SCREENING OF DISPOSAL FACILITIES FOR THE FEASIBILITY STUDY

The process for identifying and incorporating a list of disposal facilities into the feasibility study (FS) for the Portland Harbor Superfund site (Site) was documented in the June 20, 2008, technical memorandum. As described in that document, the Lower Willamette Group (LWG) identified a list of potential disposal facilities to use in the development of remedial alternatives for the FS. This memorandum presents a further screening of the potential disposal facilities to be used for the evaluation of remedial alternatives in the FS. Although this memorandum identifies a relatively short list of facilities for use in the FS, alternative facilities that offer comparable overall protectiveness will not be eliminated from consideration, and contractors bidding on the remedial implementation will identify the most cost-effective disposal alternative within the limitations that will be established in the selection and design of the remedy.

The following categories of disposal sites have been considered for the FS:

- Upland disposal sites; i.e., existing permitted landfills or new facility
- Nearshore disposal sites
- Confined aquatic disposal (CAD) sites

A generic option for a new upland facility, permitted and constructed specifically for the Portland Harbor remedial action project, will continue to be considered for potential evaluation and is discussed within this document. Such a generic upland option was identified in the June 28, 2008 technical memorandum, because such an approach could have cost and logistical benefits as compared to transporting sediments to more distant operating landfills. Ultimately, it is recognized that for such an option to be viable, a project proponent and a specific proposal is needed. If a more specific proposal consistent with this generic option is identified by the time the FS alternatives screening takes place, the specific site will be evaluated as a "representative" new upland facility.

PREVIOUSLY DEVELOPED "WORKING LIST"

The "working list" developed in the June 20, 2008, technical memorandum was the starting point for the further screening of disposal facilities. The previously developed "working list" is presented below.

Upland Disposal Sites

The following potential upland disposal sites are discussed (Figure 1):

1. Hillsboro Landfill, Washington County, Oregon (Hillsboro)
2. Northern Wasco County Landfill, The Dalles, Oregon (Wasco County)
3. Roosevelt Regional Landfill, Klickitat County, Washington (Roosevelt)

4. Columbia Ridge Landfill, Gilliam County Oregon (Columbia Ridge)

5. Chemical Waste Management of the Northwest Landfill, Gilliam County Oregon (ChemWaste)

6. Generic Near-Harbor New Upland Facility

Nearshore Disposal Sites

The following potential nearshore disposal sites are discussed (Figure 2):

1. Terminal 4 Slip 1 (T4S1)
2. Swan Island Lagoon (Swan Island)

Two additional potential Nearshore Disposal Sites that were included in the 2008 technical memorandum are no longer in consideration as representative sites. Cascade General has indicated that the facility will not be developed as a disposal site but that it is available as a transloading facility to offload sediment from barges and load it into trucks or rail cars for upland disposal (personal communication with A. Sprott, Vigor Industrial). Cascade General may be considered among several potential sites as a transloading facility near the Site. Legacy Site Services notified U.S. Environmental Protection Agency (EPA) in a July 25, 2008, letter that the Arkema confined disposal facility would not accept sediment for disposal from other sites (Legacy Site Services 2008).

Confined Aquatic Disposal (CAD) Sites

The following potential CAD sites are discussed (Figure 2):

1. River Mile (RM) 9. This is a depression located in the middle of the Willamette River at RM 9.5.

2. River Mile 4 to 5. This is a depression located in the middle of the Willamette River between RM 4 and 5.

3. A depression located in the Columbia River at RM 102.4.

4. Ross Island. (Ross Island may be appropriate as a CAD site—completed below water—or a nearshore disposal site—completed partially or completely above water. For consistency with the previous memoranda on the identification of potential disposal sites, Ross Island is evaluated in this memo as a CAD site.)

CRITERIA FOR SCREENING FACILITIES

The CERCLA criteria for remedy evaluation, codified in the National Contingency Plan (NCP) at 40 CFR 300.430(e)(9), were used, to the extent applicable, to identify representative facilities for each of the three categories of disposal facilities. The remedial evaluation criteria were used for this purpose because the information developed for this screening should then be readily usable for FS. One of the CERCLA criteria, Reduction of Toxicity, Mobility, and Volume

through Treatment, was not considered in this evaluation, because the purpose of this evaluation is only to identify representative disposal facilities, which could be used with or without treatment as part of a complete remedy. All of the CERCLA criteria, including Reduction of Toxicity, Mobility, and Volume through Treatment, will be used to evaluate remedial alternatives in the FS. Two of the other CERCLA criteria, State Acceptance and Community Acceptance, were combined in this evaluation into an assessment of agency and community acceptance. The criteria are briefly discussed in the following sections.

