be measured by an on-site rain gauge. The monitoring method shall be by a portable turbidimeter and a pH meter following the maintenance, operating and calibration procedures in the instrument's instruction manual. Alternatively, a grab sample shall be analyzed by a laboratory accredited under the provisions of Accreditation of Environmental Laboratories, Chapter 173-50 WAC.

ii) During each rain event the turbidimeter and pH meter shall also be used for the measurement of turbidity and pH upstream of the point of discharge to the receiving water and downstream of the thorough mixing of the discharge and the receiving water.

b) Oil, Grease and Temperature:

i) The Port shall sample for oil, grease and temperature as follows:

Parameter	Units	Sample Point[1]	Minimum Sampling Frequency	Sample Type
Oil and Grease	Mg/l	Point of Discharge	When visible sheen observed	grab
Temperature	^{0}C	Upstream[2] and downstream at the edge of the mixing zone (no greater than 100 feet)	Weekly[3]	grab

[1] Samples shall be collected from the outfall or an on-line stormwater drain access point nearest the outfall terminus.

[2] Background temperature measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge.

[3] During the months of July, August, and September

ii) Sampling method for Oil and Grease: The MDL for oil and grease is 0.2 mg/L using trichlorotrifluoroethane extraction and gravimetric analysis using EPA Method 413.1. The quantitation level (QL) for oil and grease is 1.0 mg/L (5 x MDL). An equivalent method is Method 1664 using normal hexane (n-hexane) as the extraction solvent in place of 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113; Freon-113). An equivalent method is total petroleum hydrocarbons with a MDL of 0.1 mg/L using Gas Chromatography and Flame Ionization Detector (FID) and Method WTPH-Dx Diesel (WTPH-D) from the Washington State Department of Ecology Method WTPH-D. The quantitation level (QL) for TPH-Dx is 0.5 mg/L (5 x MDL).

c. If monitoring indicates a need for additional BMPs, the Port may propose other BMPs for stormwater treatment if it can be demonstrated that they will result in stormwater discharges that meet the state water quality standards. Any proposed changes are subject to review and written approval by Ecology.

4. Stormwater Detention for New Outfalls

Any new diversion ditch or channel, pond, trap, impoundment or other detention or retention BMP constructed at the site for treatment of stormwater shall be designed, constructed, and maintained to contain and provide treatment for the peak flow for the ten (10) year 24 hour precipitation event estimated from data published by the National Oceanic and Atmospheric Administration.

5. <u>Vehicle Trackout</u>
Vehicles shall be cleaned of mud, rock, and other material before entering a paved public highway so that tracking of sediment onto the highway does not occur.

6. <u>Reporting - Construction stormwater</u>
Monitoring results for construction stormwater discharges shall be submitted every other month to Ecology's Federal Permit Manager, SeaTac Third Runway. Monitoring shall be reviewed for compliance with WAC 173-201A.

7. The Port shall document the use of any additives in the treatment of discharge water. Documentation shall identify the additives used, their commercial source, the material safety data sheet, and the appropriate application rate. The Port shall retain this information on-site or within reasonable access to the site and make it immediately available, upon request, to Ecology.

   Additives to enhance solids settling before discharge to surface water must be applied according to the manufacturer's recommended dose. In addition, only additives of low toxicity to aquatic organisms, an LC_{50} equal to or greater than 100 mg/l, shall be used. The use of additives to enhance settling before discharge to surface water will not be allowed if the toxicity to aquatic organisms is not known.

8. In addition to the above, the Port shall submit a monitoring plan for stormwater and construction dewatering discharges from all construction projects including grading and construction of the Auburn mitigation site. The monitoring plan shall be submitted to Ecology for review and written approval at least thirty (30) days prior to the start of construction.

L. **Emergency/Contingency Requirements:**

1. The Port shall develop a spill prevention and containment plan for all aspects of this project, and shall have spill cleanup materials available on site.

