FINAL
DRAFT

Fill Material Alternative Delivery Method Study for Third Runway

Phase I

SEATTLE-TACOMA INTERNATIONAL AIRPORT

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HNTB

Contents subject to change based on Phase II analysis

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Preface

This report is presented as a final "Draft" of the Phase I analysis to the Port of Seattle. The Phase II Analysis of the Delivery Method Study will complete the following activities:

1. Permit Assessment
   - Evaluate the likelihood that the necessary permits and approvals will be granted by the responsible agency.
   - Determine the permit and infrastructure schedule.
   - Identify the land use permits and approvals that each corridor alternative will require.
   - Analyze factors or policies determining the conditioning, approval, or denial of a necessary permit.
2. Contracting
   - Consult with "experts in the field" to evaluate bid packaging, viability of specifying a sole source delivery method, pre-purchasing issues, and pre-permitting issues.
3. Schedule
   - Define the construction schedule by determining the fill placement completion date.
4. Material Quantity
   - Define the quantity of fill material required from off-site sources.

It should be noted that Phase II analysis may change evaluations made in Phase I.

Executive Summary

A study to identify and evaluate feasible methods of transporting earth fill material to Seattle-Tacoma International Airport for construction of the embankment for the proposed Third Runway was undertaken by the Port of Seattle. The embankment for the Third Runway will require a large volume of earth fill. Some of the earth fill may be attainable from Port-owned local sites around Sea-Tac Airport, but most of the fill will need to be imported to the airport from more distant sources. The volume of earth fill to be imported will be in the range of 9 million to 14 million cubic yards, depending upon the quantity available from Port-owned local sites. Transporting this material by conventional trucking over public roads is possible. Recognizing, however, that importing earth fill is a major element of the runway project, the Port initiated this study to assess the feasibility of alternatives to conventional trucking.

The objective of the study was to develop information with which the Port could determine: 1) if an alternative delivery method or combination of methods could reduce impacts of the Third Runway project, 2) if alternative delivery methods could expand competition between potential construction contractors, with a resulting savings in project construction costs, and 3) any effect alternative delivery methods could have on the project schedule. The study was a first step in determining the optimum method to provide the earth fill needed for the runway, with a focus on defining feasible alternatives and identifying key issues related to each alternative. Technical viability, permitting requirements, and economic considerations were investigated for each alternative. It is anticipated that the Port will proceed from this study into detailed engineering evaluation of feasible alternatives, environmental analyses, and assessment of potential contracting methods.

As addressed in this study, alternative methods for fill material delivery consist of two components. One component is the mode by which the fill material is moved; the second component is the transportation route or corridor through which the material is moved. The study involved a process of identifying possible modes of fill transport, identifying potential corridors, and evaluating the feasibility of one or more modes in each of the potential corridors. To provide an understanding of all possible options, alternative methods were compared to conventional trucking.

Several alternative modes for transporting fill material were identified. Included among these were barges, mechanical conveyor systems, hydraulic pipelines, and trains. Three modes - barges, conveyors, and trains - and combinations of these three modes, were determined to be suited to possible use in transporting fill to the runway site. Three corridors were identified as potentially feasible routes for transporting fill material by alternative modes. The corridors are: Corridor 1- Des Moines Creek, Corridor 2 - SR 509, and Corridor 3 - SR 518. In the following text, alternative delivery methods are addressed by corridor.

Corridor 1, Des Moines Creek

The general concept for Corridor 1 consists of importing earth fill material by barge on Puget Sound to Des Moines, and transporting the material from the shoreline to the runway site by means of a conveyor system. In this concept, a temporary barge terminal would be located offshore from Des Moines Beach Park and a temporary conveyor system, routed adjacent to Des

Moines Creek, would deliver fill material to the runway site. The total conveyor length would be approximately 2.2 miles from the proposed temporary barge unloading facility to Port property at approximately S. 200th Street. At S. 200th Street the fill material would be either trucked or conveyored to the runway site. This alternative has been proposed by a private entity and has been determined to be technically feasible. The Corridor 1 alternative has the potential, for all practical purposes, to eliminate the volume of runway earth fill truck traffic on public roads as all fill material could be transported by barge and conveyor.

Securing construction/environmental permits for the Des Moines Creek Corridor would likely involve numerous federal, state and local jurisdictions. The ultimate success of this alternative would likely depend on the conditions and constraints placed on the alternative through the permitting process. Either the Port or a private party could conduct the studies and environmental analysis for this alternative. Identifying issues early, and maintaining a well-coordinated permitting process between agencies, should allow all the necessary permits to be obtained within a 12- to 24-month period.

Corridor 2, SR 509

The basic concept of Corridor 2 consists of transporting fill material from the Duwamish Waterway to the runway site, using the SR-509 corridor as the transportation route. Fill material would be transported to the Duwamish Waterway by barge or train, and would be transferred to a conveyor or to trucks for delivery to the runway site. Within Corridor 2, therefore, there are several possible alternatives for mode of transportation. The Corridor 2 concept includes a barge or rail transfer facility located on the Duwamish. There are several possible barge transfer sites, Port-owned and privately-owned, that could be developed or modified for use as a barge transfer facility. The Port, as well as several private entities, maintain existing barge terminal facilities in the vicinity which are permitted for operation. Initial investigations indicate that existing private terminals could be available to serve as a delivery transfer facility for material to be used at Sea-Tac Airport. Additional studies are required to determine if Port facilities could be made available.

A rail transfer facility could be co-located along West Marginal Way at either an existing barge transfer facility or a new facility. The existing Burlington Northern rail line crossing the Duwamish Waterway could be used for access to the transfer site. A new rail connection would need to be co...tructed for direct access to existing rail lines to the south.

The conveyor alternative for Corridor 2 would consist of routing a conveyor system from the barge or rail terminal along West Marginal Way and SR 509 to the runway site. The conveyor route is technically feasible, although construction would be difficult due to physical constraints and the route would be the longest of all potential conveyor routes studied. This alternative has the potential to significantly reduce the volume of runway earth fill truck traffic as all fill material would be transported by barge (or rail) and conveyor.

The trucking alternative within this corridor would consist of trucking from the barge or rail transfer facility along West or East Marginal Way to SR 509, and then along SR-509 to the runway site. Several options would be available for truck access to the runway site from SR 509. The trucking alternative is also technically feasible, and utilizes an existing state route which currently has reserve capacity. Of all state routes in the Sea-Tac vicinity, SR 509 has the greatest

reserve capacity. Access to the runway site could initially be from existing city streets. A temporary interchange could ultimately be built to provide direct construction access to the runway site, eliminating significant construction traffic on local streets.

Obtaining construction/environmental permits for a barge or rail facility, conveyor system, and truck hauling from the Duwamish Waterway to the runway site would likely involve several jurisdictions. Identifying issues early and maintaining a well-coordinated permitting process between agencies should allow all the necessary permits to be obtained within a 5- to 15-month period.

Corridor 3, SR 518

The concept for Corridor 3 consists of transporting fill material from the Tukwila/Renton area to the runway site along the SR 518 corridor. Under this concept, fill material would be transported to the Tukwila/Renton area by train, and would be transferred either to a conveyor system or to trucks for transport to runway site. A rail transfer facility would be built in the Tukwila/Renton area near I-405. The transfer terminal could be located on the Union Pacific or Burlington Northern rail lines, either north or south of I-405, and would have a parallel spur line for train off-loading. Depending on the configuration of the transfer facility, the area required for the facility could be limited to existing railroad right of way. Additional property might be required for material stockpiling and maintenance.

The conveyor alternative mode for Corridor 3 could consist of a conveyor system routed from the rail transfer terminal to I-405, along the I-405 corridor, through the I-405/I-5 Interchange, and along SR 518 to the runway site. The alternative has been proposed by a private entity and has been determined to be technically feasible. Construction and operation of the conveyor would be difficult, particularly along I-405, due to right-of-way and roadway use constraints. The total conveyor length to the runway site would be approximately four miles. This alternative has the potential to significantly reduce the volume of runway-related construction truck traffic as all fill material could be transported by rail and conveyor.

The trucking alternative within Corridor 3 would involve trucking routes from the rail transfer facility to the runway along SW Grady Way, I-405, and SR 518. As noted for the trucking alternative in Corridor 2 several options would be available for truck access to the runway site. Options would include construction of temporary ramps connecting SR 518 c...ectly to the runway site, or the use of city streets such as Des Moines Memorial Drive. In addition, an alternate city street truck route may be available between the potential location of the rail transfer facility and the runway site. This alternative mode is technically feasible. It should be noted that I-405 experiences congestion during peak traffic periods and truck hauling could be impacted.

As for other corridors, obtaining construction/environmental permits for a rail terminal facility, and for a conveyor system and/or truck hauling, would likely involve several jurisdictions. Either the Port or a private party could conduct the studies and environmental analysis for this corridor. Early identification of issues and strong efforts to maintain well-coordinated permitting efforts between agencies should allow all the necessary permits to be obtained within a 5- to 15-month period.

Trucking

Many private construction contractors currently use trucking as a means of delivering fill material to construction sites such as at the airport. The Sea-Tac Master Plan Update FEIS identified traditional construction truck haul routes which could be used to transport fill from a number of potential off-site sources. Material delivered from source sites east of I-5 would require use of the regional roadway system, primarily Interstate 5, Interstate 405, Interstate 90, SR 167, SR 18, SR 99, SR 516, and SR 518 to gain access to the airport. Access to the runway site would be on city streets, or by a temporary interchange on SR 518 and/or SR 509. The FEIS showed that truck trips associated with hauling a large quantity of material to the runway site would result in some temporary deterioration of traffic Level-of-Service (LOS) on roads where background levels of congestion are near or exceed roadway capacity, and where extended grades exist. LOS analysis indicates that SR 509 has considerable reserve capacity throughout the day which could be used by trucks transporting fill material for the runway.

Conventional trucking is feasible and offers competition between material suppliers and construction contractors. Depending on the location of the material sources, trucking could have the greatest impact on the regional highway system of the possible alternative delivery methods. Avoiding congested roadways during peak periods and hauling during off-peak hours, coupled with a longer, (lengthened) construction schedule would help alleviate the impact of conventional truck hauling on the existing public roadway system.

Permitting for hauling material by truck from any material source site to the runway site may involve local jurisdiction approval, although no State or Federal permits are required to haul on State routes. Due to the overall controversy of the runway project, time should be allowed for negotiation with local governments; the time required to secure local jurisdictional use permits could range from 2 months to 15 months, depending on complications. It should be noted that permitting for trucking could be accomplished in a much shorter period if local jurisdictions and the Port reach early agreement on specific permit conditions and required mitigation.

Economic Feasibility

In order to evaluate the economic feasibility of alternative material delivery methods, it was necessary to estimate costs for both initial capital investments to build the required infrastructure and for long-term operation and maintenance. As study of the alternatives is in the early stages, it was necessary to use a range of costs in the analysis. The purpose of evaluating the economic feasibility was to determine the relative cost between alternatives. Evaluation of environmental costs or benefits of each alternative was beyond the scope of this study.

The following table presents the results of the economic feasibility analysis. Costs were calculated on the basis of delivering 9 million cubic yards of material to the runway site. The volume of 9 million cubic yards was assumed for this analysis rather than the total 17 million cubic yard volume that will be required for the runway construction, as used in the EIS. Of the 17 million cubic yards required, it is estimated that 3 million yards can be obtained from on-site excavation, and as much as 5 million yards can potentially be obtained from nearby Port-owned property. Thus, the minimum volume to be imported to the runway site is 9 million cubic yards. A factor of 1.5 (increase) was used for conversion of cubic yards to tons in this analysis. The compacted in-place fill requirements were increased by 15 percent to account for shrinkage

during placement. Only transportation costs were included. The total cost of fill material would include the raw cost of material at the source and costs for placement and compaction at the runway site.

Economic Feasibility

DELIVERY METHOD	AVERAGE TRANSPORT COST PER CUBIC YARD
Corridor 1 - Des Moines Creek	
Barge - Conveyor	$3.40 - $4.70
Corridor 2 - SR 509	
Barge - Conveyor	$6.90 - $8.20
Barge - Truck	$3.50 - $4.80
Rail - Conveyor	$13.20
Rail - Truck	$9.90
Corridor 3 - SR 518	
Rail - Conveyor	$11.60
Rail - Truck	$8.80
Trucking Only	
Truck (round trip)	$1.10 - $5.50

Note: The cost of the material, at the source, may impact the total cost benefit of alternatives.

Based on the data shown in the table above, the lowest unit costs appear to be for Corridor 1 barge - conveyor, Corridor 2 barge - truck, Corridor 3 rail - truck, and Trucking within a 20-mile distance from the runway site. Within these four alternatives, there is no significant cost advantage of one over another.

Schedule

A key issue related to use of alternative delivery methods was the time necessary to complete the engineering, environmental analysis, permitting, and construction of infrastructure and facilities required to begin delivering material to the runway site. It was recognized that the schedule related to the Third Runway project is highly variable, and could change during the planning, design and construction process. Figure ES-1, following this page, shows the combined length of time it could take for the permitting process and building of the infrastructure. This schedule presents a conservative scenario for each corridor, and shows the amount of time required before hauling of fill material could begin. Infrastructure is defined for the purposes of Figure ES-1 as the time necessary to construct the structures and facilities required to transfer or haul the fill material under each alternative delivery method.

Schedules for each alternative were based on the mode which would require the longest time to implement. Corridors 2 and 3 were based on a new rail transfer facility and conveyor system. The rail component requires the longest infrastructure time. The trucking schedule was based on

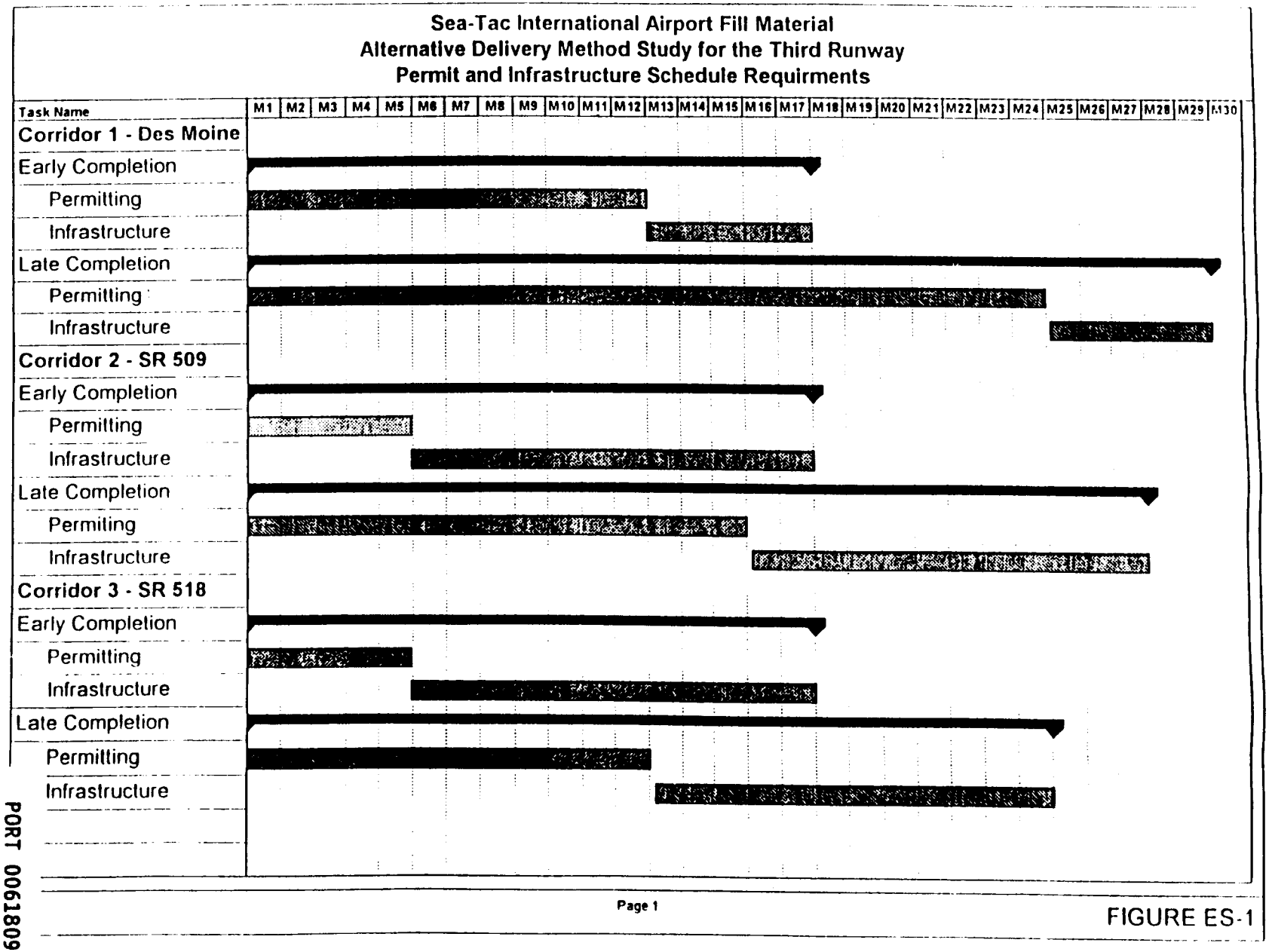

FIGURE ES-1

Sea-Tac International Airport Fill Material
Alternative Delivery Method Study for the Third Runway
Permit and Infrastructure Schedule Requirments

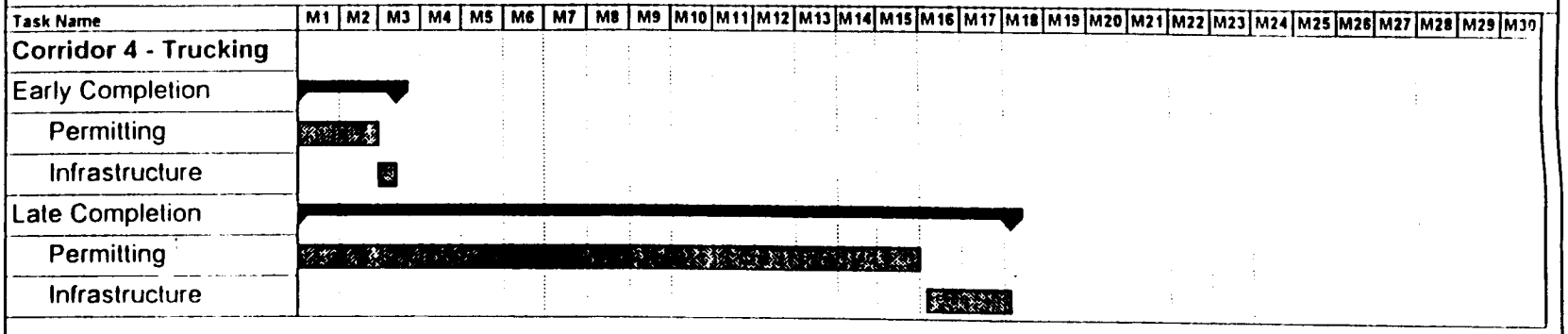

FIGURE ES-1

using existing local streets to access the runway site. Additional time could be required if special site access facilities were needed for truck traffic.

