TECHNICAL MEMORANDUM

Date:	September 5, 2000
To:	Ray Helwig Washington State Department of Ecology
From:	Elizabeth Leavitt Port of Seattle
Subject:	CWA 401 Issues for Master Plan Update Projects
cc:	Erik Stockdale, Ecology Nancy Groves, Ecology Jim Kelley, Parametrix Paul Fendt, Parametrix
Project Number:	556-2912-001(03)
Project Name:	Port of Seattle

This memorandum, as well as the attached *Revised Implementation Addendum – Natural Resources Mitigation Plan for the Master Plan Update Seattle Tacoma International Airport*, and other referenced or attached documents provide the information requested by Eric Stockdale, Tom Luster, and yourself to support the Section 401 permit for work in wetlands and streams near the airport. With submittal of this information, it is our understanding that pertinent information relating to the occurrence, type, impacts, and mitigation needed by Ecology to complete their analysis of wetland and aquatic habitat issues associated with the Master Plan Update projects is now complete.

ITEM 1 - WETLANDS

Access to Port of Seattle mitigation sites

All mitigation is planned on property currently owned by the Port of Seattle. A minor exception is the fact that, in the Lora Lake Buffer area, there are three parcels (Parcels 42, 48, and 52) that the Port will not take possession of until September 30, 2000.

Confirm ratios and buffers in plans

The *Implementation Addendum* contains a revised table of mitigation actions, the land area (acres) that this mitigation will occur on, and potential mitigation credit assigned to the mitigation against wetland impacts. The credit ratios presented in the table are the same as those presented to Ecology in February (meeting between Jim Kelley and Eric Stockdale), March (Response to Comments on Permit Ref. No. 1996-4-02325), and in June 2000 (Implementation Addendum). Minor changes to the area included in mitigation projects have occurred in response to requests from Ecology and the Corps. These include:

- The doubling of protective buffers at Auburn (from 50 feet to 100 feet).
- Additional wetland area has been included in the southwestern corner of the Auburn site.
- Recalculation of buffers and buffer averaging for the Miller Creek mitigation projects to assure that both Miller Creek and riparian wetlands are protected with 100 foot buffers. Where project elements are within these limits, a comparable area of buffer is incorporated in a different location as buffer averaging. Where feasible, buffer averaging areas were selected to retain forest habitat.
- Addition of a Des Moines Creek setback at the Tyee Valley Golf Course in lieu of buffers on the north and east side of the mitigation planned on the golf course.
- Protection of Tyee Golf Course mitigation site during construction of the RDF by placing ecology blocks or rock gabions, barrier fencing, and sediment fencing around the perimeter of the mitigation site.
- Addition of new shoreline restoration work at the Lora Lake Buffer site, to include the removal of concrete bulkheads installed along the shoreline.

Coordination with the Corps of Engineers

One or more meetings have been held with Ecology, the Port, the National Marine Fisheries Service, the Environmental Protection Agency, King County, the Washington State Department of Transportation, and the Army Corps of Engineers to coordinate and review various aspects of the project and the mitigation plan. The *Implementation Addendum to the Natural Resources Mitigation Plan* (June 2000), as well as this memo, documents changes agreed to as a result of these discussions. Revisions to the mitigation documents will also be reflected in final revisions to other project reports prior to any Section 404 approval from the Corps of Engineers.

Performance standards, monitoring protocols, and contingencies

Monitoring protocols and standards have been revised per requests by Ecology and the Corps to assure they are enforceable. These revisions include more stringent action standards for the control of invasive weeds, more stringent standards for plant survival, a commitment to monitor wetland hydrology in wetlands adjacent to construction areas, and measurement of groundwater emanating from the embankment needed to support the remaining portions of Wetlands 18, 37, and 44. Wetlands downslope of the embankment will be monitored for wetland hydrology, and if they are found to lose wetland hydrology following construction, additional seepage water from the embankment drainage system will be diverted to them. Various other changes to contingency measures have been made to clarify them and their intended action thresholds.

Wildlife Hazard Management Plan (attached)

This document has been revised to reflect edits and revision requests made by Ecology and the Corps. The document is attached and has been sent to the Port and FAA for approval. All revisions discussed with the Corps and Ecology have also been discussed with and approved by the FAA and the USDA.