2. Any work that is out of compliance with the provisions of this Order, causes distress death of fish, or any discharge of oil, fuel, or chemicals into state waters, or onto land with a potential for entry into state waters, is prohibited. If these occur, the Port shall immediately take the following actions:

   a) Cease operations at the location of the violation.

   b) Assess the cause of the water quality problem and take appropriate measures to correct the problem and/or prevent further environmental damage.

   c) Notify Ecology of the failure to comply. Spill events shall be reported immediately to Ecology's 24-Hour Spill Response Team at 425-649-7000, and within 24 hours of other events contact Ecology's Federal Permit Manager, SeaTac Third Runway at 425-649-4310.

d) Submit a detailed written report to Ecology within five days that describes the nature of the event, corrective action taken and/or planned, steps to be taken to prevent a recurrence, results of any samples taken, and any other pertinent information.

Compliance with these requirements does not relieve the Port from responsibility to maintain continuous compliance with the terms and conditions of this Order or the resulting liability from failure to comply.

3. In the event of finding distressed, dying or dead fish, the Port shall collect fish specimens and water samples in the affected area, within the first hour of the event. These samples shall be held in refrigeration or on ice until the Port is instructed by Ecology on their disposition. Ecology may require analyses of these samples before allowing the work to resume.

4. In the event of a discharge of oil, fuel, or chemicals into state waters, or onto land with a potential for entry into state waters, containment and cleanup efforts shall begin immediately and be completed as soon as possible, taking precedence over normal work. Cleanup shall include proper disposal of any spilled material and used cleanup materials.

5. Fuel hoses, oil drums, oil or fuel transfer valves and fittings, etc., shall be checked regularly for drips or leaks, and shall be maintained and stored properly to prevent spills into state waters.

6. If at any time during work the Port finds buried chemical containers, such as drums, or any unusual conditions indicating disposal of chemicals, the Port shall immediately notify the Ecology's NWRO Regional Spill Response Office at 425-649-7000.

M. **General Conditions:**

1. This Order does not authorize direct, indirect, permanent, or temporary impacts to waters of the state or related aquatic resources, except as specifically provided for in conditions of this Order.

2. This Order does not exempt and is conditional upon compliance with other statutes and codes administered by federal, state, and local agencies.

3. Ecology retains continuing jurisdiction to make modifications hereto through supplemental Order, if it appears necessary to further protect the public interest.

4. The Port shall have a designee on-site, or on-call and readily accessible to the site, at all times while construction activities are occurring that may affect the quality of ground and surface waters of the state, including all periods of construction activities.

5. The Port's designee shall have adequate authority to ensure proper implementation of the Erosion and Sediment Control (ESC) Plan, as well as immediate corrective actions necessary because of changing field conditions. If the Port's designee issues a directive necessary to implement a portion of the ESC Plan or to prevent pollution to waters of the state, all personnel on site, including the construction contractor and the contractor's employees, shall immediately comply with this directive.

6. The Port shall provide access to the project site and all mitigation sites by Ecology or WDFW personnel for site inspections, monitoring, necessary data collection, or to ensure that conditions of this Order are being met.

7. Copies of this Order and all related permits, approvals, and documents shall be kept on the project site and readily available for reference by the project managers, construction managers and foremen, other employees and contractors of the Port, and state agency personnel.

8. The Port shall comply with all provisions of any Hydraulic Project Approval issued by the Washington Department of Fish and Wildlife. Work in or near the water that may affect fish migration, spawning, or rearing shall cease immediately upon a determination by WDFW that fisheries resources may be adversely affected.

N. **Violations of the Order**:

Any person who fails to comply with any provision of this Order shall be liable for a penalty of up to ten thousand dollars ($10,000) per violation for each day of continuing noncompliance. Violations of this Order shall be addressed in accordance with the requirements of RCW 90.42 and RCW 43.21B. Upon Ecology's determination that the Port is violating any condition of this Order, it shall serve notice of the violation to the Port by registered mail.