Based on the information shown on the schedule, the trucking alternative could begin earlier than the other alternatives. Total schedule duration for all alternatives should be refined in the next study phase.

Summary Evaluation

The following matrix shows a summary of feasibility ratings for each alternative. Feasibility ratings were determined through evaluation of technical viability, permitting requirements, schedule, relative cost and competition of contractors. Each mode or alternative was rated from low to high feasibility, with low being defined as the most difficult or least feasible and high as the easiest or most feasible.

Summary Evaluation Matrix

	ALTERNATIVE	FEASIBILITY
1	**Des Moines Creek**	
	Barge - Conveyor	*3.4*
2	**SR 509**	
	Barge - Conveyor	*2.8*
	Barge - Truck	*4.4*
	Rail - Conveyor	*1.8*
	Rail - Truck	*3.2*
3	**SR 518**	
	Rail - Conveyor	*2.8*
	Rail - Truck	*3.0*
Trucking Only		
	Truck	*4.4*

Legend	
5	high feasibility
4	moderately high
3	moderate
2	moderately low
1	low feasibility

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The evaluation process was used as a basis for identifying the three alternative methods with the highest feasibility: Corridor 1 - Des Moines Creek; Corridor 2 - SR 506 (Barge-Truck); and Trucking only. Most other alternatives are also viable with somewhat lower degrees of feasibility

and should not be excluded from further consideration. Either the Port or a private entity could pursue development of the other alternative delivery methods.

The following is a brief summary of the three highest rated alternatives:

Corridor 1 - Des Moines Creek

The Des Moines Creek route barge conveyor mode received a 3.4 rating due to its relative cost competitiveness, and moderate technical and permitting issues. However, if this alternative were pursued, material supply would be limited to off-shore sources. This alternative would likely result in the longest total schedule to begin material transport; however, it has the capability to deliver all of the fill material within a range of 14 months to two years of initial operation.

Corridor 2 - SR 509 (Barge-Truck)

The highest feasibility would be for the barge-truck mode. Within this alternative, the barge-truck mode would result in the lowest transport cost, and would be competitive with the lowest costs of the other corridor modes.

Trucking Only

Trucking was rated 4.4 feasibility. Truck routes would provide the most flexibility in accessing available material sources. Trucking would result in the shortest initial implementation schedule, but potentially represents the longest schedule for delivery of fill material. Depending on the haul routes, local permits might be required.

Conclusion

This study demonstrates that alternative delivery modes are feasible and cost competitive.

As part of the procurement process, it will be necessary to define the conditions which construction contractors are required to meet during the transport of material to the runway site. These conditions should encourage innovative alternatives that could reduce construction impacts. Conditions could be established by the Port well in advance of actual construction activities through coordination and negotiation with the affected jurisdictions.

Alternative delivery methods involving conveyors, barge or rail have up front capital and development requirements. However, relative to trucking, other modes offer a fast delivery schedule once the infrastructure is in place.

This study has identified a number of issues that should be addressed in order to continue development of alternative delivery methods. Many of these issues are related to the permitting process and commitment of support for alternative delivery methods. In order to begin resolving these issues, it is recommended that the Port proceed with the following actions:

Corridor 1 - Des Moines Creek

Communicate with City of Des Moines requesting a partnership commitment to enable the Port and/or corridor proponents to proceed with permitting issues.

Corridor 2 - SR 509

Explore potential local jurisdiction permitting issues using state routes for truck traffic. Confirm Department of Transportation requirements for a temporary construction interchange on SR 509

Trucking Only

Explore potential local jurisdiction permitting issues using state routes and local streets for truck traffic. Confirm Department of Transportation requirements for a temporary construction interchange on SR 518.

Introduction

The objective of this study was to conduct a comprehensive evaluation of possible methods of delivering fill material to Seattle-Tacoma International Airport for the construction of a new runway. To date, the Sea-Tac Airport Master Plan Update and associated environmental analyses have focused on delivery of fill material by means of trucks utilizing public roads. This study evaluated alternatives to trucking-only delivery. The evaluation was undertaken through a process of identifying feasible delivery technologies and methods, assessing their technical viability, identifying possible construction/environmental permitting requirements, and assessing the economic issues related to each. The alternative delivery methods were evaluated in the context of transportation corridors which were considered potentially viable routes for transporting fill material. The alternative delivery methods which were identified, some of which include trucking components, were compared to the trucking-only methods considered in previous studies. Three alternative methods of material transport were evaluated by this study: barge, conveyor, and railroad. Since a combination of methods could be used to deliver material to the runway site, intermodal transfer was also reviewed. Intermodal transfer potentially includes barge-to-truck, barge-to-conveyor, rail-to-conveyor, and rail-to-truck. For the evaluation of alternatives, conventional truck transport was included to provide a comparison between the alternative delivery methods. In order to focus study efforts on determining the most feasible delivery concepts, corridors were chosen for further evaluation.

The study was based on an inventory of material transport methods and included the collection of available data from a wide variety of sources. Alternative concepts were developed and a preliminary screening evaluation was performed to identify the most feasible alternatives. These alternatives were then analyzed for permitting, technical viability, and economic feasibility. An evaluation matrix, presented in Table 1, summarizes advantages and disadvantages of the material delivery methods.

A specific construction schedule for fill delivery associated with the new runway embankment has not been established; a range between two and five years in duration has been assumed. Based on current schedule planning, the major fill material delivery contract could potentially begin in 1998. Preliminary estimates indicate the need for approximately seventeen million cubic yards of fill for the new runway. Approximately three million cubic yards of fill could be generated during on-site excavation for the new runway. Thus, fourteen milli-n cubic yards of fill material would be imported either from Port-owned on-site borrow sources or from off-site borrow sources. The quantity of material to be extracted from on-site borrow sources has not been determined; the quantity available could vary significantly. For the purposes of this study, a maximum of five million cubic yards was assumed. Therefore, the quantity of fill material transported from off-site borrow source areas to the runway construction site could range from nine to fourteen million cubic yards, depending on the volume attainable from on-site sources.

This study included participation by contractors, material suppliers, equipment manufacturers, system operators, railroad companies, construction industry representatives, Port of Seattle staff, local and state agencies, and engineering firms.

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Inventory

In order to identify potentially viable alternative delivery methods, a comprehensive inventory task was conducted. The inventory was conducted through collection of available data such as mapping and right-of-way information; meetings with local contractors and material suppliers; and meetings with local, state, and federal agencies. The following is a brief summary of the major inventory efforts and findings.

Material Suppliers and Contractors

Material suppliers and contractors were contacted to discuss ideas and concepts for fill material delivery methods and potential issues related to delivery. Meetings were held with thirteen material suppliers and contractors, and phone conversions were held with other contractors. Industry representatives and material suppliers were also contacted to gain operational knowledge on the potential use of conveyors systems to transport fill material to the runway site.

General contractors and subcontractors were contacted to review alternative methods of transporting fill material. Ideas included:

1) Barging from multiple borrow locations from sites as near as Maury Island or as far as Canada, to barge a potential barge terminal at Des Moines Beach Park or locations along the Duwamish Waterway, both currently developed and permitted and not currently developed;
2) Transport by rail from the north or south by Burlington Northern or Union Pacific rail lines to rail terminals located in Tukwila or West Marginal Way;
3) Transport by conveyor systems located on Des Moines Creek, along SR 509, or along I-405 and SR 518;
4) Trucking the material from overland material source sites or from any barge terminal or rail terminal; and
5) Hydraulically pumping fill material to the runway site.

Associated General Contractors (AGC) Meeting

The AGC was contacted for a list of contractors potentially interested in participating in this study. The AGC list was incorporated as part of the list of contractors contacted. Contractors were invited to a meeting on August 12, 1996, at the AGC building on Lake Union, sponsored by the Port of Seattle and HNTB Corporation. Status of the Third Runway project was discussed, and contractors were asked their opinions on whether the Port should pre-permit material haul routes. Pre-permitting would involve the Port of Seattle attaining permits prior to initiation of a fill delivery contract. Contractor's opinions varied widely, from no Port permitting involvement to pre-permitting by the Port of every route or method.

The majority of contractors also indicated that allowance for multiple routes and/or methods would be preferable during construction. Strong encouragement was given to Port staff by the contractors to provide maximum flexibility in transport methods and to clearly define conditions that would be required to use various delivery methods.

Similar Projects

A review of recent projects in the Seattle area similar in complexity, construction methods, or issues to the Third Runway project was thought to be of value. One such project is the West Point Sewage Treatment Plant, constructed by Metro in the Magnolia neighborhood. While the magnitude of fill material transported for this project was not as great as that which would be required for the Third Runway, the complexity of hauling issues are similar. The project required export of 400,000 cubic yards of earthwork and import of 150,000 cubic yards of aggregates and fill material. Imported aggregates were for concrete which was produced with an on-site batch plant. In order to stockpile the required materials needed for the concrete, aggregate was brought to the site by truck and barge. Truck haul was limited to minimize impacts on the surrounding community. Hauling the aggregate by barge became an alternative due to the proximity of that project to Puget Sound. Barging appeared to be an efficient delivery mode, providing 2,500 to 3,000 tons per day to a temporary off-load facility.

Public Agencies

Public agencies, including the Washington State Department of Transportation (WSDOT), King County, City of Des Moines, and the Corps of Engineers, were contacted to identify concerns and opinions on construction/environmental permitting issues and potential use of rights-of-way or public waterways.

Field Reviews

Material Transfer Sites for Barge and Conveyor

Port of Seattle terminals on the Duwamish Waterway were reviewed with a Port Marine Division representative for possible fill material transfer points. Sites where material could be transferred from barge or rail to truck or conveyor were discussed. Potential sites for barge transfer facilities were identified in an area from Harbor Island (on the east side of the Duwamish Waterway) to Terminal 2 and Terminal 5 (on the west side of the Duwamish Waterway), including all Port Terminals along both sides of the Duwamish Waterway as far south as Terminal 115 near the First Avenue Bridge.

Barge Transfer Site and Conveyor Route on Des Moines Creek

An evaluation was made of a potential barge terminal at Des Moines Beach Park to enable material to be conveyed up a path, parallel to or adjacent to Des Moines Creek, to the runway site. A review was made of the feasibility of the proposed barge terminal site and the proposed route of the conveyor. Import fill material could potentially be transported by barge on Puget Sound to a temporary barge transfer facility off shore at Des Moines Beach Park. A conveyor, supported over water on pilings, could potentially carry the material from the transfer facility to the shore. The conveyor could continue on land through Des Moines Beach Park, through Des Moines Creek, then on Port property to the runway site.

Conveyor Route on SR 509

An evaluation was made of possible routes for a conveyor system from the Duwamish Waterway along SR 509 to the runway site. Starting at potential sites south of the West Seattle Bridge on the Duwamish Waterway, a review of the feasibility of a conveyor system was undertaken. Due to terrain and existing land uses, terminal sites for a conveyor north of the West Seattle Bridge

were considered more difficult than sites south of the bridge. It would be most viable to locate the conveyor terminal as far south as possible, such as at the south end of Terminal 115. This is the nearest point of the Duwamish Waterway to SR 509.

Transport System Technologies

Research was conducted on types of technologies that may be feasible for transporting fill material to the runway site. A description of each transportation technology and its typical advantages and disadvantages are discussed below.

Conveyors

Types of Conveyor Systems

Several types of conveyors could potentially be used to deliver fill material to Sea-Tac Airport. Types discussed in this report are: conventional conveyor belt systems, overland and modular; a fold-up conveyor system; and an air supported conveyor system.

Conventional Conveyor Belt System

This conveyor belt system is the type of conveyor most commonly used in the construction industry. Common uses for this type of system are: in a quarry to transport material from the quarry to a stockpile or storage silo for further transport by truck or rail, and to transport large quantities of material from barges to stockpiles or storage silos. Once a conveyor belt system has been installed, the cost to operate and maintain the system is typically relatively low. This type can carry large quantities for long distances, horizontally or up and down slopes of grades as steep as approximately 18 percent. A belt conveyor system runs on troughing rollers when carrying the load and on return idlers when returning empty. The drive mechanism rotates the belt with either single or tandem pulleys.

There are two types of conventional belt conveyors: an overland system and a modular system. An overland system has a long single belt and requires a large single power source. A modular system uses smaller individual drive units and belts in sections of 40 to 60 feet that can be assembled, or dismantled and moved, fairly easily. The modular system can more easily traverse vertical inclines and negotiate curves than a single belt system because of the multiple transfer points that exist between the individual modular sections.

Advantages of these conventional conveyor belt systems include the speed and volume at which material can be transported, relatively low maintenance cost, and long-term use. Disadvantages of these open conveyor belts include potential dust and spillage. Rollers may also make noise when maintenance is needed. This conveyor system can be improved by spraying water on the material being carried and covering the belt system to minimize dust and noise concerns.

"Fold-Up" Conveyor

A "fold-up" conveyor system folds to enclose material once it is loaded, and then opens to off-load the material at its destination. The conveyor has the appearance of a flexible pipe filled with aggregate. This conveyor technology works very much like a belt conveyor system with the exceptions that it can easily negotiate corners and the belt encloses the fill material to reduce dust. The system has been used in Europe.

The advantages and disadvantages are the same as for conventional belt conveyor system except for the added advantage of the ability to fold up and cover the material, protecting the material from weather and reducing or eliminating the release of dust.

Air Supported Conveyor

An air-supported conveyor consists of a conveyor belt supported on a cushion of air. The advantage of this technology is that because the belt rides on a cushion of air rather than rollers, the aggregate is not vibrated. The result is that the release of dust is minimized. This system uses low horsepower centrifugal fans to transfer air into an air tight cavity with small holes located below the conveyor belt. The small holes allow air to pass through, supporting the belt in lieu of a conventional roller system.

This type of conveyor system is relatively easy to assemble. It is prefabricated in 20-foot lengths constructed from a variety of materials, such as fiberglass or steel, to fit the needs of a project. It can be bolted together with a two-person crew, handled with a small loader, and is easily disassembled. Disadvantages are the potential noise from blowers, and the complexity of traversing curves. In order to traverse curves, this type of conveyor must be constructed with short straight sections, with each section at an angle to the next until the curve is traversed.

Most conveyor systems are installed for use over a long period. Due to the capital investment of installing a conveyor system, the cost savings come with a longer period in use or the transport of a large volume of material. For this project, a conveyor system which uses a temporary structural support system and which can be easily disassembled would be desirable.

Loading and Off-Loading Facilities

A conveyor system requires a loading and off-loading facility to handle material. A conveyor system can load or off-load material directly to or from barges, trucks, or trains. The least amount of handling at transfer points results in lowest possible costs. For example, a truck can bottom dump directly onto a conveyor system without using labor and heavy equipment to off-load. A conveyor system has the capability to off-load and place material with a mobile spreader throughout a project site. This enables material to be spread and compacted with minimal handling. Equipment to accomplish the spreading involves additional cost.

Technically, using a conveyor system is viable, but there is a large initial capital investment to install a conveyor system. Once the system is installed, the cost to transport material becomes very competitive with other modes of transport.

Barges

There are two types of barges which could potentially be used: flat barges which are loaded and off-loaded with a front end loader or bulldozer, and barges with built-in self-loading and -unloading equipment. The self-loader is constructed with a v-shaped deck capable of bottom dumping. The barge is loaded at one end and off-loaded at the lower end onto a conveyor. A tug is required to transport barges.

Barges can be used to transport fill material from one conveyor system (at a quarry for example) to another conveyor system, from one trucking system to another trucking system, or between a combination of the two systems. At each end of barge transport, a transfer is required.

Barging fill material is a viable intermodal method of transporting large quantities of material. This mode of transport allows access to sources of material better suited to transport by water. There is a capital investment at the transfer points for facilities to accommodate off-loading and loading. A water pathway is obviously not available to enable material to be barged directly from the material source to the runway site. Therefore, the need for additional transfer points adds cost to this delivery method.

Rail

Trains can be used to transport fill material, and have been used for this purpose in a variety of situations. Material can be carried by train from a quarry or borrow source directly to a project site, or between points of transfer to other modes of transportation. One type of rail car that is compatible with fill material transport is a container car. A container car is transported by rail with the material loaded, and at the transfer point is picked up and transferred onto a truck chassis. An advantage of this method is that the raw material does not have to be handled at the transfer points; the container itself is transferred. Another type of car that would work for transferring to both truck or conveyor is a bottom dump car. A bottom dump car deposits material from the bottom of the car, supported by a trestle, either onto a conveyor or into a truck.

The use of trains to transport fill material would require coordination and scheduling with railroad owners. The number of trains that can run per day and their scheduling can be significantly constrained by other rail traffic on the particular rail sections to be used. The owner of the rail line typically supplies engines and crews for the trains that would be used.

Trucking

Conventional trucking was evaluated in the Final EIS for Sea-Tac International Airport. The data gathered for the EIS are used for screening and evaluation in comparison to alternative material delivery methods in this report.

Hydraulic Pipeline

Hydraulic pipeline technology is capable of transporting material to a construction site by using water pumped through a pipe with material suspended in the solution. This is very similar to conventional dredging operations. Primary disadvantages of this system are storage and cleaning of the discharged water, and saturation of the fill material with water. At this time, this alternative is not considered sufficiently feasible to warrant further evaluation.

General Construction/Environmental Permit Considerations

Permits for any fill material delivery method and transportation corridors will require extensive coordination and consultation with numerous local, state and federal agencies. There are a number of issues that could either shorten or lengthen the overall time frame from design to final permitting for any of the methods and corridors discussed in this report. A number of these issues are listed below:

Issues Which Could Decrease Permit Process Time Requirements:

- Strong public support from local political leaders would greatly improve the permitting process, and decrease permitting complexity and time. Demonstrable evidence of such support could be in the form of adopting a resolution or entering into a memorandum of understanding regarding the need for the runway project and the availability of local resources to assist in the permitting process.
- Well defined project concepts and design ideas are essential from the beginning of the permit phase.
- Coordination between all local state and federal agencies must take place early in the process. This coordination should continue throughout the permitting process. Although the state and federal permits are issued after the shoreline permit process concludes, these agencies should be involved at all stages of the permitting. As changes are made in the project or proposed delivery methods or routes, these agencies should be informed and their approval should be included in requirements for pursuing a new aspect of the project.
- Reasonable mitigation should be identified early in the process and designed to the satisfaction of all local, state and federal agencies.
- Public involvement should be well orchestrated. Controversial issues should be identified early in the process and addressed. Attempts should be made to create "partnerships" wherever possible.
- Efficient coordination of different governmental agency processes is essential. This requires keeping everyone informed. In advance of submitting permits, the applicant should determine where there may be "log jams" in the permitting process so that extra attention is given to those particular aspects of the permitting.
- Opportunities for receiving exemptions or "shortened" permit processes should be identified where possible. Since any structures such as conveyors to be used in material delivery would be "temporary" in nature and would be removed at the end of the runway project, there may be reduced permitting requirements that should be explored.