Overall Protection

This criterion is defined in the NCP as a general consideration drawing on the other criteria, particularly Long-Term Effectiveness and Permanence, Short-Term Effectiveness, and Compliance with Applicable or Relevant and Appropriate Requirements (ARARs). Overall Protection is used as the summary criterion in evaluating the alternatives.

The main Overall Protection considerations for upland disposal facilities are the relative ability of the facilities to contain contaminants that may be associated with materials from the Site and potential hazards associated with transporting materials from the Site to the disposal facilities. For nearshore and CAD sites, physical factors inherent to the sites are the main considerations for Overall Protection. Physical factors, such as hydraulic gradients and bathymetry, can limit the effectiveness of potential disposal sites.

Compliance with Legal Requirements

Disposal Sites Outside the Portland Harbor Superfund Site

For upland disposal sites outside the Portland Harbor Superfund Site, the main legal requirements under 42 U.S.C. 9621(3) relate to transportation of the materials from the Site to the disposal facility and the legal compliance status of the facilities. All of the facilities in consideration are believed to currently be in compliance with their permits. Compliance will be verified with the EPA regional Off-Site Rule Compliance contact before sending any material to an off-site disposal facility. CAD sites outside the Portland Harbor Superfund Site will have to be permitted, designed, and built to operate in compliance with requirements of the Clean Water Act, the Endangered Species Act (ESA), and other applicable federal and state laws and requirements.

Disposal Sites within the Portland Harbor Superfund Site

On-site disposal facilities, whether nearshore disposal or in-water confined aquatic disposal, will need to comply with ARARs consistent with the permit exemption provision of 42 U.S.C. 9621(e)(1). Legal issues associated with ownership, operation and impact upon the navigational channel would also need to be addressed.

Long-Term Effectiveness and Permanence

For all disposal facilities, this criterion assesses the ability of the facility to contain contaminants associated with materials from the Site over the long term. Factors such as the design of

containment and monitoring systems and the mobility of contaminants are significant for upland disposal facilities. Groundwater flow, bathymetry, erosive forces, and mobility of contaminants are significant to nearshore and CAD facilities.

Short-Term Effectiveness

The Short-Term Effectiveness criterion includes both the time to achieve effectiveness and risks associated with implementation of the remedy. For upland disposal facilities, the remedy would be effective as soon as the material from the Site was securely placed in the facility. The main Short-Term Effectiveness consideration for upland disposal is the potential risk and environmental impacts associated with transporting the material from the Site to the disposal facility considering the possibility of physical hazards associated with increased traffic, the possibility of a release of contaminants during transport, and releases of air pollutants associated with transportation. Short-Term Effectiveness considerations for nearshore and CAD facilities include the potential for mobilizing contaminants during construction (if the facility is located in an area of contaminated sediment) and operation of the facility. The design of CAD and nearshore facilities would incorporate methods to control releases of existing contamination, as well as releases of materials being placed in the facilities.

Implementability

The Implementability criterion includes both technical and administrative requirements that could affect the ability of the disposal facility to meet project demands. For upland disposal facilities, implementability considerations include the types of materials the facility is permitted to accept, the capacity of the facility, the distance from the Site to the facility, and the availability of necessary transportation links and transfer facilities. For new off-site disposal sites, implementability considerations include the difficulty of securing facility sitting approval and obtaining required permits. For on-site nearshore and CAD facilities, Implementability considerations include the capacity of the facility and the difficulty of obtaining necessary agency approvals for construction and operation of the facility. An additional consideration for CAD facilities (and, potentially, for nearshore facilities) is potential interference with other users of the river, such as commercial shipping and navigation channel maintenance and construction, if the CAD is located in an active navigation channel.

Cost

Considerations for existing upland disposal facilities are the costs of transloading, transportation, treatment to stabilize materials for transportation and disposal if required, disposal (tipping fees), and other fees or taxes. Considerations for nearshore and CAD facilities (as well as for creating a new uplands facility) are the costs of design, obtaining agency approvals, potential habitat mitigation, construction and operation of the facility, contaminated materials transport and placement, closure, and long-term monitoring. There are additional costs associated with siting and permitting a new off-site disposal facility.

Agency and Community Acceptance

Previous comments on the disposal facilities were noted in the evaluation.