O. **Appeal process:**

Any person aggrieved by this Order may obtain review thereof by appeal. The Port can appeal up to 30 days after receipt of the permit, and all others can appeal up to 30 days from the postmarked date of the permit. The appeal must be sent to the Washington Pollution Control Hearings Board, PO Box 40903, Olympia, WA 98504-0903. Concurrently, a copy of the appeal must be sent to the Department of Ecology, Northwest Regional Office, Shorelands and Environmental Assistance Program, Attn: Ann Kenny, 3190 160th Avenue SE, Bellevue, WA 98008-5452. These procedures are consistent with the provisions of Chapter 43.21B RCW and the rules and regulations adopted thereunder.

Dated September 21, 2001 at Olympia, Washington.

Gordon White

Gordon White, Program Manager
Shorelands and Environmental Assistance Program

Attachment A: Contractor Statement

PROJECT: Port of Seattle Third Runway & Master Plan Update Projects

I have read the Water Quality Certification/Coastal Zone Consistency Determination/Section 401 Permit (Order #1996-4-02325) and the National Pollutant Discharge Elimination System (NPDES) Permit for the above referenced project and, to the best of my ability, understand the requirements of those permits as they relate to those portions of the work that are being conducted under my supervision.

Name (Signature)

Name (Printed)

Title

Company or Organization

Attachment B: NRMP Plan Set Revisions

Appendix A – Miller Creek Relocation and Floodplain Enhancement

Sheet C3: Note 13. Provide revised sheet showing design of irrigation system and discuss irrigation plan in NRMP (timing, amounts of water, etc.).

Sheet C4: Provide revised sheet C4 showing no work in streams. Provide revised Grading plan C-129 showing no work in streams.

Sheet C7: Provide revised sheet with note detailing how woody debris will be anchored using cable or hemp.

On the swale section provide revised sheet showing that swale area will be seeded.

Sheet C-8: Provide revised sheet that shows steel anchors for all the logs in the stream channel with note that hemp rope anchors are expected to remain in place for 3-5 years.

Sheet TE1: Provide revised sheet with note on how the ditches will be blocked to prevent sediment migration.

Provide schedule or table that shows the sequence in which the different elements of the mitigation will be installed. (This applies to the Auburn site as well.)

Sheet L2: Revise sheet to show how young plants will be protected from sun exposure until they are well enough established to withstand exposure to the sun.

Revise Note 6 to state that except where needed to protect roots of conifers, care must be taken not to seed mulch collars.

Revise sheet to remove staking notes and details from sheet.

Appendix B – Miller Creek In-stream and Buffer Enhancements

Sheet C3: Revise sheet to show construction access points and add a note to the plans to minimize wetland and stream impacts. Provide note detailing how access points will be restored.

Sheet C4: Note 5. Add note to see sheet TE2 and add more details detailing how the channel will be de-watered during re-grading.

Sheet C5: Provide revised sheet if log orientation at 42+00 changes.

Note 2. Provide revised sheet with note. Discuss disposal of solid wastes in text of NRMP or in an Appendix. Provide information on how hazardous materials will be managed if discovered during the course of constructing the mitigation site.

Sheet C7: Provide revised sheet with note that details how project areas will be accessed. Also provide details on how access locations will be restored after the work has been completed.

Sheet C8: On Section 2, the coir lift is shown on the section but is not present on the plan. Provide revised sheet.

On Section 3, the logs on the plan view are not present on the section. Provide revised sheet.

On Section 5, the log shown on the plan view is not present on the section. The coir lift shown on the section is not shown on the plan. Provide revised sheet.

On Section 6, the log shown on the plan view is not present on the section. Provide revised sheet.

Sheet C9: In typical detail of coir fabric lifts, develop a specification for the quantity of willow cutting. Provide revised sheet.

Sheet C10: Provide revised sheet and include note on sheet that indicates that the geotextile fabric will be biodegradable. If this is discussed in text, then text must become part of final plan set.

Sheets TE1-TE4: Provide revised sheets adding note in notes section that states that equipment should not be driven in the streambed except where necessary to complete construction.