Issues Which Could Increase Permit Process Time Requirements:

- Appeals: Appeal of any local, state or federal government decision will add time to the process. The more complicated the issue, potentially the longer the appeal process. Some appeals issues can be resolved administratively; others can potentially be resolved through the use of mediation or facilitation to avoid expensive and protracted legal challenges.
- Public involvement: There are a number of points in the permitting process when citizens may challenge the runway project or proposals for material delivery. The typical point for challenges is either during the SEPA review and/or Shoreline Permit where appeals go to the Shoreline Hearings Board. Early involvement of the community and efforts to address concerns can diffuse many issues.

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- Agency complications related to natural resource issues, such as eel grass mitigation plans or sensitive areas plans, can slow the permit process as the parties attempt to find solutions to problems created by a proposed project.

- Resolution of possible DOT Section 4(f) impact issues may be one of the most difficult constraints to be faced. Depending upon delivery method and proposed transportation corridor, local agency approval could be required for impacts on parks or similar existing land uses.

Alternative Delivery Methods by Corridor

In order to focus study efforts on determining the most feasible delivery concepts, three transportation corridors were selected for detailed evaluation with regard to alternative delivery methods. These corridors are identified as Corridor 1 - Des Moines Creek, Corridor 2 - SR 509, and Corridor 3 - SR 518.. Figure 6, located at the end of this report, depicts the corridor locations. As previously noted, a primary objective of this study was to compare potential alternative delivery concepts to the use of trucking only for delivery of fill material to the runway site. To that end, trucking-only delivery of material has been evaluated to the same level of detail in this study as the alternative delivery methods and corridors. Trucking as addressed in this report is not for a specific corridor, but for all potential truck route corridors to the runway site.

These three corridors represent the most likely possibilities for alternative delivery concepts. Opportunities for using alternative delivery methods were identified for each of the three corridors.

In general, each of the delivery method alternatives within each corridor was evaluated for overall ability to be designed and implemented. Preliminary alignments and grades were evaluated using existing mapping and as-built plans to ascertain technical feasibility. Temporary access facilities such as freeway ramps were considered and reviewed for possible use. Existing railroad lines and surrounding land were studied to determine where temporary off-loading facilities could be located. Conveyor systems were evaluated to determine cursory information for length, grade, horizontal and vertical curves, elevated structure, right-of-way, power, maintenance/repair access, aesthetics, noise, security, and obstructions/constraints. Obstructions/constraints might include highway crossings, underpasses, overpasses, on/off ramps, intersections, structures, driveways, pedestrian walkways, parks, wetlands, vegetation, overhead utilities, and private property

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CORRIDOR 1

Corridor 1. Des Moines Creek

General Description

The general concept for the Des Moines Creek Corridor involves transporting fill material from Puget Sound to the runway site by means of a conveyor system constructed along Des Moines Creek. Import fill material could be transported by barge on Puget Sound from material sources around the Sound to a temporary barge transfer facility constructed off-shore at Des Moines Beach Park. A conveyor, supported over the water on piling, could carry the material from the transfer facility to the shore. The conveyor could continue on land along the north perimeter of Des Moines Beach Park, through Des Moines Creek Park and to Port of Seattle airport property. A tunnel or similar passageway would need to be constructed under Marine View Drive and possibly under S. 200th and S. 188th Streets to provide passage for the conveyor. Except at these locations, the entire conveyor system could be placed above ground. At its end point, the conveyor could off-load material at the construction site of the new runway.

The transfer and conveying system could be capable of operating up to 24 hours per day at a rate of 2,000 tons per hour and up to 365 days per year. At the completion of service, the entire system could be removed.

Technical Viability

Temporary Barge Transfer Facility

The temporary barge transfer facility could be located in the open waters of Puget Sound, immediately north of the Des Moines Marina and the Des Moines Public Fishing Pier, and outside the Puget Sound Ship Traffic Lanes. The site has adequate depth and clearance from adjacent structures for the maneuvering and berthing of large barges using tugboats. The site would be exposed to wind and waves from the north and southwest; however, wind and waves would likely not limit berthing and transfer operations except perhaps under severe storm conditions that may occur during a few days each year. The transfer facility could be constructed in water depths of 20 feet below mean low water and greater to accommodate the drafts of fully loaded barges. Dredging or filling would not be required.

At least two different transfer facility design options are feasible. One option would consist of a floating transfer barge that would serve as the off-shore terminus for the conveyor system. Pile dolphins could be used to moor the transfer barge and import material delivery barges. A second option would include a fixed off-shore transfer platform approximately 60 feet square instead of a transfer barge. For both options, the berthing space would be approximately 1,100 feet off-shore and could provide for concurrent berthing of two delivery barges to facilitate and expedite transfer operations.

Import material could be removed from the delivery barges by a feeder conveyor and transferred to the primary conveyor on the transfer barge or platform. All equipment on the transfer facility could be hydraulically and/or electrically operated to lessen noise impacts. Electric power is available near the shoreline.

The primary conveyor could proceed directly to the shore over subtidal and intertidal lands, supported by fixed pile bents at approximately 50-foot spacing. The conveyor width over aquatic lands would not exceed approximately 10 feet, including catwalk.

Land Conveyor System Route

From the shore, the conveyor could traverse the hillside along the north edge of Des Moines Beach Park without disturbing the existing adjacent park pedestrian trail or small park buildings. East of the park vehicle bridge that crosses Des Moines Creek, and away from the park areas commonly used by the public, the conveyor could be located adjacent to and parallel to the existing maintenance road that ends at the Marine View Drive embankment.

A tunnel or other similar passageway would need to be constructed to allow the conveyor to pass through the Marine View Drive embankment. The Midway Sewer District is currently designing a new sewer outfall and lower trunk line that will require passage through the embankment. Construction for that project is scheduled for 1997. Additionally, the City of Des Moines, together with the Washington State Department of Transportation, is currently planning the construction of a pedestrian passageway under Marine View Drive that would serve as a linkage in the city's Nature Trail Park between Des Moines Beach Park and Des Moines Creek Park. It could be feasible to construct a passageway through the Marine View Drive embankment that would effectively serve both of these projects and also provide passage for the fill material conveyor. The Phase II analysis will study this possibility further.

East of Marine View Drive to the Midway Sewer District treatment plant, the conveyor could be located adjacent to and roughly parallel to the existing maintenance road that serves the Sewer District's lower trunk line. East of the treatment plant, the conveyor could continue for a short distance along the Sewer District's maintenance road that serves the District's upper trunk line, or proceed in a more northerly direction through a vegetated area for several hundred feet to Port of Seattle property.

On Port of Seattle property, the conveyor could continue north on abandoned paved roadways, primarily 18th Street. It would be necessary to construct a portion of the conveyor overhead or to tunnel under the crossing at S. 200th Street. From S. 200th, the conveyor could continue around the west perimeter of Tyee Golf Course to S. 188th Street, then overhead or underground across S. 188th and along the airport perimeter road to the runway construction site. Alternatively, the conveyor could continue from S. 200th through the golf course on the navigation aid easement to the airport safety area and then to the runway site.

The conveyor system length from the barge transfer facility to the new runway construction area would be approximately 4 miles.

Conveyor Description

The conveyor could consist of modular conveyor sections approximately five feet wide and four feet high, varying in length from approximately 60 feet to as long as 1,000 feet. Sections could typically be supported on temporary wood or steel frames spaced at about 100 feet on center. Conveyor belts would likely be 4 feet wide, made of high strength flexible rubber material and powered by electric motors.

The use of modular conveyor sections would effectively accommodate the various changes in grade and alignment that would occur on the conveyor route. Modular conveyor sections could vary in length to fit the topography of the land the conveyor crosses. Hills, turns, and road and drainage crossings could be effectively traversed.

Special Conditions and Constraints

Along most of the likely route, the conveyor would be located on land that currently has limited public use or access. The route does, however, travel through City of Des Moines parkland, where the first phase of a 16-foot wide, multi-use trail along the Sewer District's trunk line is scheduled for construction and completion in 1997. The second phase of the trail is not currently scheduled, but is planned for construction in 1998 or 1999. Constructing a conveyor system in close proximity to a public trail and creek could be difficult due to concerns with safety, maintenance access, security, dust, and aesthetics. The route would also go through public facilities in Des Moines Beach Park, along a portion of Tyee Golf Course, and cross S. 200th street and S. 188th Street. At S. 200th and S. 188th Streets, it could be feasible to construct the conveyor overhead or underground to avoid public conflicts. Options for a system avoiding public access will be reviewed in more detail in Phase II of the study. The conveyor route does not conflict with the location or use of existing buildings or other structures.

Access for conveyor maintenance is good along most of the route. Maintenance vehicles and personnel could travel on existing roads in most locations along the conveyor.

Electric power is available along the conveyor route. Power line conflicts are expected to be minimal.

Construction/Environmental Permitting

This section summarizes possible local, state, and federal permits necessary for Corridor 1, Des Moines Creek. Local governments that would likely be involved could include the Cities of Des Moines and SeaTac. The Des Moines Creek permitting issues are listed below.

Barge and Conveyor

- Conveyor operation over parklands (will require a DOT Section 4(f) evaluation.)
- Easement and Lease Acquisition
- Noise impacts
- Visual quality impacts
- Construction impacts to on-shore and near-shore critical habitat areas
- Water quality impacts
- Coastal Zone Issues
- Air Quality Impacts

General Permit Approach

A wide variety of permits would likely be required in conjunction with this corridor. Jurisdictions issuing the permits that might be required include the City of Des Moines, the City of SeaTac, Washington Department of Fish and Wildlife, Washington Department of Natural Resources, Washington Department of Ecology, and U.S. Army Corps of Engineers. The necessary permits, permitting requirements, and the likelihood of approval will be studied and feasibility confidence determined in Phase II of the study. In response to initial inquiries, the

City of Des Moines issued an opinion letter regarding required permits for the proposed alternative. The permitting times listed below generally correlate with information received from the City of Des Moines. However, they do not include potential delays resulting from challenges or permitting complications.

Local Permits and Approvals

Right-of-Way Use Permit (conveyor)

- **Agency**
  City of SeaTac, Midway Sewer District

- **Need for Permit**
  Midway Sewer District maintains a sewer line and right-of-way through the Des Moines Beach and Creek parks, which may be an appropriate location for the conveyor. The conveyor is also likely to extend along the 18th Avenue South right-of-way located in the City of SeaTac. A right-of-way use permit would be required to locate the conveyor within the sewer easement and within the local road right-of-way. There is also a legal issue of whether the scope of the utility easement granted by the City of Des Moines to the Midway Sewer District would be exceeded by locating the conveyor in the easement. Right-of-way use permitting will be analyzed in more detail in Phase II of the study.

- **Permitting Time**
  Three months

Property Easement (conveyor)

- **Agency**
  Des Moines

- **Need for Permit**
  The conveyor would most likely be located through portions of the Des Moines Beach and Des Moines Creek parks. A property easement may need to be secured. The likelihood of obtaining an easement is unknown, but will be determined in the second phase of this study.

- **Permitting Time**
  Three months

City of SeaTac and City of Des Moines Environmentally Sensitive Areas Ordinance Review (barge and conveyor)

- **Agency**
  Cities of SeaTac and Des Moines

- **Need for Permit**
  These Sensitive Areas Ordinances identify several types of sensitive areas and establish setbacks and other construction standards for those areas. The types of sensitive areas that may be present on site within this corridor are steep slope, landslide, erosion, seismic, and flood hazard areas, wetlands, and a stream. Any construction in or around these areas may require local review and approval. Development exceptions set forth in the Ordinances may

be required for this corridor. If wetlands are identified in the permit review process, this may also trigger the requirements for securing a Section 404 permit from the Corps of Engineers, discussed below under "Federal Permits." Phase II of the study will review jurisdictional property issues, ordinances, and required permits.

- **Permitting Time**
  Six months

City of SeaTac and City of Des Moines Building Permits (barge and conveyor)

- **Agency**
  Cities of Des Moines and SeaTac

- **Need for Permit**
  The applicant is required to secure a building permit from each of the municipalities prior to construction.

- **Permitting Time**
  Three months

City of SeaTac and City of Des Moines Grading Permits (barge and conveyor)

- **Agency**
  Cities of SeaTac and Des Moines

- **Need for Permit**
  If construction activities are to result in movement of more than 50 cubic yards of fill, then a grading permit would be required. For property outside the Sea-Tac Airport aircraft operations area, grading in excess of 50 cubic yards will likely be required in order to place the support structures for the conveyor system through Des Moines Creek Park and to construct the tunnel under Marine View Drive.

- **Permitting Time**
  Three months

Unclassified Use Permit (conveyor)

- **Agency**
  City of Des Moines and City of SeaTac

- **Need for Permit**
  Phase II of the study will determine if a conveyor is considered an unclassified use. If the conveyor use is considered an unclassified use, zoning regulations of the City of Des Moines and the City of SeaTac require issuance of an unclassified use permit.

- **Permitting Time**
  Twelve months

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State Permits

Aquatic Use Authorization (Aquatic Lease) (barge)

- **Agency**
  Washington Department of Natural Resources

- **Need for Permit**
  Leases of state-owned aquatic lands are administered by the Department of Natural Resources. State-owned aquatic lands include constitutionally established harbors, state tidelands, shorelands, and beds of navigable waters. Issuance of a lease to use these public lands is based upon evaluation of the proposed use by the Department's Aquatic Lands Division. The barge-to-conveyor transfer areas could be located over state-owned aquatic lands and may require an aquatic lease. The likelihood of obtaining an aquatic lease will be considered further in the second phase of this study.

- **Permitting Time**
  Twelve months

Temporary Modification of Water Quality Criteria (Water Quality Modification) Certification (barge and conveyor)

- **Agency**
  Washington Department of Ecology

- **Need for Permit**
  Any project that may violate water quality criteria (particularly the turbidity criterion) on a short-term basis may require an interim water quality modification certification. A section 401 water quality certification is issued concurrent with the Corps of Engineers Section 404 permit. Since it is not anticipated that this corridor would require a Section 404 permit, a Section 401 water quality certification from the State of Washington may not be required. Phase II of the study will explore this issue further.

- **Permitting**
  Six months

Hydraulic Project Approval (barge and conveyor)

- **Agency**
  Washington Department of Fish and Wildlife

- **Need for Permit**
  The conveyor system may use and alter the offshore aquatic bed. The conveyor also may pass over the Des Moines stream channel. Both activities would require a hydraulic project approval. The Department of Fish and Wildlife (DFW) may require extensive review if there are eelgrass beds in the vicinity of the proposed overwater structure. Early identification of issues that may concern DFW will allow for development of mitigation opportunities to address the agency's concerns. The likelihood of obtaining hydraulic project approval will be studied further in the second phase of this study.

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- **Permitting Time**
  Twelve to eighteen months.

Department of Transportation Crossing Permit (conveyor)

- **Agency**
  Washington State Department of Transportation

- **Need for Permit**
  The tunnel to pass under Marine View Drive may require permission from the Washington State Department of Transportation (WSDOT). Other road crossings may also require permission from WSDOT. The likelihood of obtaining crossing permits will be considered further in the second phase of this study.

- **Permitting Time**
  One month

Shoreline Management Act Permit (Shoreline Substantial Development Permit or Shoreline Conditional Use Permit) and Coastal Zone Management Certification (barge and conveyor)

- **Agency**
  City of Des Moines (with Department of Ecology approval for Conditional Use Permit)

- **Need for Permit**
  A permit is required for any development or construction activity, valued at $2,500 or more, within marine waters or designated shorelines. The Des Moines Creek delta area is designated "conservancy" according to 1987 amendments to the Shoreline Management Program. Transportation is a permitted use in conservancy areas. If the barge and conveyor activities are interpreted as transportation uses, then a shoreline substantial development permit would be required. If the barge and conveyor activities are interpreted as unclassified uses, then a shoreline conditional use permit would be required. The City of Des Moines would process a substantial development permit concurrent with an Unclassified Use Permit. The State reviews the local municipality decision and issues a coastal zone management certification. The shoreline permit issues will be addressed in more detail in Phase II.

- **Permitting Time**
  Twelve to eighteen months

Federal Permits

Department of Army Standard Permit (Section 10 Rivers and Harbors Act) (barge)

- **Agency**
  U.S. Army Corps of Engineers

- **Need for Permit**
  Construction of the barge transfer facility and conveyor system would require mooring and support pilings, and therefore, a Section 10 permit would be required from the Corps. This would be evaluated as to impacts to navigable waters and any impacts to aquatic habitat.

Dredging or placement of fill in the water is not proposed for the overwater pier construction. If there are impacts to Des Moines Creek, the impacts may trigger the requirements for a Section 404 permit, a much lengthier process than a Section 10 permit. The Section 404 permit process would require a "practicable alternatives" analysis, which will be explored further in Phase II.

- **Permitting Time**
  Twelve to eighteen months.

Section 4(f) of the Department of Transportation Act (49 USC Part I, Section 303)

- **Agencies**
  FAA, Port of Seattle, and City of Des Moines

- **Need for Approval**
  Construction of a proposed conveyor in the Des Moines Creek Park may require special federal approval beyond that discussed because the route involves use of parkland. Federally funded transportation projects affecting parks are required to prepare a DOT 4(f) statement. Section 4(f) refers to a section of the Department of Transportation Act for policy on lands, wildlife and waterfowl refuges, and historic sites.

  According to the Act, the Secretary of Transportation may approve a transportation project of local significance only if 1) there is no prudent and feasible alternative to using the land; and 2) the project includes all possible planning to minimize harm to the park. Consent of the local jurisdiction (in this case, the City of Des Moines) to use of 4(f) lands would be essential in the application of this federal mandate protecting the use of parklands. The likelihood of obtaining permit approval under these criteria will be explored in Phase II.

- **Permitting Time**
  Six Months.

Summary

Permitting the Des Moines Creek Corridor would involve a multi-jurisdictional effort, as would permitting of any potential corridor. Early identification of issues and strong efforts to maintain well-coordinated permitting efforts between agencies should allow for permits to be issued in 12 - 24 months. (See Figure 1.) The ultimate success of this corridor as an alternative method for delivering fill will depend upon local support.

Economic Feasibility

The costs below represent cost data gathered from material suppliers and contractors contacted during this study. The costs should be considered as order of magnitude estimates.

Barge

Loading Facility - $1 to $2 million
Off-loading or barge terminal - $1.5 million
(The barge terminal at Metro's West Point Project was $4.5 million)
Transport per ton of material - $.50 to $1.25 (Transport distance: 4 to 50 miles)
The range of cost per ton does not include barging from Canada.