SCREENING OF DISPOSAL FACILITIES

The disposal facilities were evaluated relative to the criteria identified in the previous section. The evaluation of each of the upland disposal facilities (landfills) is contained Table 1. Table 2 contains the evaluations of each of the nearshore facilities, and Table 3 contains the evaluations of each of the CAD facilities.

Information for this evaluation was gathered from a number of sources, including previous memoranda on this topic (Anchor 2004, Anchor 2008). For landfill disposal, the sources of information were discussions with landfill operators, reviews of landfill permits, and previous project experience. For nearshore facilities, information was gathered from the prefinal design for the T4 early action (Anchor 2006), discussions with Port of Portland and Vigor Industrial, correspondence between EPA and Legacy Site Services regarding the conceptual design for the Arkema nearshore confined disposal facility, and previous project experience. For CAD facilities, information was gathered from bathymetry published by LWG and National Oceanic and Atmospheric Administration (NOAA), published documents on the Ross Island site, discussions with Ross Island Sand and Gravel, and previous project experience.

The generic Near-Harbor New Upland Facility will be retained as a separate potential type of disposal facility for consideration in the FS. A list of 37 candidate sites for a new upland disposal facility was developed for the *Draft Disposal Site Inventory Preliminary Screening Report* (Anchor 2004). These were identified based on the presence of relatively vacant land and general suitability for use as a disposal site. The LWG has not determined the potential willingness of the owners to agree to place such a facility on their land or agree to sell their land for this purpose. No stakeholders have as yet proposed a specific site or sites in this category of disposal facility. The generic concept of near-harbor new upland disposal site is being retained because it may provide a cost-effective disposal option that minimizes the negative environmental impacts associated with additional transportation. A specific upland disposal option will be evaluated in the FS as a representative site if an actual candidate site is identified prior to the FS screening of alternatives step. For the purposes of the FS, a new near-harbor upland disposal site will be considered on-site and therefore covered by the CERCLA waiver from permitting and pre-enforcement review (42 USC 9163 (h)).

Upland Disposal Site Evaluation

All of the landfills in consideration would be protective of human health and the environment, as all of the facilities would provide effective and reliable containment of materials from the site. There are similar short-term risks associated with remedial alternatives that would incorporate disposal any of the landfills, and the disposal at any of the facilities would comply with applicable legal requirements for nearly all of the materials from the Site. The primary difference between the upland disposal options is related to the need to eliminate free liquids from the material sent to any of the facilities except for Roosevelt and Columbia Ridge (both of which can accept wet materials) or transported by truck to any of the facilities. Elimination of free liquids would require additional handling of the material. The differences between the landfills are discussed in this section.

One of the landfills evaluated, ChemWaste, is distinct from the others in terms of the waste it is permitted to accept, the design of the containment system, and cost. ChemWaste is permitted

under the Resource Conservation and Recovery Act (RCRA) Subtitle C for disposal of hazardous waste. As nearly all of the material from the Site is expected to neither contain hazardous waste nor exhibit a characteristic of hazardous waste, disposal at ChemWaste is unnecessary for most of the materials that may be removed from the Site. The other landfills are all permitted under RCRA Subtitle D for disposal of non-hazardous waste, including materials containing hazardous substances from remedial action projects. This evaluation focuses on the Subtitle D facilities because they provide a protective method for disposal of materials removed from the Site at a much lower cost than disposal at ChemWaste. In addition, the use of hazardous waste disposal capacity for managing large volumes of relatively low-hazard material is unwarranted. If materials that contain hazardous waste or exhibit a hazardous waste characteristic are removed from the Site, those limited quantities of material would be managed at ChemWaste or another RCRA Subtitle C facility.

The four Subtitle D landfills are similar relative to the Compliance with applicable legal requirements and Long-Term Effectiveness and Permanence criteria. There are subtle differences between the risks and environmental impacts associated with transporting material from the Site to the landfills due to the different distances and modes of transportation available. For any of the upland disposal sites, transportation will probably involve dredging the sediment into barges, on-site or off-site transloading the sediment from barges to trucks or rail, and hauling the sediment by truck or rail to the landfill. Risks and environmental impacts are associated with potential releases of contaminated materials during transport, highway accidents with other vehicles, and emission of air pollutants from transport vehicles. Hillsboro is the closest landfill, approximately 20 miles from the Site. Wasco County is considerably farther away, but sediment would be transported most of the distance to the landfill by barge, with a single barge carrying approximately 75 truckloads of sediment. The distance from the transloading facility in The Dalles to the Wasco County landfill (approximately 15 miles) is actually less than the distance from the Site to Hillsboro. Roosevelt and Columbia Ridge are farther from the Site, but material would be transported most of the distance by barge or, potentially, all of the distance by rail. Traffic congestion is most significant in the Portland metropolitan area, so the risks of traffic accidents are somewhat greater for trucks traveling between Portland and Hillsboro. The other landfills and their respective transloading facilities are in areas of relatively low population where highways are less congested than in Portland, and the drawbacks associated with trucking are not an issue if materials are transported by rail to Roosevelt or Columbia Ridge.