Sheet TE2: Provide revised sheet showing details for stream diversion structure and flow dispersion structure.

Provide revised sheet showing detail for the flexible by-pass pipe. Note that pipe should not be trenched in.

Indicate on plan sheet direction of sump discharge water with note that it is pumped to a treatment pond. Provide specific pond. Provide revised sheet.

Sheet TE5: On the live stake detail, specify the density of staking (inches on center). Provide revised sheet.

Sheet L1.1: Provide revised sheet with note that says that if S. 157th Place is determined not to be needed for access purposes it will be revegetated.

Sheet L2: Provide revised sheet with note that says that if S. 160th Street is not needed for access it will be revegetated.

Sheet L3: It is unclear how much of this area will be cleared. Provide revised sheet with correct cross-hatching in wetland.

Sheet L5: Clarify why some of Wetland R11 shown as revegetated and others are not. Provide revised sheet with note indicating that the Corps of Engineers is requiring that the sewer easement will not be revegetated.

Provide revised sheet correcting hatching error for the replacement drainage channels buffer areas that will be graded. This area should be in darker (cleared and revegetated areas) hatch.

Sheet L5.1: Provide revised sheet with note that says that if 8th Avenue South is not needed for access it will be revegetated.

Sheet L5.2: Provide revised sheet with note indicating that any irrigation installed in the field shall be shown on the As-Built Report.

Sheet L6: Areas that are cleared and revegetated should be planted at a higher density than enhancement areas. Densities or quantities should be stated on the plan. A performance standard of 280 trees per acre is proposed for the buffer. In cases where some forest vegetation is present, the Port shall supplement the existing trees with enhancement plantings to achieve this density. Clarify in NRMP how survival monitoring will be performed in these areas to differentiate these two types of areas.

Provide revised plan detail/notes to allow for use of phased planting in areas that lack suitable shade or soil moisture. Discuss in text of NRMP.

On tree planting and staking detail, the plan needs to state when the stakes will be removed. If it is determined that staking is not necessary then remove the stake details. Provide revised sheet.

Sheet P2: Provide revised sheet showing approximate locations of the sandbags and the abutments to be removed. Provide note on TESC controls that will be in place for the timber removal in order to minimize sediment mobilization.

Appendix D – Replacement Drainage Channels and Restoration of Temporarily Impacted Wetlands

Sheet C3: Clarify how hydrologic support will be provided to Wetland 11 and Wetland 9 after construction.

Sheet C5: Provide revised plan sheet with details regarding flow spreaders and spalls.

Sheet C6: Provide revised sheet clarifying whether the dark hatched area in the vicinity of Wetlands R9a, R10, R11, A10, and A11 will be graded and revegetated.

Sheet C7: Show how will water get to Wetland 44a if the TESC channel is removed.

Show flow monitoring locations on the stormwater management plan.

Sheet C8: Clarify how the drainage channel discharge structure controls flow to the wetland. Address how often these structures will be monitored and how modifications be made if a problem is identified. Provide information in note on revised sheet.

Sheet L1: Provide revised sheet to allow for phased planting to provide shading for western red cedar and the western hemlock.

Appendix E – Auburn Wetland Mitigation

Sheet C5: Provide revised sheet with note saying that if hummocks remain in place options for removing reed canary grass will be evaluated.

The Sheet C6 grading plan shows proposed contours for re-grading the SW portion of the mitigation site. These contours do not continue onto Sheet C5. Provide revise sheet.

Sheet C8: Provide revised sheet with a note added to the plans to include culverts at the low spots if needed to eliminate ponding.

On Section 3, design to ensure the perforated pipes do not sink into the substrate and become blocked.

Sheet TE1: There is no discussion on dewatering except in the NRMP text on page 7-50. Sheet C2 (Appendix E) shows the discharge point located along a ditch, which is slated to be recontoured. Provide revised sheet with additional details to manage potential erosion and amend text in NRMP if necessary.

If it is determined that Area 1 should have a sedimentation pond submit revised sheet showing the pond.