FAA approval of NRMP

The Port has obtained written concurrence from FAA that the mitigation plan meets the standards of the Advisory Circular regarding wildlife hazards near airports (letter previously transmitted to Ecology).

Modification of wetland sites for wildlife control
Clarifications and standards have been identified that define which wildlife management actions do not require agency coordination versus those that do require coordination and are potentially subject to permit approval. These clarifications and standards have been discussed with Ecology and are included in the revised WHMP. The ability to implement the WHMP at mitigation sites is reflected in the restrictive covenants.

Emergency response
The Port and FAA are mandated to take emergency actions to protect life and property in all areas near the airport, including the mitigation sites. This need is reflected in the restrictive covenants. Language has been added to the WHMP that identifies the Port's responsibility to restore and mitigate should emergency actions damage mitigation sites.

Ecology coordination with FAA and WDFW
Ecology and FAA have held discussions to coordinate elements of the WHMP (i.e., in November 1999) and its applicability to mitigation sites. The attached final WHMP is an outcome of that coordination.

ITEM 2 - RETAINING WALL

Wall design and impact analysis for the embankment
Ecology requested that any adverse impacts associated with the wall be addressed, and stated that wall design, the *Stormwater Management Plan* (SWMP) and the *Natural Resource Mitigation Plan* (NRMP) should all address issues raised in the Gravel study. The wall design, the SWMP, and the NRMP all address issues identified in the Gravel study. These plans and reports are consistent; and do not conflict with each other or with the wall design.

The Ecology's *Hydrology* report (i.e. the Gravel study) identifies the potential for 1.68 acres of secondary, indirect impact from the embankment (especially to the Wetland 18 and Wetland 36 complex). Further analysis of this potential impact is the subject of Sections 3.2 and 3.6 of the *Hydrology* report. The analysis concludes (pages 7, 51, 52, and 60) that the loss of these downslope wetlands would not occur as a result of seepage into the embankment and the delay in water movement through the embankment. Water infiltrating the embankment will eventually discharge to the downslope wetlands. The report identifies that some potential net benefit to wetland hydrology during the summer months is possible due to the delay in discharge.

Note that this analysis of potential benefit to wetland hydrology for wetlands located downslope of the embankment is applicable to the indirect impact analysis for the following wetlands: 3, 4, 5, 7, 8, 9, 11, A1, A11, A13, 18, 37, 43, 44, Channel B, and riparian wetlands located in the west-side acquisition area.

Also note that the impact analysis completed by the Port was conservative in that indirect impacts to several small wetlands located downslope of the embankment and partially impacted by fill were considered significant (Wetlands 12, 13, A5, A6, and A8,). The total areas of these five wetlands are included in the 18.33 acres of impact reported in the public notice.

Commitment to preserve downslope wetlands
An e-mail from Bill Rozeboom, NHC to Eric Stockdale (August 7, 2000) questions the Port's commitment to maintain seepage recharge to wetlands. The specific issue, clarified below, is:

> *"To my knowledge, base flow from the embankment is the same water which also provides the seepage flow to the wetlands below the embankment. A statement that there is no commitment to base flow mitigation from the embankment is equivalent to a statement that there is no commitment to preserving seepage flows to the wetland below the embankment."*

The embankment is more than 60 percent pervious surface that will infiltrate rainwater that falls on its non-paved surfaces. Water that infiltrates into the embankment will eventually pass through the fill material and seep from the embankment via the constructed drainage layer at its base. This seepage water will provide hydrology to the wetlands at the base of the wall. It is an engineering necessity to allow water that infiltrates into the embankment to leave the base of the embankment, and engineering plans provide for a drainage layer and conveyance channels to remove this water from the embankment. To mitigate for potential indirect impacts (loss of groundwater) to downslope wetlands, this seepage water from the embankment will be directed to the remaining downslope wetlands, as described in the mitigation plans. Therefore, while there is no commitment to provide base flow *mitigation* from the embankment, there is a commitment to preserve seepage flows to the wetland below the embankment. Thus, the writer's interpretation that there is no commitment to provide seepage water to the wetlands is incorrect.

Less than 30 percent of the embankment is impervious surface that will generate stormwater runoff, reduce recharge, and potentially reduce baseflow to Miller Creek. Mitigation for loss of this baseflow includes removal of irrigation and other water withdrawals from the basin. Because of potential stability issues, along with historical failure (sediment clogging), the Port cannot commit to infiltrate stormwater into the embankment and then release it slowly during summer months as baseflow mitigation for loss of recharge.