The most significant difference between the landfills relative to the Implementability criterion is that Roosevelt and Columbia Ridge can accept materials containing free liquids, whereas Hillsboro and Wasco County can only accept dry materials for disposal. This is a very important criterion since virtually all of the material being transported will include some level of moisture. Since Roosevelt and Columbia Ridge can both accept wet materials, these landfills offer the advantage of eliminating a substantial treatment step to absorb free liquid. The Roosevelt landfill has already demonstrated its ability to successfully receive shipments of wet sediment via rail in the Hylebos Waterway cleanup project in Commencement Bay. In fact, the site operators seek out wet material to support the Roosevelt PUD 10 megawatt co-generation facility that requires wet materials to generate methane. Columbia Ridge similarly seeks wet material. Conversely, a Hylebos Waterway pilot project demonstrated that transportation of wet sediment by truck creates potential spill issues from slopping and is not a viable alternative. In addition,

the Roosevelt facility is equipped to handle sediment containing asbestos if that becomes an issue at the site.

The costs for upland disposal include the costs for transportation (including transloading), treatment (if necessary), landfill "tipping" fees, and taxes. One of the primary cost drivers in upland disposal is double handling costs. Both Roosevelt and Columbia Ridge offer a significant potential cost saving by allowing material to be transported by rail directly to the facility. The actual tipping and transportation costs may vary significantly from the preliminary estimates obtained because they are subject to changes in market conditions and specific negotiations with the site operators. Sites relying on truck transportation would also require substantial additional dewatering—beyond that required for barge or rail—to avoid potential spillage. Sites requiring dry material would also involve substantial additional dewatering costs before the site would accept the material for disposal.

Based on primary differences between the landfill options (the implementability and cost considerations associated with absorbing free liquid for transportation and disposal), rail transportation and disposal at either Roosevelt or Columbia Ridge are significantly advantageous upland disposal options as compared with trucking or disposal at Hillsboro or Wasco because of the additional handling required to eliminate free liquid.

Nearshore Disposal Site Evaluation

The two on-site facilities evaluated could both provide in-water disposal of material that would be protective of human health and the environment. Both of the sites could be designed, built, and operated to comply with all ARARs. The volume of material that may be dredged as part of the Portland Harbor remedial action may require the use of more than one disposal option, and either or both of the two nearshore disposal facilities are appropriate for evaluation in the FS. More information is currently available for the T4S1 site than Swan Island because a preliminary design has already been developed (Anchor 2006).

The geometry of the T4S1 site is particularly favorable for containing sediment. The site has minimal exposure to the river, the containment barrier is relatively short compared to the size of the disposal area, and the bathymetry in the vicinity of the barrier is gently sloping (approximately 2 percent). These features inherent to the T4S1 site all would enhance the reliability and effectiveness of the containment system by reducing the exposure of the containment to erosive forces of the river. The Swan Island site is similarly removed from the flow and erosive forces of the river, the containment barrier would be short relative to the capacity of the facility, and the bathymetry of the lagoon is gently sloping

The potential capacity of the Swan Island site may be as large as 2 million to 4 million cy depending on how much of the lagoon is used for the disposal facility and the final grade of the facility. The entire lagoon is more than 5,000 feet long and 600 feet wide. The capacity of the T4S1 site, approximately 570,000 cy (Anchor 2006), should be significant relative to the quantity of material that may require disposal, although it is considerably less than the potential capacity of the Swan Island location.

The T4S1 containment would require the construction of a barrier approximately 350 feet long. The preliminary design includes a containment berm with a maximum height of approximately 60 feet above the existing mudline in the area of deepest water. A conceptual design has not been developed for Swan Island, but the containment barrier would also be short relative to the capacity of the facility if the facility is ultimately configured as depicted on Figure 2.