Page 7-47 of the text discusses major construction activities limited to a period from October 31 to March 31 to avoid winter bald eagles. Provide revised sheet correcting error regarding construction window to avoid winter bald eagles.

Sheets L7 and L8: Provide revised sheets to show plant pattern layout areas for each phase.

Sheet L9: Provide revised sheet with a note added to the plans so that ponded areas or areas that are anticipated to be ponded shortly after planting will be planted with plugs representative of the seed mix specified. Add Hydro seeding specifications.

Revised Auburn Grading Plan (June 28, 2001):

1. The revised grading plan (June 28, 2001) shows a culvert in the northwest corner of the site in the proposed new drainage swale. The culvert will pass flows under the site access path. The drawing shows this culvert approximately 60 feet long, passing under a path that is only approximately 15 feet wide. This culvert should be no longer than is necessary to pass the water under this pathway.

2. The revised grading plan (June 28, 2001) shows a culvert in the south central portion of the mitigation site. This culvert appears to be mis-located. It appears that the culvert should be shown in the wetland directly east of the shown location, where the wetland passes under the

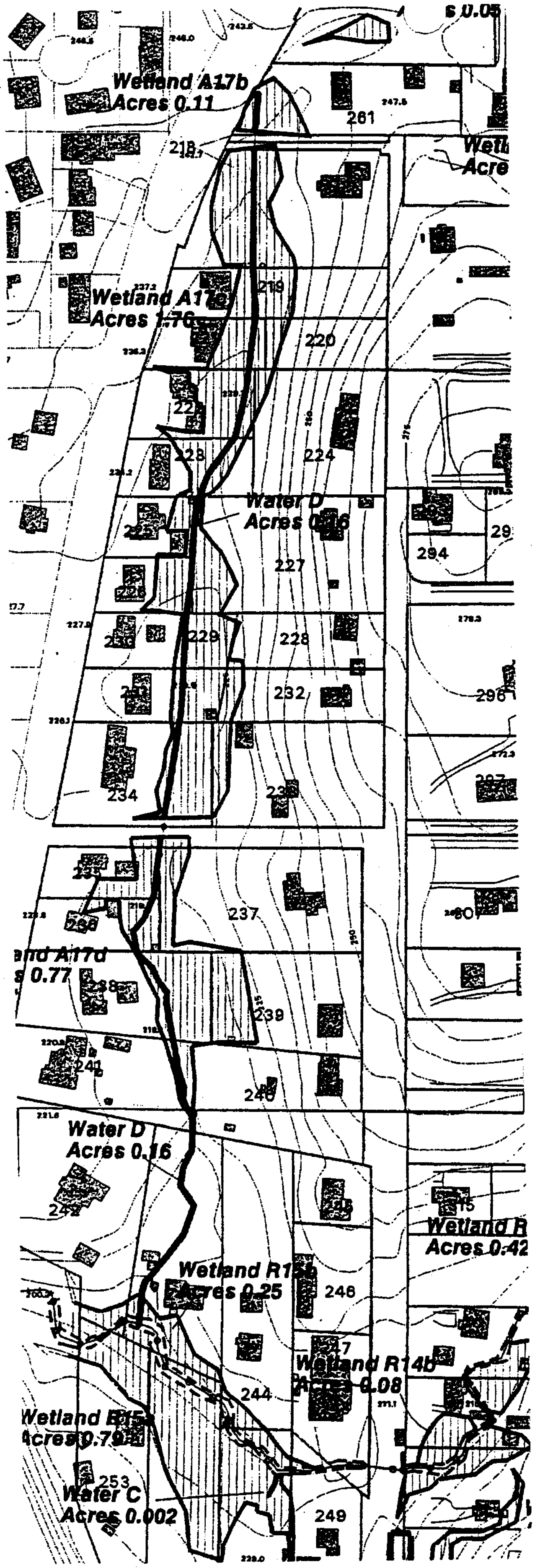
proposed maintenance path. This culvert should be no longer than is necessary to pass the water under this pathway.