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Conveyor

Loading Facility - $1.5 to $2.5 million
Off-loading Facility (Stackers and Spreaders) - $1.5 to $2.5 million
Per linear foot of conveyor - $ 300 to $500 (Range: simple to complex route)
Transport per ton of material - $ 0.60

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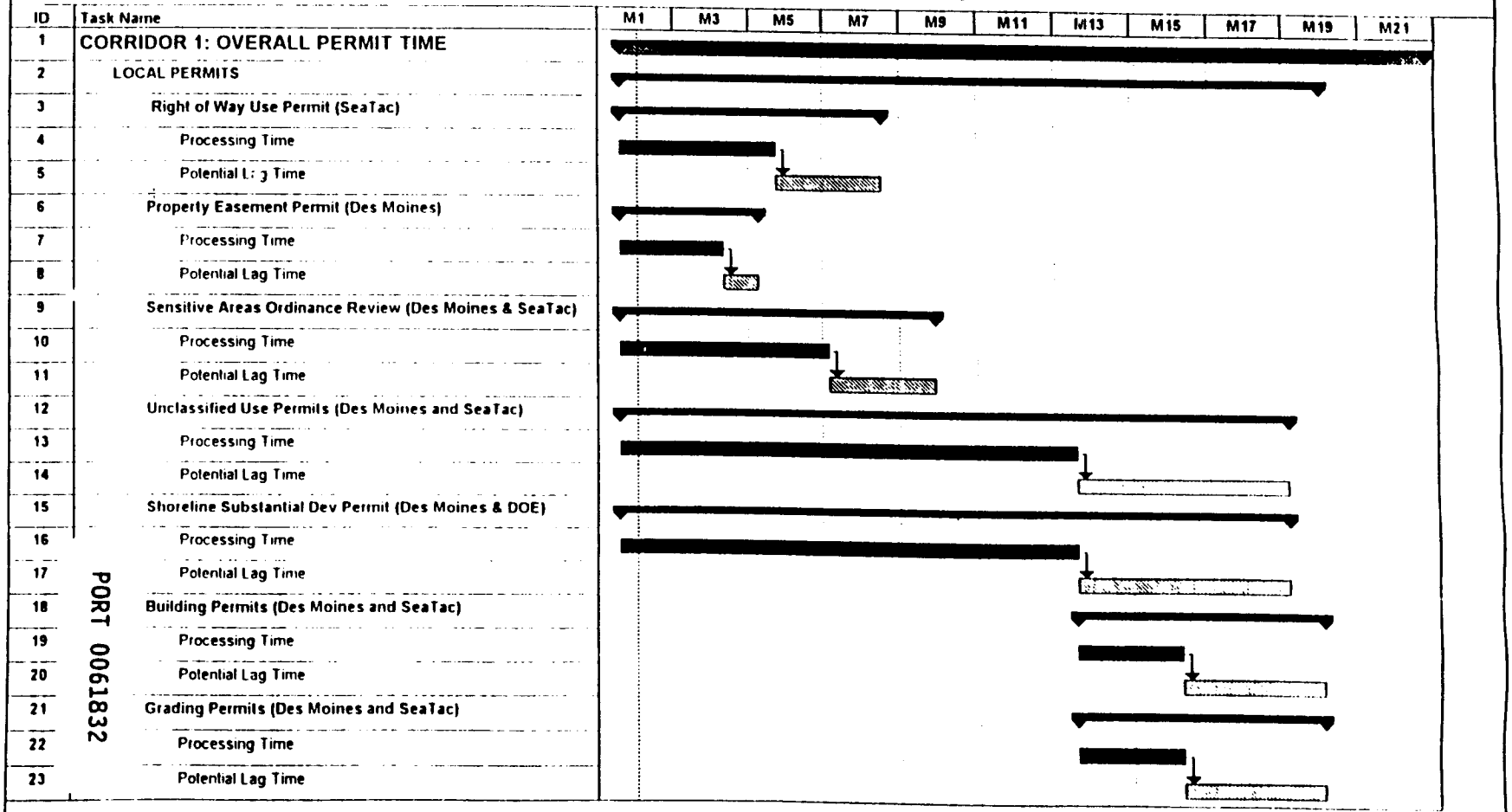
Sea-Tac International Airport Fill Material
Alternative Delivery Method Study for the Third Runway
Corridor 1: Des Moines Creek - Permit Requirements



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SCHEDULE FOR PERMIT APPROVALS - CORRIDOR 1
Date Created 9/19/96
Date Revised 10/3/96

Processing Time | Potential Lag Time | Summary

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Page 1 of 2

FIGURE 1

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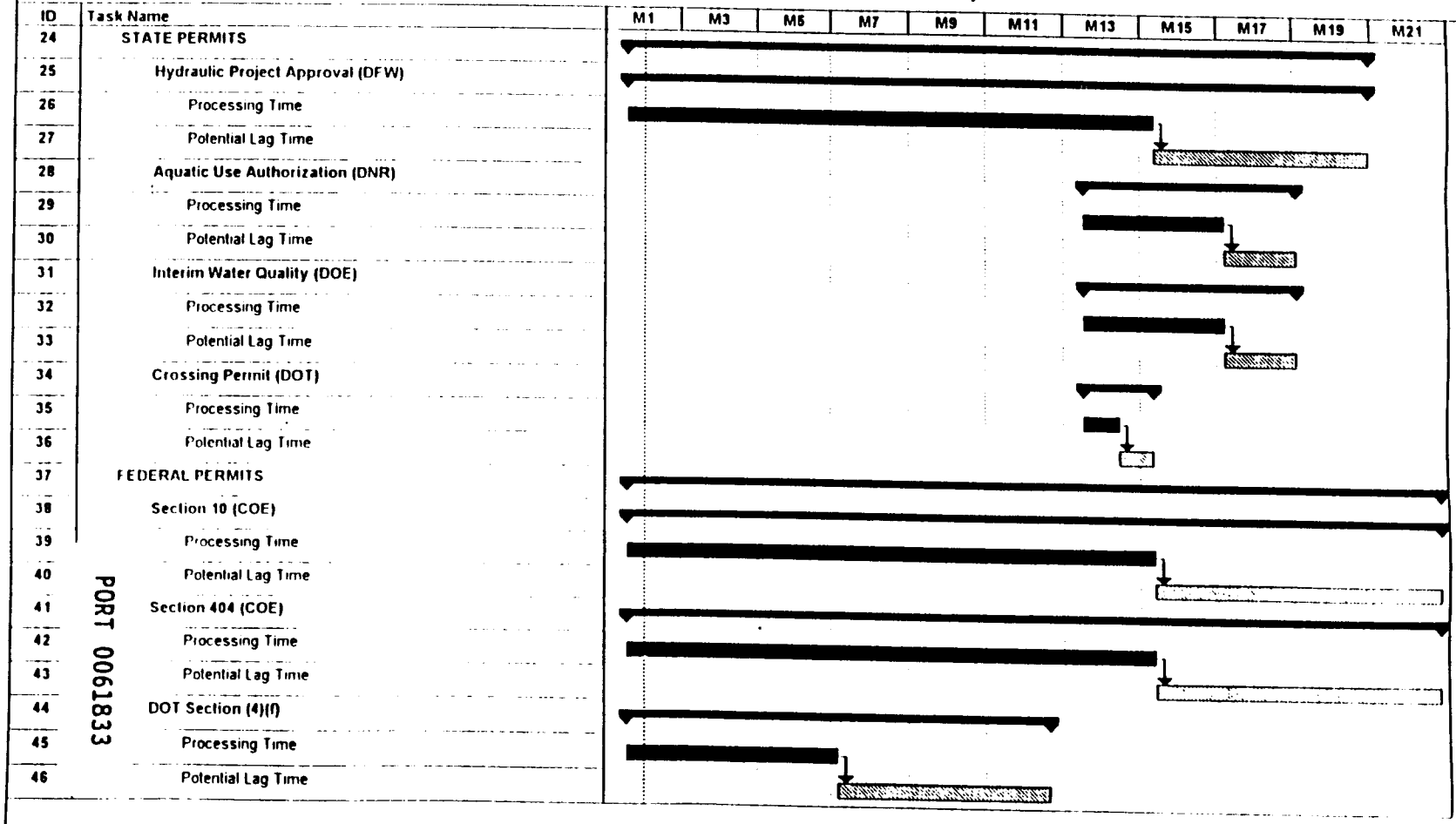
Sea-Tac International Airport Fill Material
Alternative Delivery Method Study for the Third Runway
Corridor 1: Des Moines Creek - Permit Requirements



SCHEDULE FOR PERMIT APPROVALS - CORRIDOR 1
Date Created 9/19/96
Date Revised 10/3/96

Processing Time | Potential Lag Time | Summary

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FIGURE 1

CORRIDOR 2

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Corridor 2. SR 509

General Description

The general concept for the SR 509 corridor involves transporting fill material from the Duwamish Waterway to the runway site along SR 509. Fill material would be delivered to the Duwamish Waterway by barge or train, where it would then be transferred to conveyor or truck.

Technical Viability

The technical viability of the SR 509 corridor and alternative delivery methods is addressed specifically for a conveyor system and for trucking.

Corridor System

Import fill material could be transported by barge to the Duwamish Waterway, to either a barge transfer facility to be constructed or to a modified existing facility. Optionally, import fill could be transported by rail to a transfer site west of the Duwamish Waterway, with some modification to the existing rail system. Either transfer facility could off-load material directly onto a conveyor system.

If the barge or rail transfer facility is north of the First Avenue South Bridge, the conveyor system would follow W. Marginal Way to SR 509. From this point, the system could be constructed on the west or east side of SR 509. For the purpose of this study, the west side of SR 509 was analyzed. The conveyor system would follow SR 509 south, with the majority of the system above ground and not elevated. At intersections and interchanges, the system would cross ramps and roadways in tunnels. Tunnels could be constructed using cut and cover methods at night. One option for a tunnel structure would be a precast box culvert that the conveyor would pass through. At SR 509 underpasses, the conveyor system would use a portion of the highway shoulder and pass under the crossing roadway at the same grade as the highway. At SR 509 overpasses, the conveyor would use a portion of the shoulder or, if shoulder width is inadequate, could attach to the existing bridge structure to span the crossing roadway. At its end point, the conveyor would off-load the imported material directly to the new runway construction site.

Barge or Rail Transfer Facility

A specific location for a material transfer site along the Duwamish Waterway has not been identified, although there are many possibilities. A number of privately owned sites, some of which are permitted, could serve as a barge transfer site for the import of material for the new runway. Additionally, the Port of Seattle owns various terminal sites that might be usable for transfer sites. A field review was conducted with a representative from the Port of Seattle Marine Division concerning potential transfer sites. The following sites, shown in Figure 8 at the back of the report, were reviewed:

Terminal 5 - This terminal site is currently under construction. The entire site is planned for use by containerized cargo; therefore, barging fill material to this site is not considered a likely option.

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Terminal 2 - (also known as Pier 2) In its present condition, Terminal 2 could be used as a transfer site. In approximately one year, the adjacent Terminal 5 work will be completed and will effectively isolate Terminal 2 from rail access. Terminal 5 will have a nature path with open space and will no longer be served by rail. Use of Terminal 2 as a transfer site would require fill material to pass through the W. Marginal Way/Spokane Street Intersection which is very congested.

Terminal 105 - This site appears very suitable since it is not currently being used and is in close proximity to West Marginal Way and SR 509. This site has existing dock facilities and can be accessed by rail. However, the Port is in the process of selling this terminal to businesses displaced by the planned Terminal 18 expansion on Harbor Island. The Port is currently cleaning and upgrading Terminal 105 for the displaced businesses. For this reason, the Port is unable to provide this terminal as an option for a fill material transfer site.

Terminal 107 - This site is used for public access to the Duwamish Waterway and as a nature park. It is not available for a fill material transfer site.

Terminal 115 - This large terminal is currently leased by several tenants. International Terminals Corp. (ITC) operates 900 feet of linear dock facility on the north end of the terminal. Seafreeze occupies most of the south end of the terminal. Jore Corporation has a shorter section of the waterfront between ITC and Seafreeze. Jore's waterfront is used by barges and would have very good access to the terminal's south roadway entrance, and ultimately to W. Marginal Way. South of Seafreeze is a small portion of Terminal 115, which the Port could potentially provide for a transfer site. However, the space constraint between Seafreeze and the First Avenue South Bridge make this site difficult to use as a barge transfer site due to a short waterfront and tight barge turnaround area. If an agreement could be negotiated with Seafreeze for part of their waterfront, this might develop into a desirable site given its close proximity to SR 509.

Terminal 106W-CFS - This terminal is currently idle and has adequate land space and good access to East Marginal Way and a rail line. This terminal has only a small length of waterfront and the water space is limited due to the proximity of Terminal 102. Water space could be created for docked barges and a barge turnaround area if an agreement was made with the marina leasing space at Terminal 102. The east end of the marina provides moorage for a few tugs which, if moved, might make this a viable option.

Terminal 108 - This terminal is used by a company in the business of storing and rebuilding cargo containers. It may be possible to negotiate a different site for this tenant and enable this terminal to serve as a barge transfer site. The waterfront at this terminal was not reviewed.

Lockheed site - The Lockheed-owned site is on the west shore of Harbor Island, north of Fisher Flour Mills and south of Todd Shipyard. It is a large vacant site which could be leased. The difficulty with using this site for fill material transfer is its location on Harbor Island; trucking or conveying material off Harbor Island would be difficult due to congestion along Spokane Street.

T18 Berth - This site is on the east shore of the East Duwamish Waterway between Terminal 25 and Terminal 30. It has very good docking facilities and is adjacent to Alaskan Way S. This site is potentially available for use within the next couple of years.

Summarizing this preliminary review of potential material transfer facilities: Terminal 115 and a few of the existing private barge dock facilities appear to be the most desirable fill transfer sites. Terminal 115 is very close to SR 509, avoiding congestion on W. Marginal Way, but has limited space, would require construction of a dock facility, and is not currently under permit. The existing private barge transfer facilities reviewed have permits and have adequate space, but would need to use W. Marginal Way for transporting material. Although many of the terminal sites were not immediately available for use, the Port should evaluate the current status of terminals and other sites that could be leased or purchased for a fill material transfer area.

Conveyor System Route

A reasonable site for a barge terminal would be south of the West Seattle Bridge due to traffic and rail congestion north of the bridge. Beginning south of the bridge in the vicinity of Terminal 105, a conveyor system could leave the west shore of the Duwamish Waterway and exit the private or Port property with a 90-degree directional change onto the W. Marginal Way corridor. A conveyor route using the right-of-way on the east side of the street would be constrained by an existing rail line, bike trail, overhead powerlines, and access driveways. To use the west side of West Marginal Way, the conveyor would need to be elevated to cross West Marginal Way. This elevated crossing would likely require the relocation of a section of overhead powerline. The conveyor would likely remain elevated to avoid driveways and streets until south of Terminal 107, where vegetated right-of-way on the west side of the street is a more conducive space for the system. The system could be elevated again to cross Highland Park Way or W. Marginal Way, depending on the route chosen to reach SR 509.

Given the constraints and challenges mentioned above, a conveyor system beginning near SR 509 and avoiding W. Marginal Way could be more feasible. The Port owns property at the south end of Terminal 115 where it may be possible to build a barge off-loading facility, as noted above. If fill were transferred to a conveyor system at this location, it could greatly simplify the conveyor routing required to reach the SR 509 corridor.

Once the conveyor route has reached the SR 509 corridor, the route could follow the west side of the highway carrying material south. The conveyor could stay close to the shoulder of the highway in order to avoid the wetlands at the first intersection. There is limited space on either side of SR 509 for the conveyor and a maintenance road, unless WSDOT would allow the shoulders to be used. This conveyor route has many obstacles. The system must pass through seven interchanges, cross 14 to 18 ramps or roadways, attach to two or three bridge structures, and use highway shoulder at a number of undercrossings. On bridge crossings, the conveyor system could be installed on roadway shoulders or, where shoulder width was insufficient, could be attached to the outside of the bridge traffic barrier. Strengthening of existing bridges to support the conveyor could be required. During system assembly, roadway tunnels could be constructed by closing the roadway or ramp at night and installing a box culvert or similar precast structure under the roadway. Some impacts to traffic during conveyor construction would be expected, even if major construction was undertaken at night.

At the SR 518/SR 509 Interchange, the route could follow SR 518 to the north end of the runway construction site or could continue south along SR 509 and enter the construction site south of the S. 160th St. Interchange.

The conveyor system length from a barge transfer facility on the Duwamish Waterway near the West Seattle Freeway to Port property near the 160th Street exit would be approximately 9 miles. A conveyor system from Terminal 115 to Airport property near the 160th Street exit would be approximately 7 miles.

Conveyor Description

The SR 509 conveyor system could consist of modular conveyor sections, interspersed with overland conveyor sections mainly at highway intersections, at varying lengths from approximately 60 feet to as much as 1,000 feet. Modular conveyor sections would enable easier traversing of hills, turns, roads, and drainage crossings.

Special Conditions and Constraints

The SR 509 conveyor route would be located along a highway with full public use and access. Security for the system would need to be provided for the entire route. Access to maintain the conveyor would be constrained and could require use of the highway shoulder for a maintenance road. Although WSDOT has stated an intention to assist in making an option such as this possible, approval for use of portions of the highway right-of-way is uncertain.

The SR 509 conveyor route is difficult starting at the Duwamish Waterway, regardless of which route is taken, due to power line conflicts and limited access. The route, although possible to construct, has many power line conflicts, steep hillsides, elevated structures, horizontal and vertical transfer points, and roadway crossings, and would be longest of all conveyor routes reviewed.

Trucking

As an alternative to a conveyor along SR 509, trucks could be used to haul fill material from the Duwamish Waterway to the runway site. Import fill material can be transported by barge or rail to a transfer facility along the west or east shore of the Duwamish Waterway, as discussed previously. The material could then be transferred to trucks for delivery to the runway construction site. With a transfer site on the west side of the Duwamish Waterway, the truck route would result in trucks entering West Marginal Way and traveling south to SR 509. On the east side of the Duwamish Waterway, the route would have trucks entering East Marginal Way and traveling south over the First Avenue South Bridge to SR 509. The route would follow SR 509 and could exit at a number of different locations listed in the *Truck Route* section below. It is technically feasible to transport fill material by barge and truck using the SR 509 corridor.

Transfer Facility

A barge-to-truck transfer facility would be essentially as was described for the barge-to-conveyor transfer facility on the Duwamish. The difference would be that the transfer of material would require that material be stockpiled or stored in silos before being loaded into trucks.