ITEM 3 - ADDITIONAL IMPACTS TO WATERS OF THE STATE-CUMULATIVE AND INDIRECT

Analysis of indirect impacts has been provided for various elements of the project. This analysis is summarized below:

Hydrology and persistence of wetlands downslope from construction areas
The *SeaTac Runway Fill Hydrologic Studies Report* (Ecology 2000) identifies the potential of 1.68 acres of secondary, indirect impact from embankment (especially to the Wetland 18 and Wetland 36 complex). Further analysis of this potential impact is the subject of Sections 3.2 and 3.6. The analysis concludes (pages 7, 51, 52, and 60) that the loss of these downslope wetlands would not occur as a result of seepage into the embankment and the delay in water movement through the embankment. This water will eventually discharge to the downslope wetlands. The report identifies that some potential net benefit to wetland hydrology during the summer months is possible due to the delay in discharge.

This analysis of potential benefit to wetland hydrology for wetlands located downslope of the embankment is applicable to the indirect impact analysis for the following wetlands: 3, 4, 5, 7, 8, 9, 11, A1, A11, A13, 18, 37, Channel B, and riparian wetlands located in the west-side acquisition area.

Also note that the impact analysis completed by the Port was conservative in that indirect impacts to several small wetlands located downslope of the embankment and partially impacted by fill were considered significant (Wetlands 12, 13, A5, A6, and A8). The total area of these five wetlands is included in the 18.33 acres of impact reported in the public notice.

Impacts to riparian Wetland R1 occur as a result of the 154th/156th Street Bridge Crossings. Following construction, the small area of remaining wetland will continue to receive hydrology from Miller Creek, and thus the area will remain jurisdictional. The wetland will retain existing functions because, despite the loss of adjacent riparian wetland, remaining portions will be restored and incorporated into the buffer enhancement for the Miller Creek Relocation mitigation at Vacca Farm. This action will remove lawn, remove nearby houses, and restore native plants to the wetland and adjacent area.

Impacts to riparian Wetlands R2, R3, and R9 (as well as other riparian wetlands along the east bank of Miller Creek) will be beneficial. These wetlands will retain wetland hydrology from their association with Miller Creek and groundwater moving downslope. As discussed above, the embankment will not prevent groundwater from continuing to move downslope to support wetlands.

Impacts to Wetlands 43 and 44 are discussed in the *Analysis Of Indirect Impacts to Wetlands from the Temporary SR-509 Interchange – Seattle-Tacoma International Airport* (Parametrix May 2000). Additional pertinent analysis is presented in Ecology's *Hydrology Report* that demonstrates the fill embankment design will not interrupt the water source to wetlands downslope of the embankment.

There are no "headwater seeps" that provide significant baseflow to Walker Creek in the area where the project impacts Wetland 44. Fill for the runway embankment will not be placed in any "headwater seep" that provides significant baseflow to Walker Creek. One of the most significant sources of water to the Walker Creek baseflow is from the drainage system constructed beneath SR-509, near 176th Street. The outlet of this drainage system may be properly construed to be the true headwaters of Walker Creek, and it will not be affected by the project.

Wetlands Near SASA

In the SASA area, indirect impacts to Wetland G5 have been considered, and the wetland is presumed to be eliminated by the project. The full 0.87 acre is included in the 18.33 acres listed in the Public Notice. The wetland was assumed to be fully impacted because it may be maintained by stormwater runoff and interflow generated by the golf course, which will be converted to impervious surface. The East Branch of Des Moines Creek and perennial groundwater seeps supports Wetland 52, in the SASA area. Non-filled portions of this wetland are expected to remain because the SASA project would not eliminate water sources for the creek or wetland.

Wetlands Adjacent to Borrow Area 1

Portions of Wetlands 48 and B15a that are not excavated as part of Borrow Area 1 extend downslope of the proposed borrow area. These wetlands are largely maintained by seasonally perched water. The existing stormwater drainage system in the streets found in the borrow area collect surface runoff and direct it away from these wetlands. Following excavation, the remaining wetlands will continue to seasonally perch water, and also receive runoff directed to them by the finished grades established at the end of the mining. Demolition of the streets and stormwater drainage system may establish a more natural flow pattern to the site and extend the hydroperiod of the wetlands. The wetlands are thus expected to remain functional.