3. Two additional culverts need to be shown along the new drainage swale where the water outlets the southwestern basin, under the maintenance pathway.

4. Culverts should be placed during construction under the paths/roads in all areas where there is a potential for impounding water. A note should be added on the construction documents.

5. Provide revised grading plan that addresses items 1 through 4 above.

Attachment C
1996-4-02325
(Amended-1)
September 21, 2001
Wetland A17 Complex



wetland A17 image.doc

ATTACHMENT D

Borrow Area 3 Wetland and Swale Buffer

Attachment E

SECTION 401 CERTIFICATION SYNTHETIC PRECIPITATION LEACHING PROCEDURE WORK PLAN

This Work Plan provides an alternative methodology for meeting the fill suitability criteria found in Section E.1(b) of the Department of Ecology's Water Quality Certification #1996-4-02325 (the "Certification")issued to the Port of Seattle ("Port"). This Work Plan describes procedures for use of the Synthetic Precipitation Leaching Procedure ("SPLP") to determine the suitability of fill for the Port's third runway embankment and other Port projects for which the fill criteria of the Certification are applicable (defined in the Certification as "Port 404 Projects").

I. <u>Summary of Requirements</u>

Requirements applicable to the Port include those of the Certification and also those contained in the U.S. Fish and Wildlife Service's ("FWS") May 22, 2001 biological opinion ("BO") (FWS Reference Number 1-3-00-F-1420). The Ecology Certification and the FWS BO both have screening level criteria for Port 404 Projects, including the third runway embankment (the "Embankment"), as well as special screening criteria that apply to a zone of material above the drainage layer at the bottom of the embankment. Special criteria for this zone (referred to as the "drainage layer cover" in the BO and in this document) are applicable to a zone that is 40 ft thick at the face of the embankment and reduces in height to the east at a rate of 2 percent until it meets the drainage layer at the existing ground surface to the east.

Table 1 shows the soil criteria that have been developed for the third runway embankment by FWS and Port 404 Projects by Ecology. Ecology's Certification specifies soil criteria for 14 metals and TPH (column 5 – the last column on the right). In addition, the Certification soil criteria for chromium, lead, nickel, and diesel in the drainage layer cover of the Embankment are more stringent than for the rest of the Embankment and other Port 404 Projects (column 2). The FWS BO specifies soil criteria for the drainage layer cover as shown in column 3 for the RCRA 8 metals. Because the FWS and Ecology soil criteria differ, the Port will use the most stringent criteria of the two for the drainage layer cover (shown in column 4) and for the remainder of the Embankment (shown in column 5).

Because metals are naturally occurring, they have widespread concentration variability throughout the Pacific Northwest. Many of the soil criteria in Table 1 are at Puget Sound background concentrations calculated at the 90th percentile. Thus, by definition a constituent, even at a naturally-occurring, unaltered concentration will fail these criteria10% of the time. When testing is done for multiple constituents, the probability that naturally-occurring concentrations will disqualify a fill source rises. For fill constituents that do not meet the screening criteria of the Certification and BO, fill acceptability can be demonstrated using the SPLP test procedure.

In accordance with the BO, upper bounds are established for constituent concentrations that cannot be accepted even following a successful SPLP test (referred to in this document as "upper bound limits"). For the drainage layer cover, the upper bound limits are set in the BO at applicable MTCA Method A standards. However, Method A values were not available for barium, selenium and silver. As a result, the upper bound limit for barium was backcalculated using the MTCA three phase partitioning approach (WAC 173-340-747) and selenium and silver soil criteria were set at the PQL. Upper bound limits for the drainage layer cover and the remainder of the Embankment are incorporated into this Work Plan to avoid any potential inconsistency with the BO. As such, any material that is unacceptable for the Embankment under the BO is also unacceptable for the Embankment under this Work Plan and the Certification.