An additional implementability, and potentially a community acceptance, consideration for the Swan Island location is that several industrial facilities are located around the lagoon. Use of the Swan Island location for a nearshore disposal facility would require resolving any needs of such facilities for access to the Willamette River.

Based on the foregoing evaluation, both the T4S1 and Swan Island locations will be considered as potential nearshore disposal facilities in the FS.

CAD Site Evaluation

All of the facilities evaluated could provide in-water disposal of material that would be protective of human health and the environment. The CAD sites could all be designed and operated to comply with all ARARs. The volume of material that may be dredged as part of the Portland Harbor remedial action may require the use of more than one disposal option, but the CAD facilities were evaluated to select one to use as a representative facility for evaluation in the FS.

While each of the sites could be designed to effectively contain contaminated sediment, the Columbia River and Ross Island sites have certain marginal advantages relative to the Long-Term Effectiveness criterion. The Long-Term Effectiveness factors that vary between the potential CAD sites are location relative to the potential erosive forces associated with ship traffic and the size of the working face of the CAD during placement (or size of the cap after closure) relative to the capacity of the CAD.

The Columbia and Ross Island locations have significant implementability disadvantages arising out of the need to obtain permits and CERCLA prohibition on pre-enforcement review (42 USC 9163 (h)) meet all applicable federal and state legal requirements associated with design and construction. By comparison, the RM 4 to 5 and RM 9 sites would be exempt from obtaining permits.

The off-site Columbia River and Ross Island sites are outside the active navigation channel, and the Columbia River site is in deep water (approximately 60 feet deep surrounding the proposed CAD site). Therefore, propeller wash is less likely to resuspend sediment during placement or to affect the cap after closure. Both the on-site RM 9 and RM 4 to 5 sites are within the navigation channel. The water depth surrounding the RM 4 to 5 site is approximately 60 feet, and the water depth at the RM 9 site is approximately 50 feet.

The volumes and surface areas of three of the potential CAD sites were evaluated from existing bathymetry to gauge the capacities, exposed surface areas, and amount of capping materials that would be required.

CAD Site	Approximate Surface Area (square yard)	Approximate Volume (cy)	Volume:Surface Area ratio
Willamette RM 4-5	150,000	272,000	1.8
Willamette RM 9	142,000	515,000	3.6
Columbia River	117,000	750,000	6.4

Greater volume-to-surface-area ratio of a site indicates that more sediment could be managed in the disposal facility with less exposure to erosive forces of river currents and less potential for resuspension of material if other factors, such as surface water velocity, are equal. In addition, less capping material is required for sites with smaller surface area.

Relative to the Short-Term Effectiveness and Implementability criteria, the RM 4 to 5 and RM 9 sites offer the advantage of being within the Site and closer to the locations where sediment may be dredged. Sediment would need to be transported from the Site to the Columbia River CAD with some potential for a release of sediment during transport. Placement of sediment in CADs in deeper water (RM 4 to 5 and Columbia River sites) involves the potentially greater risk of entraining sediment in the water column. The risk of sediment entrainment during placement can be mitigated through the use of an appropriate placement technique and monitoring during placement.

The Ross Island site offers a location in proximity to the Site with a potential capacity to handle the volume of sediment that may be dredged from the Site. The Ross Island site is sheltered from the flow of the Willamette River, offering both short-term and long-term effectiveness advantages. The large potential capacity of Ross Island may also make dredging techniques that require substantial dewatering—like hydraulic dredging—more viable. The Ross Island site has been the subject of several environmental disputes with individual LWG members, and this may impact the ability to reach an agreement with the owners for use as a disposal site. Based on the greater capacity of the Columbia River and Ross Island locations and reduced interference with commercial shipping, these two potential CAD sites have technical advantages for in-water management of material from the Site as compared with the RM 4 to 5 and RM 9 locations. Administrative obstacles to the use of the Ross Island location would need to be overcome to proceed with the use of this location. Consequently, Ross Island is included primarily due to EPA's stated preference to further consider this location in the FS.

REFERENCES

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Sprott. 15 May 2009. Personal communication between Alan Sprott of Vigor Industrial and Eric Schwarz of Anchor QEA.