Truck Route

As was stated above in the general description, the truck route could follow either West or East Marginal Way to SR 509. Many options exist from the SR 509 route when nearing the runway construction site and include

- SR 509 to SR 518 to the North Airport Expressway to South 170th to Air Cargo Road to South 154th/156th St. to a north construction site entrance.
- SR 509 to S. 160th St. to a west construction entrance.
- SR 509 to S. 188th St. to the Airport Roadway System at Des Moines Memorial Drive intersection.
- SR 509 to SR 518 to the existing South 154th St. Interchange to a north construction entrance.
- SR 509 to a new off-ramp constructed for construction vehicles only at S. 176th St. to a southwest construction entrance.

Special Conditions and Constraints

A truck route from a barge transfer facility on the Duwamish Waterway south of the West Seattle Freeway to the Airport is technically feasible. Using a barge or rail transfer facility on the Duwamish Waterway to transfer material to trucks, a route exiting to either West Marginal Way or East Marginal Way and hauling on SR 509 to a number of different access points into the Airport is a viable solution. The SR 509 corridor has the highest level of service of all the state routes in the vicinity of the Airport. Material barged or carried by train to the Duwamish Waterway could be trucked to the site using SR 509 during any time of the day.

A direct route to the runway site from SR 509 is provided by S. 160th St., but the ramp intersections currently function at a poor level of service during peak periods, and the haul route passes through a residential area potentially requiring a permit from the City of Burien. A route using S. 170th, Air Cargo Road, and S. 154th St. would likely require improvements to several of the intersections and is a relatively indirect route, although it does avoid residential areas. A route using the existing S. 154th St. interchange would appear to be a good route option since it would be fairly direct, would use designated arterial truck routes, and would use intersections with a reasonable level of service. S. 188th Street would also appear to be a good route option. This route would avoid residential areas, would be fairly direct, would use a designated arterial truck route, and affected intersections operate at a reasonable level of service.

The construction of direct access ramps from SR 509 to the runway site for construction vehicles could make trucking more acceptable to the surrounding communities. A new off-ramp could potentially be constructed to access S 176th St. if a small area of right-of-way could be acquired in the northwest quadrant of this grade-separated crossing. This would provide direct access to the site via S. 176th St. Constructing a new off-ramp to S. 168th St. does not appear to be feasible due to grade problems associated with the crossing of Des Moines Memorial Drive nearby.

Construction/Environmental Permitting

This section summarizes local, state, and federal permits likely to be required for Corridor 2, SR 509. Local governments which might be involved, depending on the specific route, could be the City of SeaTac, the City of Seattle, the City of Burien, and King County. Permitting will be studied in greater detail in the second phase of this study. Permitting issues for the SR 509 corridor are listed below.

Barge

- Construction impacts to on-shore and near-shore critical areas
- Water quality impacts

Conveyor

- Easement (right-of-way) acquisition
- Construction of the conveyor and service road
- Conveyor noise
- Visual and air quality impacts

Truck

- Trucking material on state routes would not require permits
- Trucking material on local routes would most likely require local government involvement

Rail

- Construction impacts to critical areas related to terminal site modification

Agreement for use of the rail lines would need to be acquired. The additional train traffic would require coordination with the Union Pacific or Burlington Northern Railroad traffic planners. Terminal site modifications may be needed.

Local Permits and Approvals

Agreement for Use of the Rail Lines (rail)

- **Agency**
  Union Pacific or Burlington Northern Railroad

- **Need for Permit**
  The additional train traffic would require coordination with the rail line traffic planners of the railroad owner(s).

- **Permitting Time**
  Three to six months

Property Easement (conveyor)

- **Agency**
  Private land owners

- **Need for Permit**
  If a utility right-of-way use permit could not be secured for use of SR 509 right-of-way, the conveyor must be located on private land, and easements from each property owner would need to be secured.

- **Permitting Time**
  Six to twelve months

Cities of Seattle, Burien, and SeaTac, and King County Environmentally Sensitive Areas Ordinance Review (barge, rail, and conveyor)

- **Agency**
  Cities of Seattle, Burien, and SeaTac, and King County

- **Need for Permit**
  The Cities of Seattle, Burien, and SeaTac, and King County sensitive areas ordinances identify several types of sensitive areas and establish setbacks and other construction standards for such areas. Any construction for a transfer terminal, conveyor system, or maintenance road in or around sensitive areas will require local review and approval.

- **Permitting Time**
  Three to nine months

Cities of Seattle, Burien, and SeaTac, and King County Building Permits (barge, rail, and conveyor)

- **Agency**
  Cities of Seattle, Burien, and SeaTac, and King County

- **Need for Permit**
  The applicant would be required to secure a building permit from the municipalities prior to construction of the terminal facilities, conveyor, and maintenance road.

- **Permitting Time**
  Three to nine months

Cities of Seattle, Burien, and SeaTac, and King County Grading Permits (barge, rail, and conveyor)

- **Agency**
  Cities of Seattle, Burien, and SeaTac, and King County

- **Need for Permit**
  If construction activities are to result in movement of more than 50 cubic yards of fill, a grading permit would be required.

- **Permitting Time**
  Three to nine months

Local Haul Route Use Permits (truck)

- **Agency**
  Local governments that might be involved, depending on the specific route, could be the Cities of SeaTac, Seattle, Burien, and Des Moines

- **Need for Permit**
  Special use of local roads and designated truck haul routes

- **Permitting Time**
  Two to fifteen months

State Permits

Aquatic Lease (barge)

- **Agency**
  Washington Department of Natural Resources

- **Need for Permit**
  Leases of state-owned aquatic lands are administered by the Department of Natural Resources. State-owned aquatic lands include constitutionally established harbors, state tidelands, shorelands, and beds of navigable waters. Issuance of a lease to use these public lands is based upon evaluation of the proposed use by the Department's Aquatic Lands Division. The barge-to-conveyor transfer areas may be located over state-owned aquatic lands and may require an aquatic lease.

- **Permitting Time**
  Twelve to fifteen months

Right-of-Way Use Permit (conveyor)

- **Agency**
  Washington State Department of Transportation

- **Need for Permit**
  A right-of-way use permit would be required to locate the conveyor within state route right-of-way. Numerous road and interchange crossings also would need to be negotiated.

- **Permitting Time**
  Six to nine months

Air Space Lease (conveyor)

- **Agency**
  Washington State Department of Transportation

- **Need for Lease**
  An air space lease would be required to locate the conveyor within SR 509 right-of-way. The purpose of the lease is to prevent highway safety problems, traffic interference, and interference with others (e.g., radio wave transmission).

- **Permitting Time**
  Twelve to fifteen months

Temporary Modification of Water Quality Criteria (Water Quality Modification) Certification (barge)

- **Agency**
  Washington Department of Ecology

- **Need for Permit**
  Any project that may violate water quality criteria (particularly the turbidity criterion) on a short-term basis may require a water quality modification certification. (A Section 401 water quality certification is often issued concurrent with the water quality modification certification. However, because the proposed activity would not require a Corps of Engineers Section 404 permit, a Section 401 water quality certification from the State of Washington would not be required.)

- **Permitting Time**
  Six to nine months

Hydraulic Project Approval (barge)

- **Agency**
  Washington Department of Fish and Wildlife

- **Need for Permit**
  The conveyor system may use and alter the offshore aquatic bed and may pass over stream channels. These crossings may require a hydraulic project approval.

- **Permitting Time**
  Two to three months

Shoreline Management Act Permit (Shoreline Substantial Development Permit or Shoreline Conditional Use Permit) and Coastal Zone Management Certification (barge, rail, and conveyor)

- **Agency**
  City of Seattle with Department of Ecology approval

- **Need for Permit**
  A local permit is required for any development or construction activity, valued at $2,500 or more, within the Duwamish Waterway or within 200 feet of the Duwamish Waterway shoreline. The state reviews the local municipality decision and issues a coastal zone management certification.

- **Permitting Time**
  Thirteen to fifteen months

Federal Permits

Department of Army Standard Permit (Section 10 Rivers and Harbors Act) (barge)

- **Agency**
  U.S. Army Corps of Engineers

- **Need for Permit**
  Construction of a barge transfer facility and conveyor system may require modification of the shoreline, and mooring and support pilings. Therefore, an individual permit could be required. Modification activities would be evaluated as to their impacts on navigable waters and any impacts to aquatic habitat. Transfer facility or conveyor structure supports may be placed in sensitive aquatic habitat; however, it is unlikely that Section 404 of the Clean Water Act permit evaluation would apply.

- **Permitting Time**
  Six to twelve months

Summary

Transfer sites would most likely be located on industrial waterfront property in the Duwamish waterfront area. A barge terminal facility may require a shoreline permit, state permits, and a Corps 404 permit if the site is not an existing barge docking and transfer facility. Impacts to critical areas should be minimal and acquisition of permits should not be an unreasonable effort. A rail transfer site in the SR 509 corridor may require modification of existing facilities, but also should require minimal effort to acquire permits. Permits for the barge or rail terminal facilities could likely be acquired within 5-12 months. Permitting a conveyor system from a Duwamish Waterway barge or rail terminal to the site would involve numerous agencies. Depending on the need for property easements and permission to access state right-of-way, conveyor permits could take approximately 15 months. Permitting for trucking material from the barge or rail terminals can vary considerably depending on the jurisdictions involved and the volume of truck traffic through each jurisdiction. Simple negotiations for use of local roads could take from 2-15 months. Permitting for any combination of barge or rail with conveyor or truck could take 5-15 months. (See Figure 2.)

Economic Feasibility

Corridor 2 includes several alternatives for transporting material, as described above. The costs below represent cost data gathered from material suppliers and contractors contacted during this study. The costs shown should be considered as order of magnitude estimates.

Barge

Loading Facility - $1 to $2 million
Off-loading or barge terminal - $1.5 million
(The barge terminal at Metro's West Point Project was $4.5 million)
Transport per ton of material - $.50 to $1.25 (Transport distance: 4 to 50 miles)
Note: The range of cost per ton does not include barging from Canada.

Conveyor

Loading Facility - $1.5 to $2.5 million
Off-loading Facility (Stackers and Spreaders) - $1.5 to $2.5 million
Per linear foot of conveyor - $ 300 to $500 (Range: simple to complex route)
Transport per ton of material - $1.75

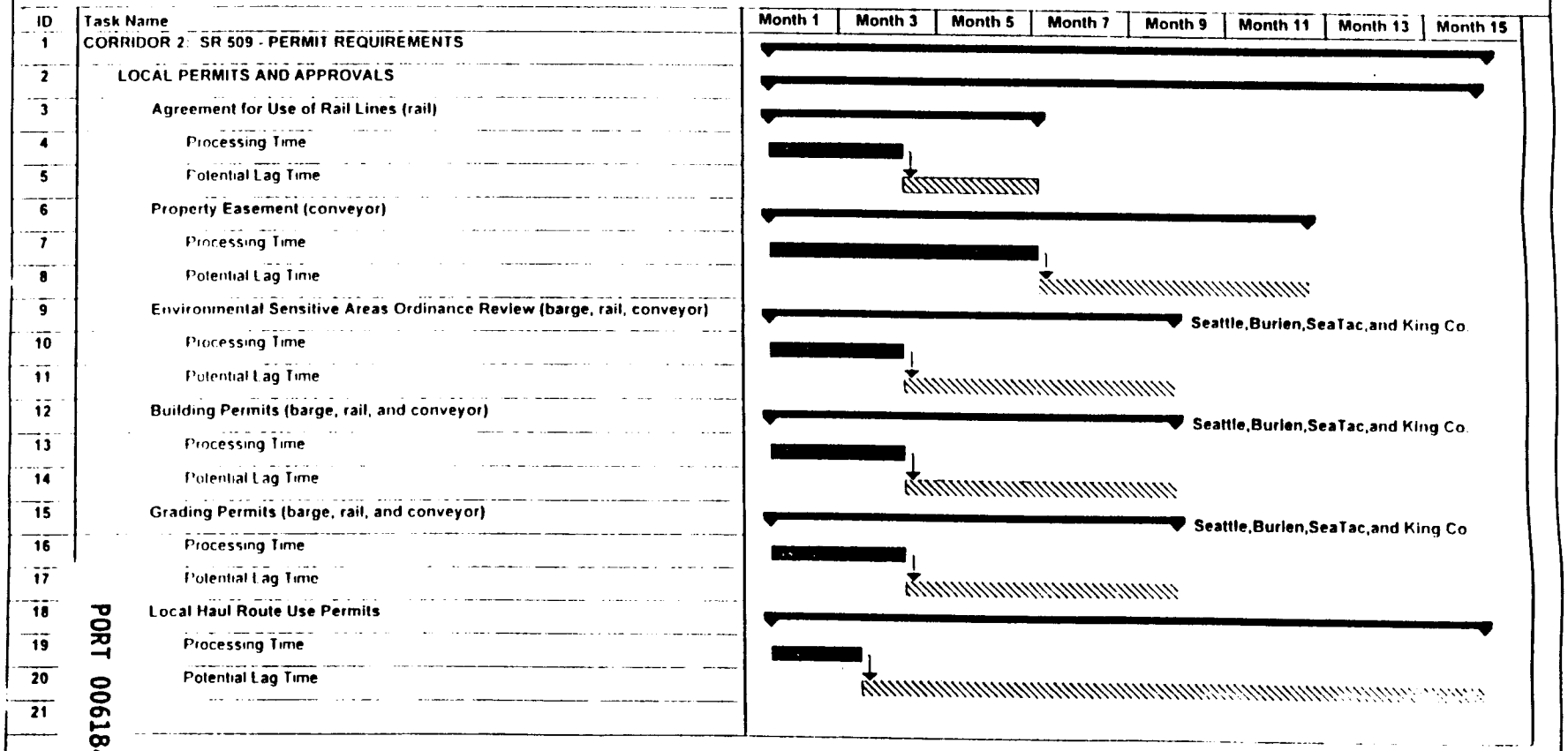
Rail

Construct 1 1/2 miles of spur - $500,000 (Land costs not included.)
Off-loading Facility - $500,000
Transport per ton of material - $4.00 to $5.00
Total capital investment - $3,000,000 to $4,000,000

Truck

Transport per ton of material - $.08 per mile
Investment of equipment is included in price per ton/mile.
The capital investment for new interchanges or traffic revisions that maybe constructed connecting state highways to the runway site is not included in this cost range.

Sea-Tac International Airport Fill Material
Alternative Delivery Method Study for the Third Runway
Corridor 2: SR 509 - Permit Requirements



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SCHEDULE FOR PERMIT APPROVALS - CORRIDOR 2
Date Created 9/18/96
Date Revised 10/2/96 9:51 AM

Processing Time | Potential Lag Time | Summary

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FIGURE 2

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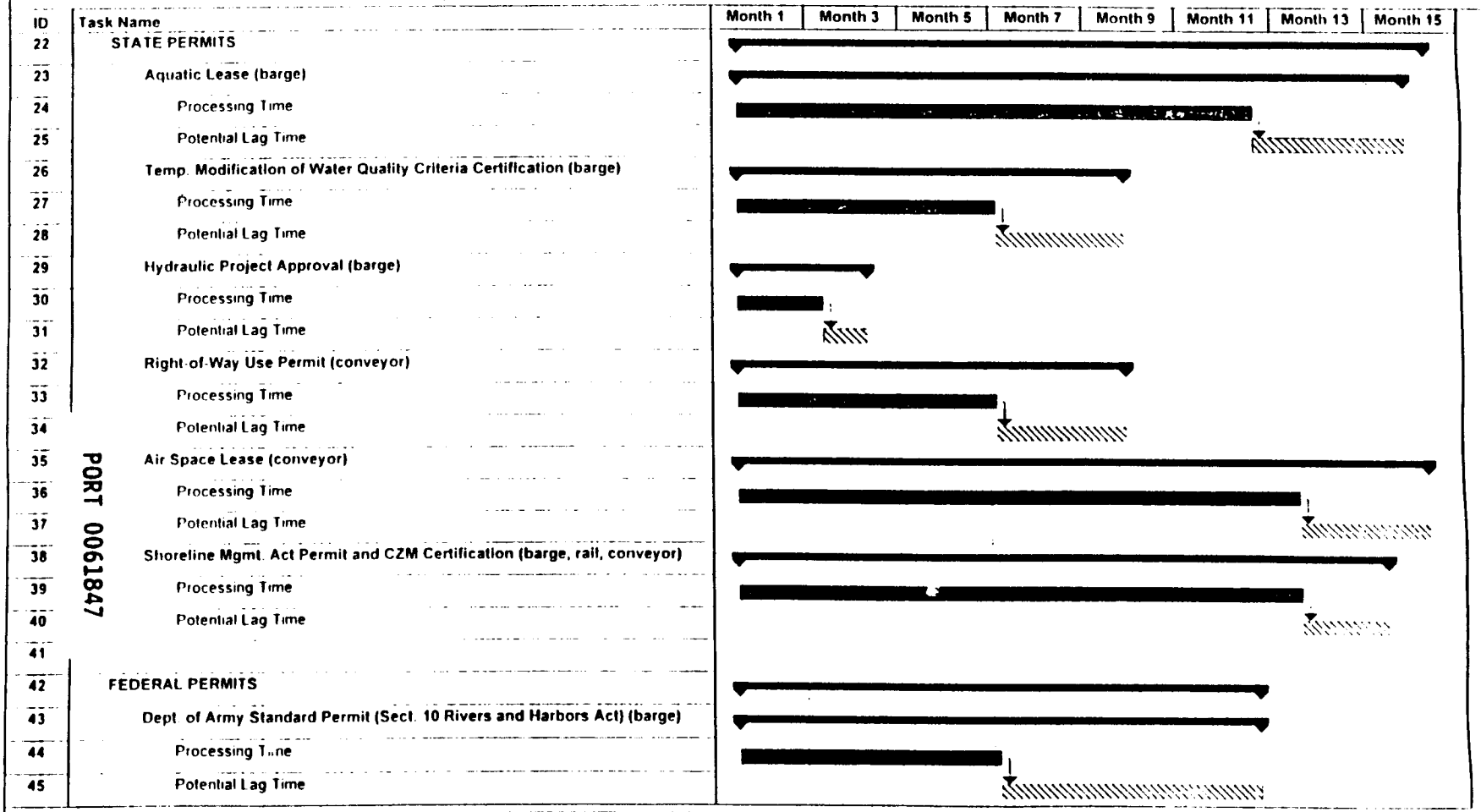
Sea-Tac International Airport Fill Material
Alternative Delivery Method Study for the Third Runway
Corridor 2: SR 509 - Permit Requirements



PORT 0061847

SCHEDULE FOR PERMIT APPROVALS - CORRIDOR 2
Date Created 9/18/96
Date Revised 10/2/96 9 51 AM

Processing Time | Potential Lag Time | Summary

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FIGURE 2

CORRIDOR 3

Corridor 3. SR 518

General Description

The general concept for the SR 518 corridor involves transporting fill material from the Tukwila/Renton area near I-405 to the runway site along SR 518. Fill material would be delivered by train to a transfer facility, where it would be loaded onto a conveyor system or into trucks for transport to the runway site.