At proposed fill sources for which sampling is required in accordance with the Certification, the appropriate number of samples of proposed fill material (per Certification requirements) will be collected and analyzed for the constituents listed in Condition E.1(b). Constituent concentrations will be compared to the lower screening criteria in Condition E.1(b) and in the BO for the drainage layer cover (Table, 1, column 4) or for the rest of the embankment (Table 1, column 5). If the screening criteria are not exceeded, fill from that source will be considered suitable for placement in the appropriate portion of the embankment, or on other Port 404 Projects. If the screening criteria are exceeded, but the upper bound limits are not exceeded, the Port must demonstrate fill suitability by employing the SPLP testing protocol discussed below prior to accepting fill from that source.

II. SPLP Testing Protocol

The purpose of the SPLP is to evaluate the potential for metals and organic constituents to mobilize and move through soils in fluid form. The SPLP is an accepted laboratory leaching test, as discussed in WAC 173-340-747(7). The SPLP will be conducted in accordance with the procedures contained in SW-846 Method 1312. In the SPLP, fluid representing acid rain is passed through a soil sample and the liquid is collected and analyzed.

SPLP testing will be conducted and the results will be evaluated relative to the applicable ambient water quality criteria of WAC 173-201A as discussed below. In the event that SPLP results consistently show that criteria for specific metals are not exceeded across a range of sites and soil conditions, the Port may elect to submit such information to Ecology for its review as evidence that the Port may discontinue the requirement to implement SPLP for specific metals. Upon approval by Ecology, the Port may then adopt the applicable upper bound limit, or some intermediate figure as determined by Ecology, as its new soil screening criterion for that constituent.

Use of SPLP to demonstrate fill acceptability will require sampling of the material proposed as imported fill. At a minimum, one SPLP sample will be collected for each original sample that exceeds the screening criteria. This sample will be representative of the area where the original sample indicating an exceedence of the screening criteria was collected. The SPLP will only be conducted for the specific chemical constituent that exceeds the criteria.

III. <u>Screening Procedure</u>

Results from the SPLP will be compared to freshwater ambient water quality criteria according to guidelines outlined in WAC 173-201A-040 (adjusted for PQLs). As an initial screening tool, the constituent concentrations as determined from the SPLP will be divided by a dilution factor of 20. The default dilution factor of 20 was established by Ecology for use in the Three Phase Partitioning Model (WAC 173-747). This dilution factor represents a very conservative estimate because it accounts only for the dilution that occurs between the pore water at the spot in the embankment where the constituent exceeded water quality criteria, and ground water in the saturated zone directly below, without accounting for attenuation processes. The actual dilution factor, first from a specific point in the embankment through the underlying drainage layer and then transport to Miller Creek, is much greater. If the adjusted SPLP results are equal to or below the freshwater ambient water quality criteria, the material will be considered suitable for placement in the embankment (including the drainage layer cover, provided applicable upper bound limits were not exceeded for any constituents in the initial soil test prior to SPLP use). If adjusted SPLP results are above freshwater ambient water quality criteria, the material will be rejected and will not be considered suitable for placement at any location within the embankment.

Water Quality Certification # [illegible]-4-02325 (Amended-1)
September [illegible], 2001
Attachment E/SPLP Workplan Table 1

Table 1
Criteria for Drainage layer cover and other Port 404 Projects.

Constituent	Ecology special criteria for drainage layer cover (mg/kg)	FWS drainage layer cover criteria (mg/kg)	Final drainage layer cover criteria (most conservative of FWS and Ecology values) (mg/kg)	Ecology criteria for remainder of embankment and other Port 404 Projects (mg/kg)
Antimony		NA	16	16
Arsenic		7	7	20
Barium		12,000	12,000	NA
Beryllium		NA	0.6	0.6
Cadmium		1	1	2
Chromium	42	48	42	2000
Copper		NA	36	36
Lead	220	24	24	250
Mercury		0.07	0.07	2
Nickel	100	NA	48	110
Selenium		5	5	5
Silver		5	5	5
Thallium		NA	2	2
Zinc		NA	85	85
Gasoline		NA	30	30
Diesel	460	NA	460	2000
Heavy Oils		NA	2000	2000