Table 1. Summary of Upland Disposal Facility Comparison

CERCLA Criteria[1]	Overall Protection[2]	Compliance with ARARs	Long-Term Effectiveness and Permanence	Short-Term Effectiveness[3]	Implementability[4]	Cost	State & Community Acceptance
Considerations for:							
Hillsboro Landfill (Hillsboro)	Most cost-effective upland disposal option, at least for materials with the lowest potential to leach constituents. May be limited as to quantity of material that can be accepted.	With minor variations, the following apply to Hillsboro, Wasco County, Roosevelt, and Columbia Ridge: Permitted to accept nonhazardous waste, including cleanup materials contaminated with hazardous substances per a Special Waste Management Plan Compliance status will be confirmed with EPA Region 10 Off-Site Rule Coordinator Differences between Hazardous Waste Regulations in Oregon and Dangerous Waste Regulations in Washington need to be considered for disposal at Roosevelt.	The nonhazardous waste (Subtitle D) facilities (Hillsboro, Wasco County, Roosevelt, and Columbia Ridge) are permitted and designed to accept a variety of wastes, including cleanup materials containing hazardous substances.	Shortest haul route reduces transportation-related risks and environmental impacts. However, only alternative that requires trucking through most congested area (Portland)	Disposal at Hillsboro, Wasco, or ChemWaste requires elimination of free liquids. Transportation by truck also requires elimination of free liquids. Rail transport and disposal at Roosevelt or Columbia Ridge are the only options that do not require the elimination of free liquids. Dredged material would be transported to shore by barge (either at the Site, in the case of transport to Hillsboro or transfer to rail for disposal at one of the other facilities, or to a transloading facility near one of the other landfills) and then transported to the disposal facility by truck or rail. The alternatives do not require specialized technology, and disposal at two of the facilities has been successfully demonstrated by two Portland Harbor early actions. The administrative implementability is similar for the five disposal sites. Disposal at Hillsboro, Wasco County, and Columbia Ridge would require Special Waste Authorizations in accordance with Oregon Regulations. Transportation to ChemWaste would need to be documented on hazardous waste manifests. Disposal at Roosevelt, the only out-of-state facility in consideration would require review of the wastes for compliance with Washington regulations.	Lowest total cost of the landfill disposal options	May be less favored by agencies and the public, at least for some materials, because of proximity to metropolitan Portland.
Northern Wasco County Landfill (Wasco County)	Cost-effective disposal option for all materials that do not contain RCRA hazardous wastes. May be limited as to quantity of material that can be accepted.			Longer overhaul travel distance than Hillsboro but mostly by barge. Truck distance is less than half the distance for Hillsboro and through much less densely populated area.		Low to moderate cost	Expected to be acceptable to agencies and public for disposal of a wide range of materials.
Roosevelt Regional Landfill (Roosevelt)	Cost-effective disposal option for all materials that do not contain RCRA hazardous wastes.			Roosevelt, Columbia Ridge, and ChemWaste are farther from the Site than Hillsboro or Wasco County but transportation would be mostly by barge or rail. Direct rail transportation from the Site to Roosevelt, Columbia Ridge, or ChemWaste is an option if a transloading facility can be sited in Portland near the river and a rail spur (Cascade General, centrally located to the site is a potential transloading facility in Portland).		Moderate cost. The cost treating to eliminate free liquid may be avoided if material is transported to Roosevelt or Columbia Ridge by rail, as both facilities can accept wet waste and both have rail unloading facilities.	
Columbia Ridge Landfill (Columbia Ridge)	Cost-effective disposal option for all materials that do not contain RCRA hazardous wastes.						
Chemical Waste Management of the Northwest Landfill (ChemWaste)	Most expensive option and a poor use of hazardous waste disposal capacity for most materials from the Site. May be appropriate (and possibly required) for a limited volume of material from the Site.	Permitted to accept hazardous waste, although very little, if any, material containing hazardous waste is expected. Compliance status will be confirmed with EPA Region 10 Off-Site Rule Coordinator. Materials containing hazardous waste would be transported with a manifest per RCRA.	Permitted and designed to permanently contain much more hazardous materials than sediment that may be dredged from the Site. Redundant containment and leachate collection systems and location in an area that receives little precipitation and is removed from shallowest groundwater all contribute to long-term effectiveness.			Highest cost, expected to be approximately three times higher than Hillsboro.	May be preferred by agencies and public for the most contaminated material because of the enhanced design features for containment. May be unfavored by agencies for most Site material because of unnecessary use of hazardous waste management capacity.