Technical Viability

The technical viability of the SR 518 corridor and alternative delivery methods is addressed specifically for a conveyor system and for trucking.

Conveyor System

Import fill material could be transported by rail to a temporary transfer terminal constructed in the Tukwila/Renton area near I-405. A conveyor would transport the material from the transfer site using the I-405 corridor, travel through the I-405/I-5 Interchange and along the SR 518 corridor to Port property north of the runway construction area. At its end point, the conveyor would off-load material at the runway construction site.

Transfer Facility

A rail transfer facility could be located on the Union Pacific or Burlington Northern rail line with a parallel spur of sufficient length for off-loading trains. The spur could be built on a trestle structure using bottom dump rail cars to off-load the material onto the conveyor system below. Space constraints, due to existing wetlands and existing development, could make the construction of this transfer facility challenging.

Conveyor System Route

The SR 518 conveyor route could begin from various points, as there is more than one option for a transfer facility location. This study assumed a rail to conveyor transfer facility to be located south of, but near I-405 and the Union Pacific and Burlington Northern rail lines. This location is immediately west of the former Longacres Race Track. The conveyor route could leave the transfer facility traveling north while climbing to reach the elevation of I-405. Once the conveyor route reaches I-405, the system could make a near 90-degree turn and follow the south side of I-405 carrying material west. In general, this route would use the south side of I-405, pass through the I-5/I-405 Interchange, and use the south side of SR 518 until reaching the north construction entrance for the new runway. It is anticipated that the route would require six conveyor transfer points for horizontal and vertical alignment changes. This conveyor route has many obstacles. The system must pass through four interchanges, cross 10 to 12 ramps or roadways, traverse one or two bridge structures, and use highway shoulder at a number of undercrossings. On bridge crossings, the conveyor system could be installed on roadway shoulders or, if the shoulder width was insufficient, could be attached to the outside of the bridge traffic barrier. Strengthening of existing bridges to support the conveyor could be required. During system assembly, tunnels under roadways could be constructed by closing roadway at night and installing box culverts or similar precast structure during night closures to minimize traffic impacts.

Conveyor Description

The SR 518 conveyor system could be a belt conveyor consisting of modular conveyor sections interspersed with overland conveyor sections. The system would be enclosed and fenced.

Special Conditions and Constraints

The SR 518 conveyor route would be located along a highway with full public use and access. Security for the system would need to be provided for the entire route. Access to maintain the conveyor would be constrained and could require use of the highway shoulder for a maintenance road. Although WSDOT has stated an intention to assist in making an option such as this possible, approval for use of the roadway is uncertain.

The SR 518 conveyor route has many of the same difficulties as the SR 509 route, but it is much shorter with fewer roadway crossings. Traversing the I-5/I-405 Interchange would require considerable WSDOT coordination to determine final conveyor alignment, maintenance areas, and transfer points. The uphill grade on SR 518 would require additional consideration, but would not likely render the route unfeasible. This system would be possible to construct if issues such as roadway usage, elevated structures, horizontal and vertical transfer points, roadway crossings, and maintenance areas are detailed and resolved.

The SR 518 conveyor route from the rail transfer facility at the location described above to the new runway construction site would be approximately 4 miles long.

Trucking

Trucking along SR 518 would be an alternative to a conveyor to transport fill material from a Tuckwila/Renton transfer facility to the runway site. Import fill material could be transported by rail to a temporary transfer terminal constructed in the Tukwila/Renton area near I-405, as described above. The material could then be transferred to trucks for delivery to the runway construction site. For the purpose of this study, the truck route reviewed for this alternative would begin at the rail transfer point mentioned above, and end at the runway construction site. Trucks could transport the material from the transfer site using I-405, travel through the I-405/I-5 Interchange, and then along SR 518. The route could exit SR 518 at a number of different locations as listed in the *Truck Route* section below.

Transfer Facility

A rail transfer facility could be located on the Union Pacific or Burlington Northern rail line with a parallel spur long enough for off-loading trains. The spur could be built on a trestle structure or over an excavated pit using bottom dump rail cars to off-load the material onto a short conveyor system. The conveyor system would carry the material to a nearby stock pile or material storage bin. The material would then be loaded onto trucks from the stock pile or storage bin. As previously mentioned, space constraints, due to existing wetlands and existing development, could make the construction of this transfer facility challenging.

Truck Route

Similar to the conveyor option, the truck route could begin from various points as there are several options for a transfer facility location. If the transfer location is north of I-405, trucks

would enter onto SW Grady Way between SR 167 and SR 181. The route could then be west on SW Grady Way to the I-405/SR 181 Interchange and/or east on SW Grady Way to the I-405/SR 167 Interchange where trucks could enter I-405 at either interchange. If the transfer location is south of I-405, trucks could use SR 181 to the I-405/SR 181 Interchange, where they could enter I-405.

Using I-405, the route would continue through the I-5/I-405 Interchange and up the grade on SR 518 to the interchange at SR 99. From this point, there are various route options, including:

- SR 518 to North Airport Expressway to South 170th to Air Cargo Road to South 154th/156th St. to a north entrance to the construction site.
- SR 518 to Des Moines Memorial Drive to either S. 160th, S. 156th, or S. 151st Streets to north and west construction entrances.
- SR 518 to SR 509 to S. 160th St. to a west construction entrance.
- SR 518 to SR 509 to S. 188th St. to Airport Roadway System at Des Moines Memorial Drive intersection.
- SR 518 to a new off-ramp, for construction vehicles only, between the S. 154th St. on-ramp and the Des Moines Memorial Drive off-ramp to a north construction entrance.
- SR 518 to SR 509 to a new off-ramp, for construction vehicles only, to S. 176th St. to a southwest construction entrance.

Special Conditions and Constraints

The Final Environment Impact Statement (FEIS) for the Sea-Tac Master Plan Update has analyzed traffic impacts associated with off-site truck trips for airport construction. This information was used to help evaluate the trucking option for the SR 518 corridor.

Predicted traffic flow on I-405, without airport-related truck traffic, is estimated to be level of service (LOS) F during AM and PM peak periods. LOS F is the lowest LOS rating, representing long delays and traffic conditions generally unacceptable to the public. Increased truck traffic could also worsen congestion on I-405 during the midday from LOS E to F. Predicted maximum off-site truck traffic would cause SR 518 between I-5 and SR 99 to deteriorate from LOS D to F during the PM peak. It is unlikely that a contractor would attempt to haul on these routes during extreme congestion periods. Contractors would most likely choose to operate along this route with very low volumes during the day, and conduct most of the haul activity during off-peak periods.

A route using S.170th, Air Cargo Road, and S. 154th St. would likely require improvements to several of the existing intersections and is somewhat of an indirect route, although it does avoid residential areas. Using Des Moines Memorial Drive off of SR 518 provides a direct route, but would likely require intersection improvements at the off-ramp and at 8th Avenue S. S 160th St. provides a direct route to the site from SR 509, but the ramp intersections currently function at a poor level of service and the haul route passes through a residential area potentially requiring a permit from the City of Burien. S. 188th Street would appear to be a good route option. This route would avoid residential areas, is a fairly direct route using a designated arterial truck route, and affected intersections operate at a reasonable level of service.

The construction of direct access ramps from SR 518 or SR 509 to the runway site for construction vehicles could make trucking more acceptable to the surrounding communities and improve truck haul operation efficiency. Based on a cursory review, constructing a new off ramp from SR 518 between the S. 154th St. on-ramp and the Des Moines Memorial Drive off-ramp appears feasible, but further investigation and consultation with WSDOT would be required. Constructing a new off-ramp to S 168th St. is not technically feasible due to grade problems associated with the crossing of Des Moines Memorial Drive nearby. A new off-ramp could potentially be constructed to access S. 176th St. if a small area of right-of-way could be acquired in the northwest quadrant of this grade separated crossing. This would provide direct access to the site via S. 176th St.

Construction/Environmental Permitting

This section summarizes local, state, and federal permits expected to be required for Corridor 3, SR 518. Local governments that might be involved could include the Cities of SeaTac and Tukwila. Permitting will be studied in greater detail in the second phase of this study. Permitting issues for the SR 518 corridor are listed below.

Conveyor

- Easement acquisition
- Construction of the conveyor and service road
- Visual and air quality impacts
- Conveyor noise

Truck

- Trucking material on state routes would not require permits
- Trucking material on local routes would most likely require local government involvement

Rail

- Construction impacts to critical areas related to terminal site modification
- Agreement for use of the rail lines would need to be acquired. The additional train traffic would require coordination with the Union Pacific or Burlington Northern Railroad traffic planners.

Local Permits and Approvals

Agreement for Use of the Rail Lines (rail)

- **Agency**
  Union Pacific or Burlington Northern Railroad

- **Need for Permit**
  The additional train traffic would require coordination with rail line traffic planners of the railroad owner(s)

- **Permitting Time**
  Three to six months

Property Easement (conveyor)

- **Agency**
  Private land owners

- **Need for Permit**
  If a right-of-way permit could not be secured for use of I-405 and SR 518 right-of-way, the conveyor would need to be located on private land, and easements from each property owner must be secured.

- **Permitting Time**
  Six to nine months

Cities of Tukwila and SeaTac Sensitive Areas Ordinance Review (rail and conveyor)

- **Agency**
  Cities of Tukwila and SeaTac

- **Need for Permit**
  The Cities of Tukwila and SeaTac sensitive areas ordinances identify several types of sensitive areas and establish setbacks and other construction standards for those areas. Any construction for the transfer terminal or conveyor system in or around sensitive areas may require local review and approval.

- **Permitting Time**
  Six to twelve months

Cities of Tukwila and SeaTac Building Permits (rail and conveyor)

- **Agency**
  Cities of Tukwila and SeaTac

- **Need for Permit**
  The applicant is required to secure a building permit from these municipalities prior to construction.

- **Permitting Time**
  Three to nine months

Cities of Tukwila and SeaTac Grading Permits (rail and conveyor)

- **Agency**
  Cities of Tukwila and SeaTac

- **Need for Permit**
  If construction activities are to result in movement of more than 50 cubic yards of fill, a grading permit would be required.

- **Permitting Time**
  Three to nine months

Local Haul Route Use Permits (truck)

- **Agency**
  Local governments that might be involved, depending on the specific route, could be the Cities of SeaTac, Seattle, Burien, and Des Moines

- **Need for Permit**
  Special use of local roads and designated truck haul routes

- **Permitting Time**
  Two to fifteen months

State Permits

Right-of-Way Use Permit (conveyor)

- **Agency**
  Washington State Department of Transportation

- **Need for Permit**
  A right-of-way use permit would be required to locate the conveyor within state route right-of-way. Numerous road crossings including Interstate 5 and SR 99 also would need to be negotiated.

- **Permitting Time**
  Six to nine months

Air Space Lease (conveyor)

- **Agency**
  Washington State Department of Transportation

- **Need for Lease**
  An air space lease would be required to locate the conveyor within SR 518 right-of-way. The purpose of the lease is to prevent highway safety problems, traffic interference, and interference with others (e.g., radio wave transmission).

- **Permitting Time**
  Twelve to fifteen months

Temporary Modification of Water Quality Criteria (Water Quality Modification) Certification and Water Quality Certification (401) (rail)

- **Agency**
  Washington Department of Ecology

- **Need for Permit**
  Construction of the terminal facility and the additional rail line spurs may violate water quality criteria (particularly the turbidity criterion) on a short-term basis and may require a water quality modification certification. Construction of new rail line spurs and development of the transfer terminal site may require a Corps of Engineers section 404

permit; therefore, a section 401 water quality certification from the State of Washington may be required. A section 401 water quality certification is often issued concurrently with the water quality modification certification.

- **Permitting Time**
  Six to nine months

Hydraulic Project Approval (rail and conveyor)

- **Agency**
  Washington Department of Fish and Wildlife

- **Need for Permit**
  The conveyor system could potentially cross the Green River and traverse streams, which would require a hydraulic project approval.

- **Permitting Time**
  Two to three months

National Pollutant Discharge Elimination System Permit (NPDES) (rail)

- **Agency**
  Washington Department of Ecology

- **Need for Permit**
  Construction activities (including clearing, grading, and filling for the transfer area; stockpiling; and new rail line spurs) that disturb five acres or more would require an NPDES permit.

- **Permitting Time**
  Three to four months

Federal Permits

Department of Army Standard Permit (Section 404 of the Clean Water Act) (rail)

- **Agency**
  U.S. Army Corps of Engineers

- **Need for Permit**
  Construction of the material transfer facility, conveyor system, and new rail spurs may require filling regulated wetland areas.

- **Permitting Time**
  Six to Twelve months

Summary

Rail transfer sites would most likely be located on existing rail yard sites. Impacts to critical areas should be minimal and acquisition of permits should not be an unreasonable effort. Building and environmental permits for a rail terminal facility could be acquired within 5-12

months. The variation on permitting time would be dependent on the proposed change to the site and on site environmental conditions. Permitting the conveyor system from the rail terminal to the site would involve numerous agencies. Depending on the need for property easements and permission to access state right-of-way, conveyor permits could take approximately 9-12 months. Permitting for trucking material from the rail terminal could vary considerably depending on the jurisdictions involved and the volume of truck traffic through each jurisdiction. Simple negotiations for use of local roads could take from 2-15 months. Permitting for any combination of rail with conveyor or truck could take 5-15 months. (See Figure 3.)

Economic Feasibility

Corridor 3 includes two alternatives for transporting material, as described above. The costs below represent cost data gathered from material suppliers and contractors contacted during this study. The costs shown should be regarded as order of magnitude estimates.

Rail

Construct 1 1/2 miles of spur - $500,000 (Land costs not included.)
Off-loading Facility - $500,000
Transport per ton of material - $4.00 to $5.00
Total capital investment - $3 to $4 million

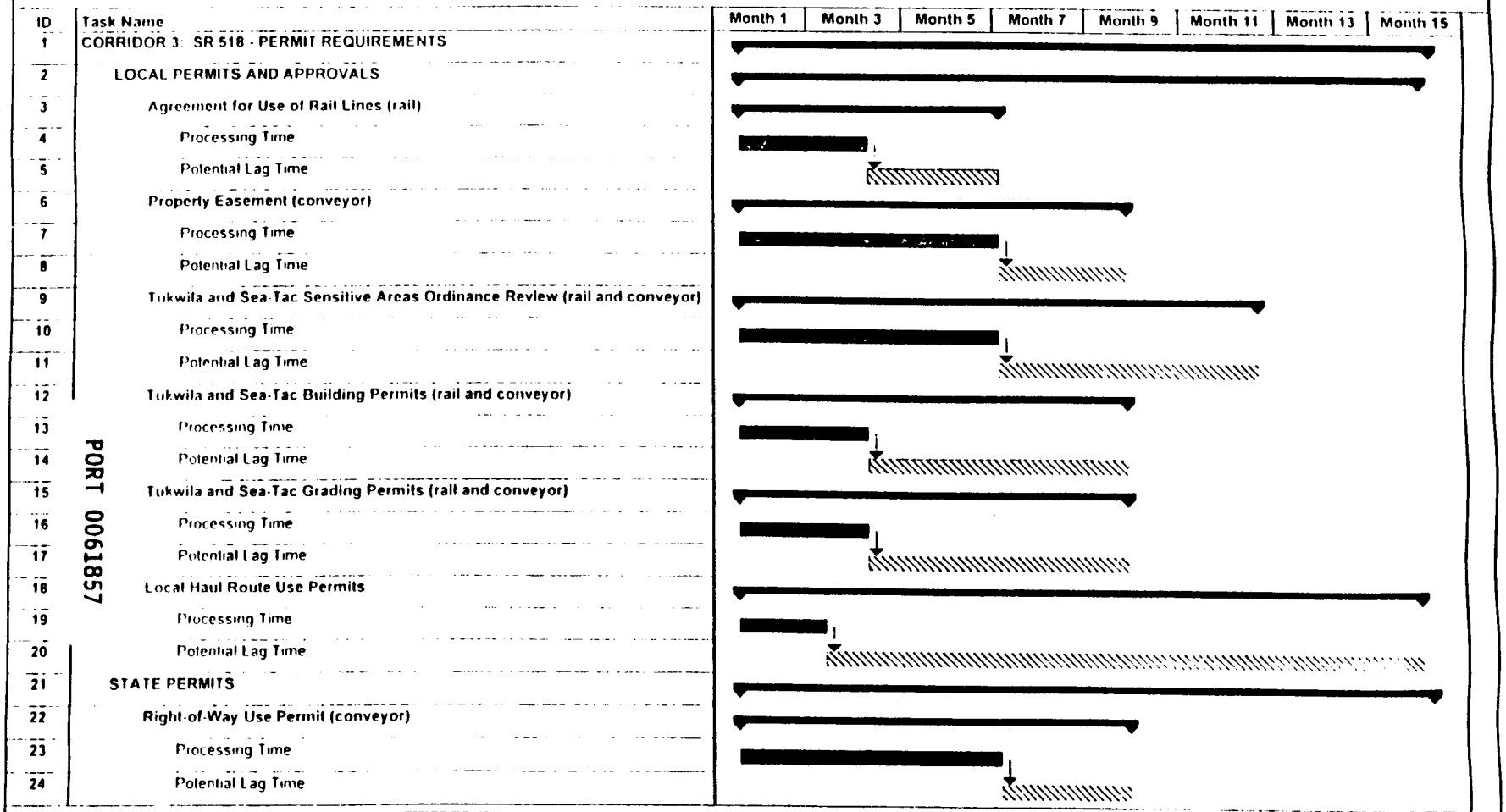
Truck

Transport per ton of material - $.08 per mile
Investment of equipment is included in price per ton/mile.
The capital investment for new interchanges or traffic revisions that may be constructed connecting state highways to the runway site is not included in this cost range.

Conveyor

Loading Facility - $1,500,000 to $2,500,000
Off-loading Facility (Stackers and Spreaders) - $1,500,000. to $2,500,000
Per linear foot of conveyor - $ 300 to $500 (Range: simple to complex route)
Transport per ton of material - $ .60 to $1.75
There are used conveyor systems available.