Wetlands Adjacent to Borrow Area 3
Potential wetland impacts at Borrow Area 3 have been evaluated, and a summary report prepared (*Evaluation of Perched Zone Interception and Possible Impacts to Wetland Hydrology-Borrow Area 3;* Hart Crowser 2000, attached). This study found that potential losses in hydrology to wetlands avoided in Borrow Area 3 could be mitigated by collecting and directing water that collects in the Borrow Area to the wetlands. This contingency would prevent indirect impacts to the hydrology supporting Wetlands *B5, B6, B7, B9a & b, B10, 29.* Further design of the interception and conveyance system is underway.

Additional resolution to this issue includes development of more detailed plans for the collection ditch that would supply water to the wetland and contingency measures for alternate mitigation.

Wetlands Adjacent to Borrow Area 4
Borrow Area 4 is located about 400 feet south of Wetland 28. Wetland 28 is maintained by several water sources including groundwater that emanates from beneath the existing airfield, runoff from wetlands located east of it, and runoff from the surrounding impervious area. Some water infiltrating into Borrow Area 4 may also reach the south and southeastern portion of this wetland. Unlike Borrow Area 3, excavation in Borrow Area 4 will not reach any groundwater table, and thus would not be expected to alter groundwater flow or availability for Wetland 28, and no indirect impacts are likely.

Temporary SR-509 Interchange Design
The temporary SR-509 interchange has been redesigned to avoid direct impacts to Wetland 43 (see attached design). Indirect impacts associated with the SR-509 design are discussed in *Analysis of indirect impacts to wetlands from the temporary SR-509 interchange – Seattle-Tacoma International Airport* (Parametrix May 2000).

Industrial Waste Treatment System
The Industrial Waste System expansion is not a Master Plan Update Project, and is not included in this permit application. The lining of Lagoon 3 is required as a condition of the Port's NPDES permit and is intended to prevent potentially contaminated wastewater from infiltrating into groundwater. The IWS project will not fill any wetlands. The project is located on existing fill, near Wetland 28. The project involves (1) excavating and creating a berm to increase the volume of the IWS Lagoon 3 from 29 million gallons to 76.5 million gallons, (2) cleaning the existing Lagoon, and (3) lining the entire newly enlarged Lagoon. Indirect impacts to nearby Wetland 28 are minimized by the extensive TESC methods employed to prevent sedimentation and/or construction water quality impacts to the wetland. In particular, most of the site is sloped to drain into the excavation, and the slopes around the outside of the site are surrounded by a ditch/berm system that intercepts stormwater before it enters the wetland. All collected construction runoff in the excavation and the perimeter ditch/berm system is conveyed to a stormwater treatment plant similar to the systems used for the third runway embankment and other projects at STIA.

Constructing a lined pond will create about 12.3 acres of area that will effectively act as impervious surface. This is not expected to reduce discharge to Wetland 28 or to Des Moines Creek, because this is an area of groundwater discharge, rather than infiltration (Kennedy/Jenks, IWS Lagoon 3 Upgrade Preliminary Design Report 1999).

A new underdrain system beneath the lined treatment lagoons will allow groundwater beneath the lagoon to drain to Wetland 28. Thus, the liner and underdrain system will actually allow more water to reach Wetland 28 and Des Moines Creek, because rainwater and upwelling groundwater that currently reaches unlined Lagoon 3 is pumped to the IWTP and discharged outside the Des Moines Creek basin. Furthermore, this may have a potential water quality benefit in that it will prevent intermingling of untreated industrial wastewater with groundwater. All water contained within the Lagoon will be treated

in the Industrial Wastewater Treatment Plant and discharged to Puget Sound or the King County Treatment Plant, and therefore will not affect peak flows in Des Moines Creek.

Wetland hydrology for the wetlands adjacent to Lagoon 3 is maintained by surface runoff and seepage from the constructed embankment. Surface runoff will be unchanged. Lost seepage from the small pond area (small relative to the area providing groundwater hydrology to the wetland) is unlikely to adversely affect the adjacent wetlands.