Notes:

1 - The CERCLA evaluation criteria are documented in 40 CFR 300.430(e)(9). This table combines two of the criteria, State Acceptance and Community Acceptance, and excludes one criterion, Reduction of Toxicity, Mobility, or Volume Through Treatment, that does not apply to an evaluation strictly of disposal options. Reduction of TMV Through Treatment for complete remedial alternatives will be evaluated in the Feasibility Study.

2 - Overall Protection is defined as a general consideration drawing on other criteria, particularly Long-Term Ef fectiveness and Permanence, Short-Term Effectiveness, and Compliance with ARARs. This criterion provides an overall summary of the pros and cons of each Upland Disposal option.

3 - Short-Term Effectiveness includes consideration of both the time required for the remedy to achieve protectiveness an d hazards associated with the implementation of the remedy.

4 - Implementability includes consideration of both administrative factors (e.g., agency approvals required) and engineering factors (e.g., availability of specialized equipment)

The considerations identified in this table will be used to compare facilities within each facility category (Upland Disposal, Nearshore Disposal, Confined Aquatic Disposal), not to make comparisons between the categories of disposal facilities..

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This document is currently under review by US EPA and its federal, state and tribal partners, and is subject to change in whole or in part.

Table 2. Summary of Nearshore Disposal Facility Comparison

CERCLA Criteria[1]	Overall Protection[2]	Compliance with ARARs	Long-Term Effectiveness and Permanence	Short-Term Effectiveness[3]	Implementability[4]	Cost	State & Community Acceptance
Considerations for:							
Terminal 4 (Slip 1)	Expected to offer effective containment of a significant volume of dredged material due to the geometry (long and narrow) and physical characteristics (gently sloped bathymetry) of the site.	The following requirements would apply during the construction, operation, and long-term monitoring of any of the Nearshore confined disposal facilities: Clean Water Act Rivers and Harbors Act, Section 10 National Historic Preservation Act Endangered Species Act Floodplain Management (Executive Order 11988)	Confined on three sides; Slip 1 is approximately 250 feet wide by 750 feet long. The containment berm would be approximately 300 feet long and 60 feet tall. The footprint of the berm is on gently sloping bathymetry (approximate 2-foot drop over 160-foot width), and the same gentle slope extends another 75 feet from the toe of the berm. The Design Analysis Report (DAR) contains an evaluation of erosive forces that would affect the containment berm and potential contaminant transport through the berm. The berm would be armored with appropriately sized rock to protect from erosion. The DAR also contains a seismic evaluation to support the design of the containment berm.	The DAR contains calculations to demonstrate the seismic stability of the containment berm and contaminant transport through the berm. Steps for controlling and monitoring releases are also discussed. Full protection will be achieved when the cap is installed, The schedule has not been defined. Waste acceptance criteria proposed in the DAR would limit materials that would be accepted, thereby reducing the potential of water-quality impacts during operation of the facility. Potential resuspension of contaminated sediment during construction will be controled.	The capacity of the T4 site for Portland Harbor material is approximately 560,000 cy. The location of the facility is roughly in the center of the Portland Harbor Site (as are all four candidate facilities) Three sides of the facility location are part of the developed Port facility, so upland access should be available for construction. Agency approvals would be required for in-water construction and the discharge of return water.	Unit costs expected to be relatively low compared to the other alternatives because of the high volumetric capacity and the relatively short containment barrier required.	Preliminary agency response to Terminal 4 as an in-water disposal option has been generally favorable.
Swan Island Lagoon	Similar to T4S1 (confined on three sides, gently sloping bathymetry) except larger		The lagoon is confined on three sides, so the disposal facility will be sheltered from the river even though only a portion of the lagoon would be used for the disposal facility. Conceptual design, including the actual size of the facility, has not been developed. Gently sloping bathymetry simplifies the design and construction of the containment.	Conceptual design will address short-term risks associated with implementation. Full protection will be achieved when the cap is installed, The schedule has not been defined.	Potentially very large capacity (approximately 2 to 4 million cy) depending on the portion of the lagoon that would be used and the final grade of the facility. Agency approvals required	Costs will depend on the configuration selected for the disposal site. High available disposal capacity will tend to lower unit disposal costs.	

Notes:

1 - The CERCLA evaluation criteria are documented in 40 CFR 300.430(e)(9). This table combines two of the criteria, State Acceptance and Community Acceptance, and excludes one criterion, Reduction of Toxicity, Mobility, or Volume Through Treatment, that does not apply to an evaluation strictly of disposal options. Reduction of TMV Through Treatment for complete remedial alternatives will be evaluated in the Feasibility Study.