Sea-Tac International Airport Fill Material
Alternative Delivery Method Study for the Third Runway
Corridor 3: SR 518 - Permit Requirements



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SCHEDULE FOR PERMIT APPROVALS - CORRIDOR 3
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Date Revised 10/2/96 9:51 AM

Processing Time | Potential Lag Time | Summary

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FIGURE 3

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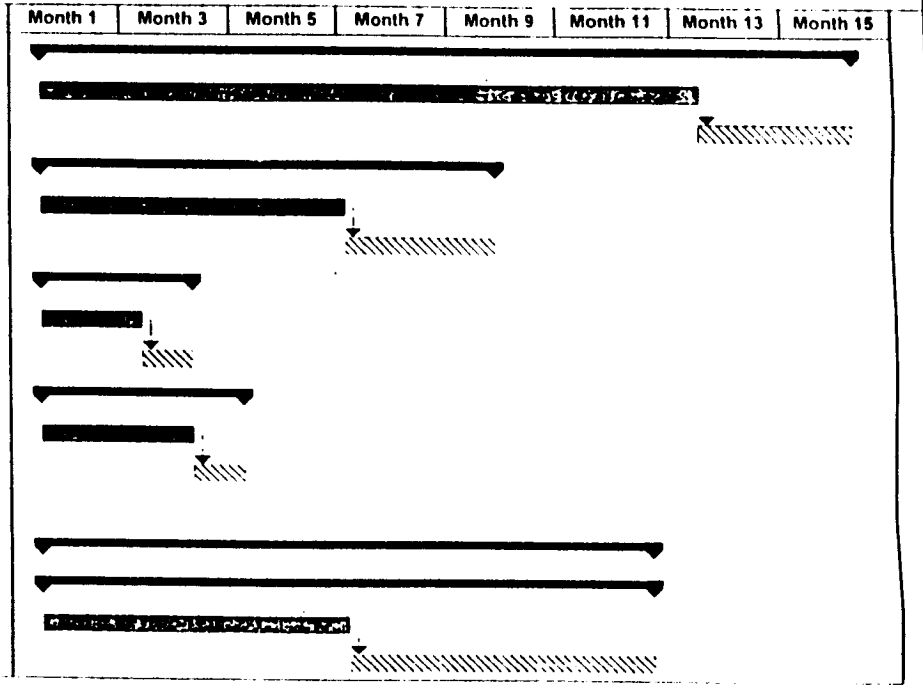
Sea-Tac International Airport Fill Material
Alternative Delivery Method Study for the Third Runway
Corridor 3: SR 518 - Permit Requirements

ID	Task Name
25	Air Space Lease (conveyor)
26	Processing Time
27	Potential Lag Time
28	Temp. Mod. of Water Qual. Criteria Certif. - Water Qual. Certif. (401) (rail)
29	Processing Time
30	Potential Lag Time
31	Hydraulic Project Approval (rail and conveyor)
32	Processing Time
33	Potential Lag Time
34	National Pollutant Discharge Elimination System Permit (NPDES) (rail)
35	Processing Time
36	Potential Lag Time
37	
38	FEDERAL PERMITS
39	Dept. of Army Standard Permit (Sect. 404 of the Clean Water Act) (rail)
40	Processing Time
41	Potential Lag Time



PORT 0061858

SCHEDULE FOR PERMIT APPROVALS - CORRIDOR 3
Date Created 9/18/96
Date Revised 10/2/96 9:51 AM

Processing Time | Potential Lag Time | Summary

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FIGURE 3

TRUCKING

PORT 0061859

Trucking

The technical viability, permitting process and issues, and economic feasibility of trucking-only methods of transporting fill material to the runway site are addressed individually as follows.

Technical Viability

The technical viability is addressed here for trucking by all potential land haul routes.

General Description

The Third Runway Preliminary Engineering Report dated March, 1994 and the Sea-Tac Master Plan Update FEIS identified 16 to 18 off-site and six to eight on-site fill material borrow sources. Corridors 1, 2, and 3 evaluated in this study would potentially be material transportation corridors for only a small number of the identified borrow sources. To maximize the number of borrow sources available to supply material for the new runway, trucking on the regional highway system and designated truck routes must be considered. As was stated earlier, this trucking evaluation is not for one specific corridor, but for all potential truck route corridors into the runway construction site.

Trucking Routes

Contractor use of material sites east of I-5 would require the use of the regional highway system, primarily I-5, I-405, I-90, SR 167, SR 169, SR 18, SR 516, and SR 99, to reach SR 518 and SR 509 to access the new runway construction site. Many options exist to access the runway construction site from SR 518 or SR 509 and are stated in the *Trucking* section of Corridor 3 - SR 518. Some of these routes would need coordination with the Cities of SeaTac, Burien, Des Moines, and Seattle. Potential direct access from existing roadways include S. 154th/156th St., S. 160th St., and the Airport Perimeter Road. Appendix J of the Master Plan Update FEIS shows LOS impacts on most of the regional system from truck haul for airport construction. The LOS results are summarized in Table J-7 on page J-24 of the FEIS.

Material from on-site sources south of the new runway could most likely be transported using on-site haul routes constructed within or adjacent to the material sites to reach S. 200th St. Construction trucks from these sites could use S. 200th St. to access Des Moines Memorial Drive and the Airport Perimeter Road at the intersection with S. 188th St.

Special Conditions and Constraints

As is shown in the Sea-Tac Master Plan Update FEIS, truck trips associated with hauling a large quantity of material to the Airport would result in some deterioration of LOS where background levels of congestion are near or exceed roadway capacity and where extended grades exist. Affected intersections near the Airport, if used as haul routes during peak periods, would likely require further investigation to determine their reserve capacity with or without mitigation. Avoiding roadways that are affected by congestion during peak periods, hauling during off-peak hours, and a lengthened construction schedule would help alleviate impact to the existing roadway system. The LOS analysis mentioned above shows SR 509 has considerable reserve capacity throughout the day to transport the required fill material within the schedule assumed in this study.

Construction/Environmental Permitting

State routes and local roads could be used in trucking material to the site. Trucking material on state routes would not require permits. Truck use of local roads typically must occur on established truck haul routes and may require coordination with local jurisdictions. Many local governments have enacted elements of their comprehensive plan or ordinances that may require permitting for use of local haul routes. Considering the number of the trucks necessary to complete the project, local governments may require right-of-way use permits for using local roads as haul routes.

Local Permits

Local Haul Route Use Permits

- **Agency**
  Local governments that might be involved, depending on the specific route, could be the Cities of SeaTac, Seattle, Burien, and Des Moines

- **Need for Permit**
  Special use of local roads and designated truck haul routes

- **Permitting Time**
  Two to fifteen months

Summary

Permitting for trucking material to the runway site from a barge, dock, rail yard, or any borrow source up to 50 miles away, would primarily involve local jurisdiction approval. Permitting for trucking material can vary considerably depending on the jurisdictions involved and the volume of truck traffic through each jurisdiction. Negotiations for use of local roads could take from 2-15 months. (See Figure 4.)

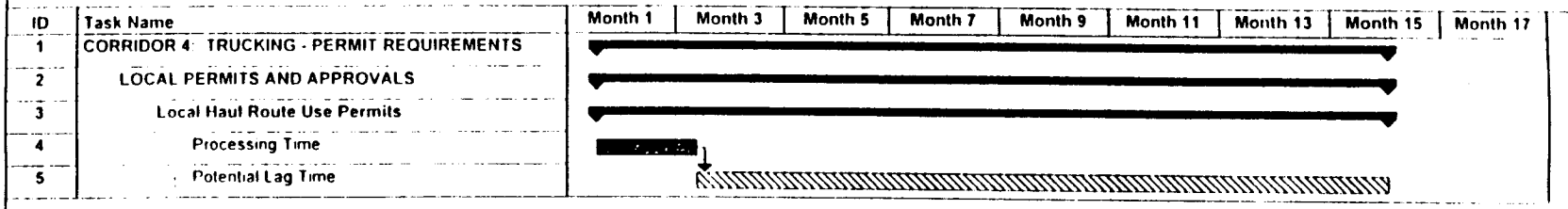
Economic Feasibility

Trucking includes transporting the material by truck from many directions and material sources to the runway site. The cost per cubic yard of material is based on a range of 4 miles to 50 miles from the runway site. The costs below represent cost data gathered from material suppliers and contractors contacted during this study. The costs shown should be considered as order of magnitude estimates.

Truck

Transport per ton of material - $.08 per mile
Investment of equipment is included in price per ton/mile.
The capital investment for new interchanges or traffic revisions that maybe constructed connecting state highways to the runway site is not included in this cost range.

Sea-Tac International Airport Fill Material
Alternative Delivery Method Study for the Third Runway
Corridor 4: Trucking - Requirements



SCHEDULE FOR PERMIT APPROVALS - CORRIDOR 4
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Date Revised 10/2/96 9:52 AM

Processing Time | Potential Lag Time | Summary

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Page 1 of 1

FIGURE 4

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MARINA

AR 040014

Summary

The following summarizes the technical viability, the permitting acquisition feasibility, and the economic feasibility of the fill material delivery methods and corridors evaluated in this study. All corridors, as well as trucking-only methods, are rated in a matrix located at the end of this section.

Technical Viability

It is technically feasible to construct all the alternative methods of transporting fill material within each of the three corridors considered. Some methods are more complex than others.

Corridor 1 is feasible but there are several challenges to consider. A tunnel or similar passageway would need to be constructed to allow the conveyor to pass through the Marine View Drive embankment. The City of Des Moines and the State Department of Transportation are planning the construction of a pedestrian nature trail connecting Des Moines Beach Park and Des Moines Creek Park. It is feasible to construct a tunnel for a conveyor and effectively serve both projects.

For Corridor 2, it is technically feasible to construct a barge transfer facility and a conveying system to transport material from the Duwamish Waterway to the runway site. There are several possible sites both Port-owned and privately owned that could be developed or modified for use as a barge transfer facility. The conveyor route is difficult from the Duwamish Waterway regardless of which route is taken. This system, although possible to construct, has several conflicts with existing facilities and terrain, such as power lines, steep hillsides, elevated structures, horizontal and vertical transfer points, and roadway crossings. Additionally, this conveyor route would be the longest of all the conveyor routes reviewed. Truck routes, on the other hand, are very feasible starting at a barge or rail terminal and using either West or East Marginal way to SR 509. Several options for access to the runway site would be available.

For Corridor 3, it is feasible to construct a temporary rail transfer terminal in the Tukwila/Renton area near I-405 and a conveyor from this rail transfer terminal using the I-405 corridor, through the I-405/I-5 Interchange and up SR 518 to the runway site. The conveyor route on SR 518 poses many or the same difficulties as the SR 509 route. However, the SR 518 route is much shorter and has fewer roadway crossings. The SR 518 conveyor route through the I-405/I/5 Interchange would be complex. From a rail transfer terminal, various truck routes are very feasible to the runway site.

Trucking is technically feasible, as a variety of potential truck routes exist. Affected intersections near the Airport, if used as haul routes during peak periods, would require further investigation to determine their reserve capacity with or without mitigation. Avoiding roadways that are affected by congestion during peak periods, hauling during off-peak hours, and a long construction schedule would help alleviate impacts on the existing roadway system.

Permitting Acquisition Feasibility

It is assumed that permits for the three corridors and for trucking can be acquired. Utility and property easements and local permits are likely to be the most difficult to acquire for each of the corridors and for trucking. The following matrix (Table 1) presents a ranking of the feasibility of

Table 1
Summary Evaluation Matrix

		Technical	Permitting	Schedule (2)	Relative Cost	Competition	Combined Feasibility
1	**Des Moines Creek**						
	Barge - Conveyor	*4*	*3*	*3*	*5*	*2* (3)	*3.4*
2	**SR 509**						
	Barge - Conveyor	*3*	*3* (1)	*3*	*2*	*3*	*2.8*
	Barge - Truck	*5*	*4* (1)	*4*	*5*	*4*	*4.4*
	Rail - Conveyor	*2*	*2*	*2*	*1*	*2*	*1.8*
	Rail - Truck	*3*	*4*	*3*	*3*	*3*	*3.2*
3	**SR 518**						
	Rail - Conveyor	*2*	*3*	*3*	*3*	*3*	*2.8*
	Rail - Truck	*2*	*3*	*3*	*4*	*3*	*3.0*
Trucking Only							
	Truck	*4*	*5*	*4*	*4*	*5*	*4.4*

Definitions

Technical - The feasibility to construct the mode of transport including loading and off-loading facilities

Permitting - The feasibility to obtain permitting including amount and difficulty of permits per mode and time to obtain permits. This includes time for infrastructure development.

Schedule - The fasibility for the mode of tranportation to meet the requirements of the Third Runway construction schedule. This includes time to obtain permits and construct necesssary infrastructure

Relative Cost - Cost comparison relative to other modes

Competition - Rates the degree a corridor allows for competition

Combined Feasibility - Summary of feasibilities

(1) Score is based on existing permitted barge transfer facilities

(2) May change based on Phase II analysis

(3) Assumes this corridor is not open to all contractors

Legend

5	high feasibility
4	moderately high
3	moderate
2	moderately low
1	low feasibility

permit acquisition for the components of the different corridors. The ranking is based on anticipated issues, the number and types of permits necessary for each corridor and for trucking, and the number of local governments involved in the permitting process. The possible rankings are (1 through 5) low, moderate/low, moderate, moderate/high, and high feasibility for permit acquisitions.

Economic Feasibility

The purpose of evaluating the economic feasibility was to determine the relative cost between alternatives. Since each of the alternatives are in the early stages of development, it was necessary to use a range of costs in the analysis. A capital investment would be required to build loading and off-loading facilities to transfer fill material for a conveyor system for barging and rail. The capital investment cost for trucking is included in the cost per cubic yard.

Based on the cost data gathered from contractors and material suppliers, the following table summarizes an estimated average cost per cubic yard for each delivery method. Costs were calculated on the basis of nine million cubic yards of material delivered to the runway site. The total cost of fill material would include the raw cost of material at the source and costs for placement and compaction at the runway site, which is not included in the following table.

As shown in Table 2, the most cost effective ways of transporting fill material appear to be by: 1) Corridor 1, barge to conveyor on Des Moines Creek; 2) Corridor 2, barge to the Duwamish Waterway and trucking up SR 509 to the runway site; and 3) trucking only, with shorter haul distances obviously resulting in lower cost. The method which appears least cost effective is the rail to conveyor on SR 509, mainly due to the capital investment and high cost of the conveyor. With the exception of the rail-to-conveyor method under Corridor 2, there is not a wide disparity between the costs for the different methods.

Schedule

For the purposes of this report, schedule is defined as the time necessary to complete the engineering, environmental assessment, permitting, and construction of infrastructure and facilities required to begin delivering material to the runway site. Schedules are highly variable and could easily change during the planning, design, and construction process.

Schedules for each alternative were based on the mode which would require the longest time to implement. C...idor 2 and 3 were based on a new rail transfer facility and conveyor system. The rail component requires the longest infrastructure time. The trucking schedule was based on using existing local streets to access the runway site.

Comparative Evaluation

Table 1 summarizes the feasibility of the material transportation modes within the three corridors and trucking. For Corridor 1, Des Moines Creek, barge-conveyor has a rating of 3.4 feasibility. For Corridor 2, SR-509, barge-conveyor has a rating of 2.8 feasibility, barge-truck has a rating of 4.4 feasibility, rail-conveyor has a rating of 1.8 feasibility and rail-truck has a rating of 3.2 feasibility. Corridor 3, SR-518, rail-conveyor has a rating of 2.8 feasibility, and rail-truck has a rating of 3.0 feasibility. Trucking has a rating of 4.4 feasibility.

Table 2
Economic Feasibility

	DELIVERY METHOD	CORRIDOR 1 Des Moines Creek	CORRIDOR 2 SR 509				CORRIDOR 3 SR 518		TRUCKING ONLY
		Barge-Conveyor	*Barge-Conveyor*	*Barge-Truck*	*Rail-Conveyor*	*Rail-Truck*	*Rail-Conveyor*	*Rail-Truck*	*Truck (Round Trip)*
BARGE	Mode Transfer	$ 2,000,000	$ 2,000,000	$ 2,000,000					
BARGE	Transport Cost	$ 7,700,000 to $19,400,000	$ 7,700,000 to $19,400,000	$ 7,700,000 to $19,400,000					
	Mode Transfer	$ 1,500,000	$ 1,500,000	$1,500,000					
RAIL	Capital Investment				$ 4,500,000	$ 4,500,000	$ 4,500,000	$ 4,500,000	
RAIL	Transport Cost				$62,000,000	$62,000,000	$62,000,000	$62,000,000	
	Mode Transfer				$ 1,500,000		$ 1,500,000		
CONVEYOR	Capital Investment	$ 7,400,000	$21,100,000		$21,100,000		$10,500,000		
CONVEYOR	Transport Cost	$ 9,300,000	$27,000,000		$27,000,000		$23,600,000		
	Mode Transfer	$ 2,500,000	$ 2,500,000		$ 2,500,000	$ 2,500,000	$ 2,500,000	$ 2,500,000	
TRUCK	Transport Cost			$20,000,000		$20,000,000		$10,000,000	$ 9,900,000 to $49,500,000 (8 to 40 miles)
	TOTAL	$30,400,000 to $42,100,000	$61,800,000 to $73,500,000	$31,200,000 to $42,900,000	$118,600,000	$89,000,000	$104,600,000	$79,000,000	$ 9,900,000 to $49,500,000
	Average Cu Yd	$3 40 to $4 70	$6 90 to $8 20	$3 50 to $4 80	$13 20	$9 90	$11 60	$8 80	$1 10 to $5 50

NOTES Assume 9 million cubic yards
Costs do not include engineering or permitting costs

The evaluation process was used as a basis for identifying the three alternative methods with the highest feasibility: Corridor 1 - Des Moines Creek; Corridor 2 - SR 506 (Barge-Truck); and Trucking only. Most other alternatives are also viable with somewhat lower degrees of feasibility and should not be excluded from further consideration. Either the Port or a private entity could pursue development of the other alternative delivery methods.

The following is a brief summary of the three highest rated alternatives:

Corridor 1 - Des Moines Creek

The Des Moines Creek route barge conveyor mode received a 3.4 rating due to its relative cost competitiveness, and moderate technical and permitting issues. However, if this alternative were pursued, material supply would be limited to off-shore sources. This alternative would likely result in the longest total schedule to begin material transport; however, it has the capability to deliver all of the fill material within a range of 14 months to two years of initial operation.

Corridor 2 - SR 509 (Barge-Truck)

The highest feasibility would be for the barge-truck mode. Within this alternative, the barge-truck mode would result in the lowest transport cost, and would be competitive with the lowest costs of the other corridor modes.

Trucking Only

Trucking was rated 4.4 feasibility. Truck routes would provide the most flexibility in accessing available material sources. Trucking would result in the shortest initial implementation schedule, but potentially represents the longest schedule for delivery of fill material. Depending on the haul routes, local permits might be required.

Conclusion

This study demonstrates that alternative delivery modes are feasible and cost competitive.

As part of the procurement process, in Phase II it will be necessary to define the conditions which construction contractors are required to meet during the transport of material to the runway site. These conditions should encourage innovative alternatives that could reduce construction impacts. Conditions could be established by the Port well in advance of actual construction activities through coordination and negotiation with the affected jurisdictions.

Alternative delivery methods involving conveyors, barge or rail have up front capital and development requirements. However, relative to trucking, other modes offer a fast delivery schedule once the infrastructure is in place.