Fragmentation of Wetland Habitat And Reduction In The Size Of Wetland Habitats

Habitat impacts due to reductions in size of wetland habitat

Potential loss of wildlife habitat resulting from a reduction in the size of the remaining wetlands adjacent to the embankment or adjacent to other areas of project activity is not anticipated, as discussed below. Wildlife habitat impacts resulting from wetland fill are typically proportional to the area of wetland filled if species will continue to use the wetland and stream buffer as suitable habitat after the loss of wetland size is considered. Wildlife could be eliminated from the area if (a) the minimum habitat requirements of a wetland dependent species are smaller than a remaining wetland, or (b) if unique wetland habitat features that wetland dependent species use are eliminated.

The typically terrestrial wildlife species using the wetlands partially filled by Master Plan Update projects are not dependent on the wetlands for their life history functions, and these species are expected to persist in the remaining habitat matrix of uplands and wetlands.

Filling of existing wetlands may potentially affect populations of wetland-dependent species that are restricted to specialized habitats (e.g. waterfowl), by eliminating the specific habitat that a given species requires. However, because the existing wetlands occur in an already highly urbanized and disturbed environment, many of the wildlife species that occur in these wetlands are widespread, cosmopolitan species, with wide environmental tolerances. Filling of existing wetlands may reduce the amount of habitat available, but should not eliminate habitat on which these species depend, because they are not restricted to a specific habitat type. Wildlife species with specialized wetland habitat requirements have not been observed in the wetlands affected by the project, and it is unlikely they are present in the project area due to the condition of existing habitat

For the wetlands being partially filled, no unique or special habitats will be filled that would affect a species ability to use the remaining portion of the wetland. For example, if breeding amphibians were present in a wetland, and all the open water breeding habitat were filled, the remaining wetland could lose its ability to support amphibians, and experience an indirect impact to its wildlife diversity. This, or similar cases are not present at the airport.

The potential for indirect impacts to habitat resulting from the project is mitigated by the positive effects of the proposed mitigation on habitat connectivity, patch size, and habitat quality. On the west side of the embankment, connecting the smaller wetlands via the riparian and wetland buffer, eliminating human and pet use of the area, and enhancing the habitat through planting of native vegetation will eliminate the potential for indirect wetland impacts.

The presence of undisturbed corridors between habitat patches and groups of smaller, but interconnected habitat patches, can increase population persistence and species diversity. For example, the 200 foot wide riparian buffer along Miller Creek and the Vacca Farm restoration will lead to: (1) increased connectivity between individual wetlands, (2) increased connectivity between riparian zone wetlands and stream systems, and (3) protection of riparian habitats by upland buffers

Loss of habitat complexity and biodiversity
The project will not result in a loss of wetland habitat complexity or species diversity. Reductions in genetic diversity, source populations to re-colonize disturbed areas, and a gene pool necessary to adapt to long term change will not be lost.

The diversity of wetland systems affected by the project is generally low for several reasons. A primary reason is because logging, farming, grazing, golfing, ornamental landscaping, etc. has eliminated natural plant communities and wetland habitats. As some of these wetlands have been more or less abandoned, they have been colonized with native and non-native plants. The generally early successional plant communities found in these wetlands consist of cosmopolitan plant species[1], non-native grasses, or invasive grasses or shrubs (e.g., Himalayan blackberry). Because the wetlands have generally had only a few decades or less to recover from significant disturbance, there has not been enough time for the full compliment of native plants to colonize them.

Another reason plant diversity in the wetlands is low is because the range of wetland types impacted is relatively small. For example, most wetlands are seasonally saturated systems. Most lack seasonal ponding, and most lack saturated soil during the summer and early fall months. Given these conditions the variety of habitats or "niches" for different species of plants and animals adapted to different environmental conditions to colonize is limited.

The plant and animal communities supported by the wetland habitats are very unlikely to support a gene pool that differs from that in other local wetlands for several reasons. The recent colonization of the wetlands following disturbance is insufficient time for genetic divergence to occur. (For many species of plants colonizing the wetlands, the flora represents a single generation of plants, which presents little opportunity for genetic divergence to occur.)

The cosmopolitan species found in the wetlands are generally expected to be genetically similar to those plants in the region, as the efficient seed and pollen dispersal mechanisms found in these plants promote genetic homogeneity at local and regional levels. For example, many of the tree (willow, black cottonwood, alder, and cedar) and shrub (willow, western hazel) species are wind pollinated. The small pollen grains are readily dispersed hundreds of yards to tens of miles by wind. Likewise, the seeds of most of these species are equally adapted to be dispersed significant distances by wind (nearly all common trees and many shrubs in Washington) or animals (berry and nut producing trees and shrubs). These pollination and seed dispersal

[1] Cosmopolitan plant species are those that are capable of and generally do occur in a wide range of habitats and over large geographical areas. They are frequently tolerant of a wide range of soil, climate, and other habitat conditions.

mechanisms for these common wetland plants found in the area generally prevent development of specific genotypes at the local level.

Because wind and animals readily disperse the species, seed sources for populations to recolonize disturbed areas are typically abundant. The planned in-basin mitigation and preservation of several large existing wetlands will assure that the watershed and local area is not deprived of seed sources of these wetland plants. For these reasons, a change in the resistance of the wetlands or watersheds to disturbance is not likely.

As demonstrated in the mitigation plan, most mitigation for impacts to wetland function are occurring on-site and in-basin. Furthermore, mitigation ratios alone do not adequately reflect how functions will be replaced and restored by the combination of mitigation actions detailed in the Port's mitigation plan. The mitigation plan increases the level of post-mitigation wetland function on the mitigation site, as well as the numerous additional mitigation actions (e.g., upland buffers, stream habitat enhancement, implementation of additional stormwater management, etc.) that protect or enhance ecological functions.

Disturbance to wildlife

The indirect effects of noise disturbance on wildlife using wetlands adjacent to the airport were reviewed in the *Wetland Functional Assessment and Impact Analysis Report* (Parametrix 1999). Disturbance of habitats adjacent to the new third runway at STIA due to increased aircraft noise should not be significant because the new third runway will be constructed in areas that are currently subject to significant human disturbance (noise from residential development and existing airport development). Wildlife occurring in the acquisition area is limited to those species that can habituate to substantial noise and human disturbance. Wildlife habitat near the new runway is also near existing runways, and thus it currently receives aircraft noise. For these reasons, the wildlife species present are likely habituated to aircraft noise, and unlikely to abandon suitable habitat upon operation of the new runway.

Water quality impacts

Although the water quality functions of the existing wetlands will be lost when these wetlands are filled, the overall project, including the planned mitigation, is likely to result in improved water quality in Miller and Des Moines Creeks. This is true for several reasons.

First, a number of the existing wetlands to be impacted by the project do not provide optimal water quality treatment functions. Wetlands impacted by the project receive on-site runoff and groundwater discharge. The treatment function in some of these wetlands may be sub-optimal due to a short residence time (as inferred by wetlands on slopes, small size, topography that limits ponding and storage of water, and channelized flow) and by a lack of dense emergent vegetation. The above mentioned factors are typically associated with wetlands with high function for water quality improvement.

Second, the proposed stormwater management facilities will include water quality treatment. This will primarily be biofiltration swales and filter strips, as well as some use of wet vaults where biofiltration swales are not feasible. These water quality treatment facilities will be constructed to meet Ecology requirements, which are designed to optimize water quality treatment functions.

These facilities will result in treatment efficiencies necessary to prevent degradation of surface water and meet NPDES requirements. These facilities will be at least partially effective in replacing the water quality functions of the wetlands to be filled.

It is noteworthy that the wetlands to be filled provide water quality functions for stormwater runoff that is currently not treated by approved treatment best management practices. For example, wetlands downslope of 12th Avenue receive untreated stormwater runoff from 12th Avenue. The wetlands function to treat this water (at less than optimal rates) prior to discharge to Miller Creek. This stormwater treatment function likely degrades some biological functions the wetlands also provide. Following construction of the embankment, runoff currently flowing through the impacted wetlands will be treated by the water quality treatment features of the Port's stormwater management facilities, and this should represent an enhancement of the biological functions of the remaining wetlands.

Third, and perhaps most important, the construction of the third runway and SASA will result in a variety of land use changes and mitigation measures that will have the effect of improving the quality of water runoff into the creeks. These include:

- Existing impervious areas within the buyout area without water quality BMPs will be removed

  Farmed areas in the Miller Creek floodplain will be restored to native vegetation, eliminating erosion and potential pollutant sources.