This study has identified a number of issues that should be addressed in Phase II in order to continue development of alternative delivery methods. Many of these issues are related to the permitting process and commitment of support for alternative delivery methods. In order to begin resolving these issues, it is recommended that the Port proceed with the following actions:

Corridor 1 - Des Moines Creek

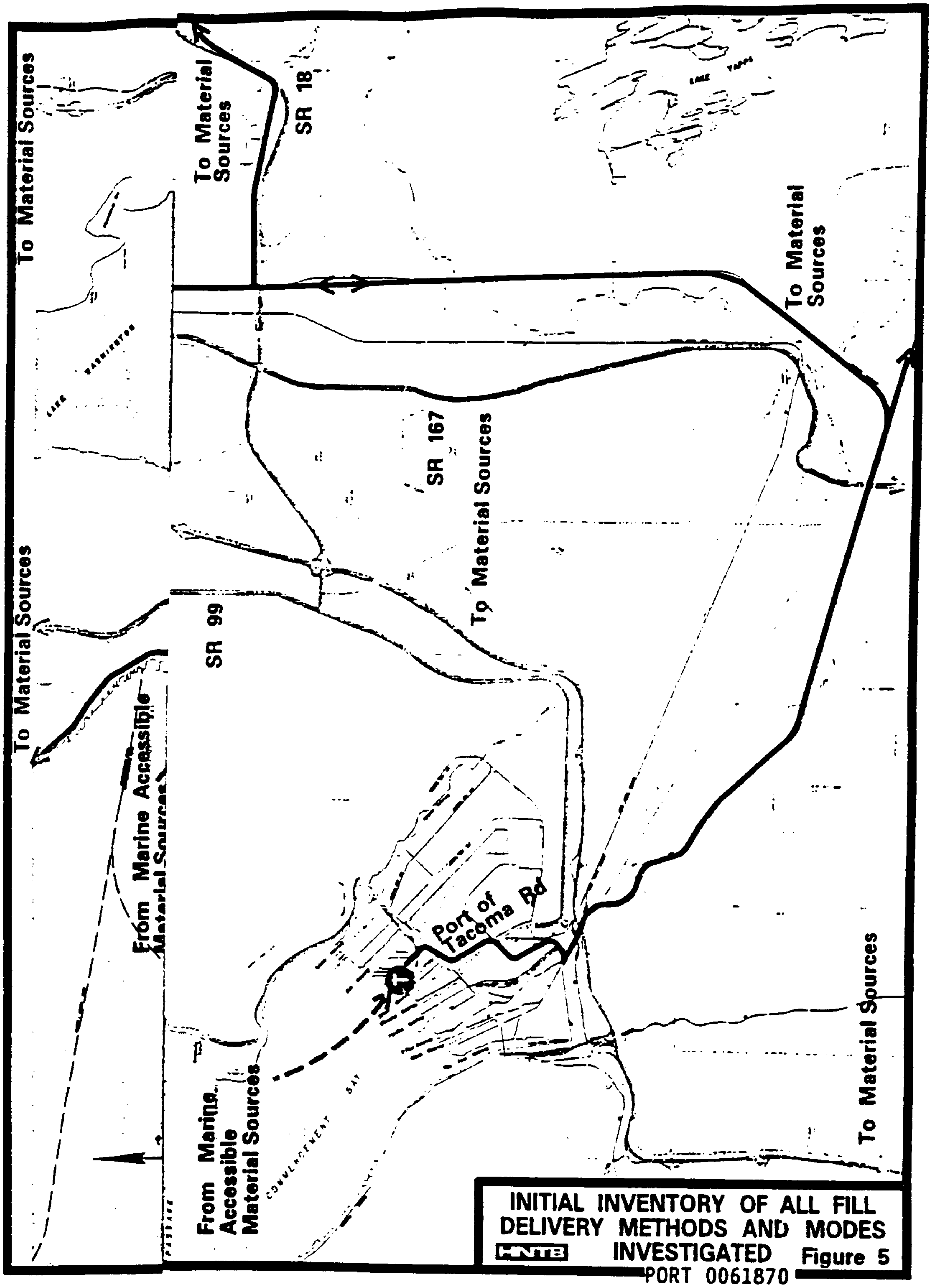
Communicate with City of Des Moines requesting a partnership commitment to enable the Port and/or corridor proponents to proceed with permitting issues

Corridor 2 - SR 509

Explore potential local jurisdiction permitting issues using state routes for truck traffic. Confirm Department of Transportation requirements for a temporary construction interchange on SR 509.

Trucking Only

Explore potential local jurisdiction permitting issues using state routes and local streets for truck traffic. Confirm Department of Transportation requirements for a temporary construction interchange on SR 518.



INITIAL INVENTORY OF ALL FILL DELIVERY METHODS AND MODES INVESTIGATED Figure 5

HNTB

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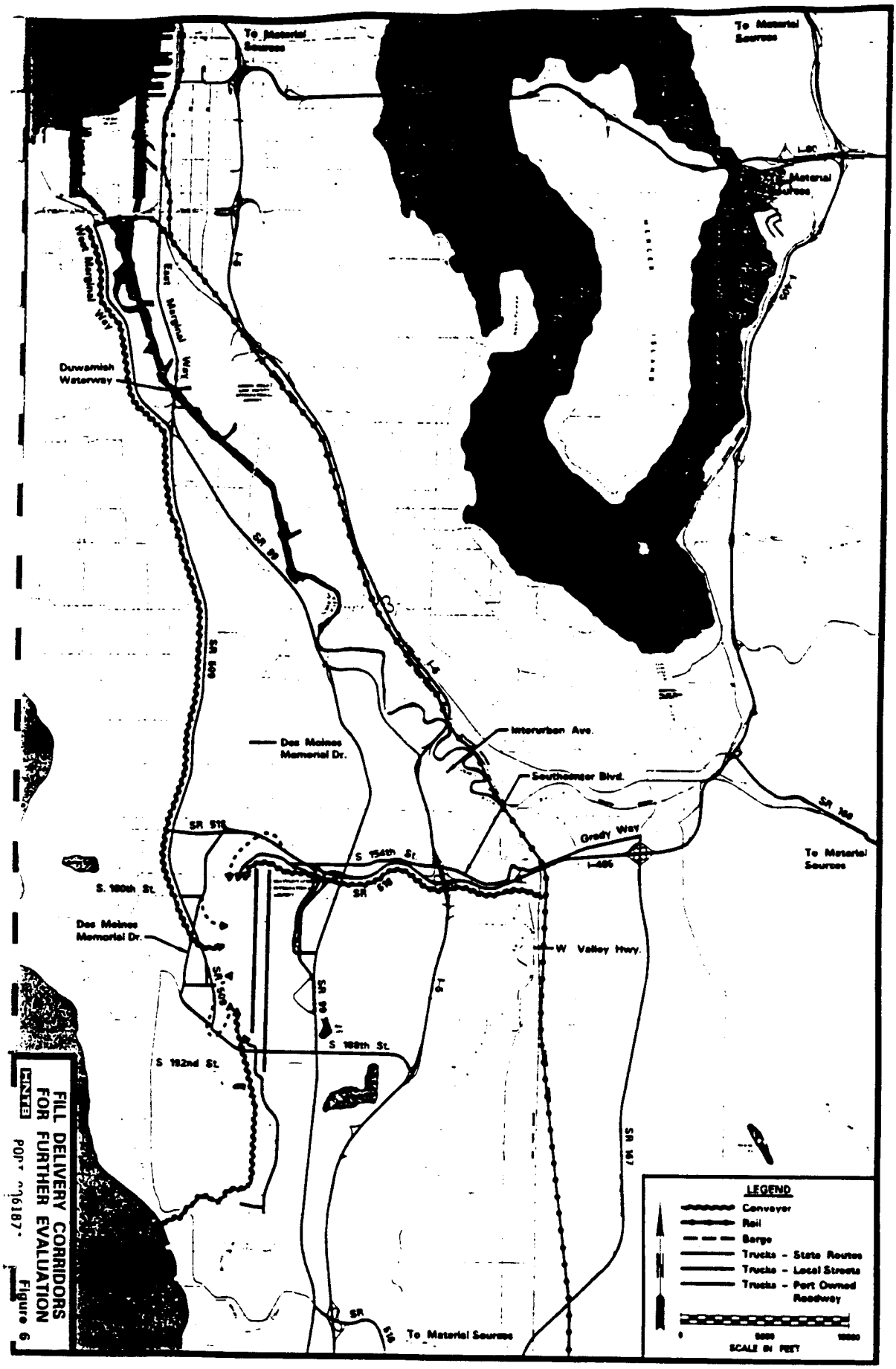

FILL DELIVERY CORRIDORS FOR FURTHER EVALUATION

Figure 6

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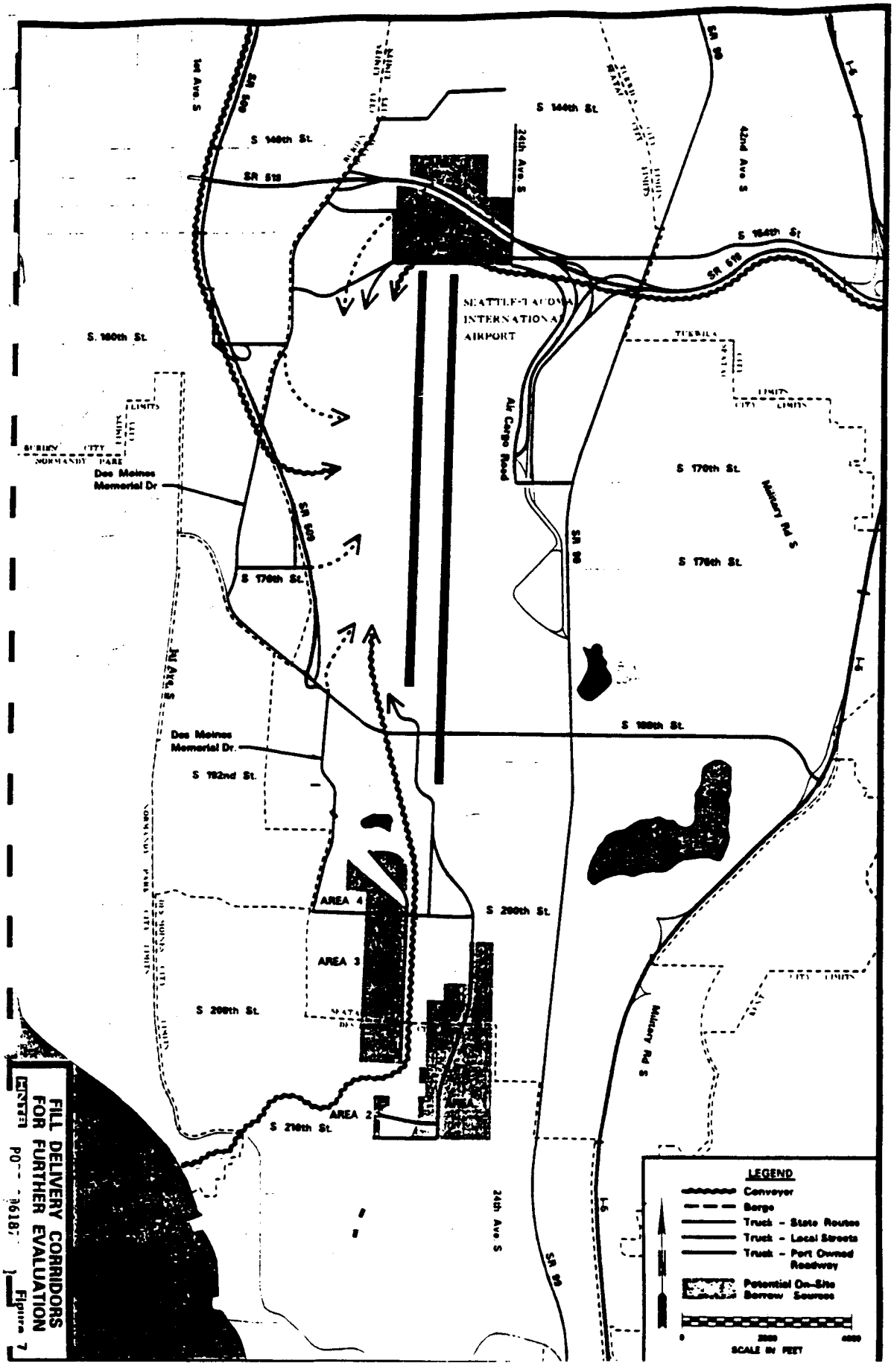

FILL DELIVERY CORRIDORS FOR FURTHER EVALUATION

Figure 7

AR 040023

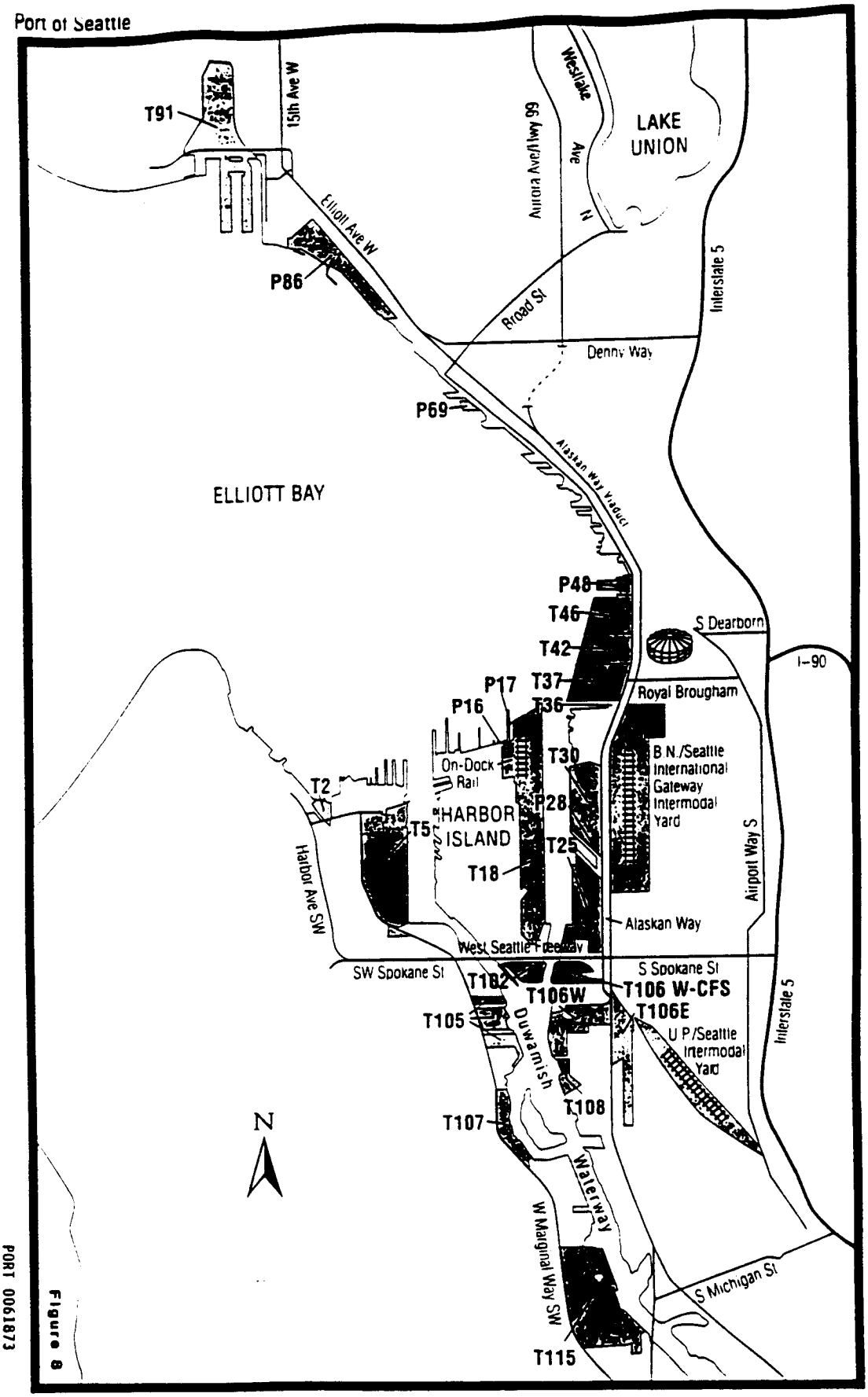

Figure 8

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Pacific Northwest Ports Handbook 1995

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Appendix A

List of Study Contacts

Jim Jansen
Lynden

CONTACT LIST FOR SEA TAC THIRD RUN MATERIAL SUPPLIERS and CONTRACTORS

AGC - David Sween & Dick Bristo
Metro - Brian Casson (West Point Project)

BORROW PIT AND RAIL

Hos Brothers - John Caunt & Gene Schmitt

McDonald Management - Tim McDonald

Washington Rock - Harry Heart
Hurlen Construction Company - Wil Clark

RAIL

Rebanco Companies - Gary Schultz

BARGE AND CONVEYOR

Lone Star - Ron Summers

Wescot Company - Hank Hopkins

TUG AND BARGE

Foss Maritime - Thomas VanDawark
Thomas Coburn
Foss Environmental - Carlos Tseng
Sea Coast Towing Inc.- Marine Transportation Robert Dorn

CTI - Bob Smith

Island Tug and Barge Dave Wells

GENERAL CONTRACTORS

Kiewit Pacific - Steve Preedy

Fletcher General - Tom Anderson

Guy F. Atkinson Construction - Forrest Dill

Callen Construction - Cleo Callen

Cadman - Michael Buell and Steve Whitescarver

Deeny Construction - Steve Fiorito

Dickson Company - William Dickson or Jason

Imco General Construction - Frank Imhoff

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Manson Constuction & Engineering - Glenn Edwards (MARINE CONTRACTORS)

M. A. Mortenson - Gene Hussey

Northwest Cascade - Steve Barger

Pipkin Construction - Arnie Pipkin

Selland Construction - Larry Campbell

Lloyd Enterprises - Dan Lloyd

Olson Brothers - Mike Olson

Continental Dirt Contractors - Jerry McCann

Nuprecon - John Hennessy

Ms. Lloyd, Inc. - Kathy Lloyd

Lakeside - Tim Lee

CSR - Associated Sand and Gravel - Steve Lindjord

CONVEYORS

Northwest Construction - Bob Keener

Rahco International - Tom Crocker
Martin Col

Grisley Inc. - Roy Acheson

PJM Machinery, Inc. - Paul Masson

SOURCE OF BORROW MATERIAL

Pacific Coast Coal Company - Bruno Ridolfi

Fiorito Brothers - Dan Fiorito

TRUCKING

Segale - Steve King

Santana Trucking Steve

Scarsella Brothers - Frank Scarsella

Penny Lee Trucking - Penny Gutschidt

Stowe Construction Inc. - Brian Stowe

MARINE SERVICES

POS - Marine Services - Al Lowe
George England
Fred Doehring

Crowley Marine Services, Inc.

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