- Removal of residential and commercial land-uses in the buy-out area will eliminate pollutant sources, including failing septic tanks, fertilizer, runoff, and other potential pollutants (pesticides, pesticide residues).

- Buffers established on Miller Creek and the development setback on Des Moines Creek will provide water quality protection to the creeks.

In addition, the $300,000 trust fund will make possible watershed restoration projects that may improve the water quality in the creeks.

The overall effect of all these changes and mitigation measures is likely to be improved water quality in Miller and Des Moines Creeks

Floodplain impacts

Wetlands that are within floodplains are limited to those in the Vacca Farm area. Floodplain mitigation is incorporated into the mitigation project for this site, as discussed in the NRMP.

Cumulative Impacts

Cumulative impacts have been considered as required by NEPA and SEPA in numerous environmental documents for the Master Plan Update Improvement. Attached is the text of the response to comments on the CWA404/401 Public Notice that addresses cumulative impacts for MPU project areas.

ADDITIONAL ISSUES

Lora Lake Buffer

The Port has revised the mitigation design for the Lora Lake buffer to include removing the concrete bulkhead lining the shoreline edge, softening the shoreline by re-grading to a gradual slope, and planting 25 ft wide buffers with native forest and shrub vegetation. In addition, the Port will use a performance standard of no more than 10% cover of non-native invasive species in the Lora Lake buffer at monitoring year 10. These revisions to the design are included in the revised Implementation Addendum (attached).

Channel design and migration zone of new Miller Creek

Two issues were raised regarding the design of the relocated Miller Creek channel segment. The first questioned the use of 1:1 side slopes for the new channel and the second addressed the channel migration zone for Miller Creek. Only the side slopes of the low flow channel will be 1:1; side slopes of the new channel will be 3:1 (please see p. 5-8, Figure 5.1-1 of the Mitigation Plan; see also Implementation Addendum Appendix A; Sheets C1.2, C5). Low flow channels typically have more vertical side slopes than the main channel (Rosgen 1994; Montgomery and Buffington 1993). The 1:1 slopes of the low flow channel are designed to maintain minimal flow depths for fish passage, as well as to allow some minor undercutting to increase shelter and fish habitat (see p. 5-12 of Mitigation Plan).

The mitigation design for the Miller Creek relocation includes reconnecting Miller Creek to its floodplain along this reach and providing a channel migration zone. Both these aspects of natural channel morphology and function are currently lacking in the channelized portion of Miller Creek that will be relocated. The channel migration zone is constrained at the northern most portion of the new channel due to the proximity of the relocated 154th/156th Street roadway, however, the new channel design does not include any structures or engineering that would constrain channel migration. The grading plan for the floodplain and channel alignment provides sufficient area on the west side of the channel along its entire length and on the east side in the southern half of the relocated channel reach. Therefore, the new Miller Creek channel will be able to migrate freely through the floodplain at the Vacca Farm site.

Source and use of irrigation water

The source and use of irrigation water is fully explained in the Implementation Addendum (attached). Irrigation for all mitigation projects will use city water. In addition, irrigation systems are temporary systems that will be decommissioned after the first few growing seasons by removing above-ground sprinkler heads, risers and control boxes and capping underground pipes. Irrigation water will not be used to provide site hydrology in any mitigation area. Irrigation water is used on the mitigation sites solely to provide flexibility in the plant installation schedule, to maximize survival and plant growth during the first few growing seasons, and to provide a contingency in the event of extreme drought during the first few years of the mitigation.

Soil profile in peat excavation areas

Included with the Implementation Addendum Appendices (attached) is a schematic soil profile showing representative soil profiles following grading in the peat areas of the Vacca Farm site. Additional information is provided in the Implementation Addendum regarding the use of soil amendments in the excavated areas of Vacca Farm.

Attachments:

WHMP (to be sent under separate cover)
Implementation Addendum (to be sent under separate cover)
Implementation Addendum Appendices A-E (to be sent under separate cover)
Email from Bill Rozeboom to Ecology (attached)
SR 509 plans in relation to wetlands (attached)
Hart-Crowser 2000 report (to be sent under separate cover)
Response to CWA 404/401 comments on cumulative impacts (attached)
Restrictive covenants (to be sent under separate cover)
Map of restrictive covenants (to be sent under separate cover)