2 - Overall Protection is defined as a general consideration drawing on other criteria, particularly Long-Term Effectiveness and Permanence, Short-Term Effectiveness, and Compliance with ARARs. This criterion provides an overall summary of the pros and cons of each Nearshore Disposal option.

3 - Short-Term Effectiveness includes consideration of both the time required for the remedy to achieve protectiveness and hazards associated with the implementation of the remedy.

4 - Implementability includes consideration of both administrative factors (e.g., agency approvals required) and engineering factors (e.g., availability of specialized equipment)

The considerations identified in this table will be used to compare facilities within each facility category (Upland Disposal, Nearshore Disposal, Confined Aquatic Disposal), not to make comparisons between the categories of disposal facilities.

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Table 3. Summary of Confined Aquatic Disposal Facility Comparison

CERCLA Criteria[1]	Overall Protection[2]	Compliance with ARARs	Long-Term Effectiveness and Permanence	Short-Term Effectiveness[3]	Implementability[4]	Cost	State & Community Acceptance
Considerations for:							
Willamette River Mile 9 (RM 9)	There are some differences between the locations regarding potential impacts from vessel traffic, size, water depths, and proximity to the site. However, it is expected that a CAD facility design could be developed that provides an acceptable level of protection for the site-specific concerns in each area.	The following requirements would apply during the construction, operation, and long-term monitoring of any of the Confined Aquatic Disposal facilities: Water quality criteria (Clean Water Act) Protection of threatened and endangered species (Endangered Species Act)	Each of the sites is located in river areas with shoreline development and historical filling activity. No significant difference is expected between the sites for surface and groundwater flow. Depth averaged velocity data indicates that both Willamette River locations are exposed to similar water velocities. Water velocity data was not available for comparison for the Columbia River location. However, significant riverbed shears are expected in each location during high flow events. Both Willamette River locations are within the navigation channel. The Columbia River area is located in deep water areas adjacent to the Lower Vancouver Navigation Channel. Both channels see traffic from deep draft vessels and it is expected that each location would be exposed to propeller wash scour from these vessels. The Columbia River location would likely be subject to less frequent vessel travel, since it is not directly inside the navigation channel. The level of the propeller wash scour would depend on the proximity of the top elevation of the CAD to the vessel propeller. The water depths in the vicinity of RM 9 are somewhat shallower than RM 4-5 and the Columbia River location.	Located within the site boundaries, thus material would be transported shorter distances than with the other facilities thus lowering the risk of release during material transport. Water depths in the RM 9 area are somewhat shallower than at the RM 4-5 site, which would reduce the potential for losses during material placement. Dispersion potential in a deeper site can be mitigated with the selection of the method of placing material.	Moderate capacity (approximately 515,000 cy) Because located within site boundary, advantages of CERCLA permit waiver and lower cost associated with shorter transport distances.	Construction, operation, closure, and monitoring costs may be slightly lower due to smaller surface area Transport costs may be lower since within site boundary	Located within site boundary, in an area of industrial use. May be favored due to shorter transport distances.
Willamette River Mile 4-5 (RM 4-5)					Smaller capacity (approximately 272,000 cy) Because located within site boundary, advantages of CERCLA permit waiver and lower cost associated with shorter transport distances.	Construction, operation, closure, and monitoring costs may be higher due to larger surface area Transport costs may be lower since within site boundary	
Columbia River				Located outside the site boundaries; somewhat increased potential risk during transport. Both sites are outside active commercial navigation channels and may offer advantages relative to potential losses of material during placement in the CAD.	Greater capacity than the RM 9 and RM 4-5 sites (approximately 750,000 cy)	Moderate: lower construction, operation, closure, and monitoring costs due to smaller surface area, higher transport costs since outside site boundary	Potentially increased community resistance due its location off-site.
Ross Island			As the Ross Island location is in an area of similar industrial development as the other three sites, no significant difference is expected in surface and groundwater flow. The Ross Island CAD is sheltered from normal river flow by the surrounding island.. Although water velocity data was not available for comparison, it is expected that this location would be more protected from scour during high flow events. It also would not be subject to potential scour from ship traffic as would be expected in navigation channel areas.		Specific capacity information was not available, although the lateral extent and depth of the former borrow pit is very large.	Cost information not available	The owner, DEQ, and public may be resistant to the use of Ross Island. Ross Island Sand and Gravel currently has an agreement with DEQ to place only Class "A" Fill (concentrations below screening levels) in the lagoon.

Notes:

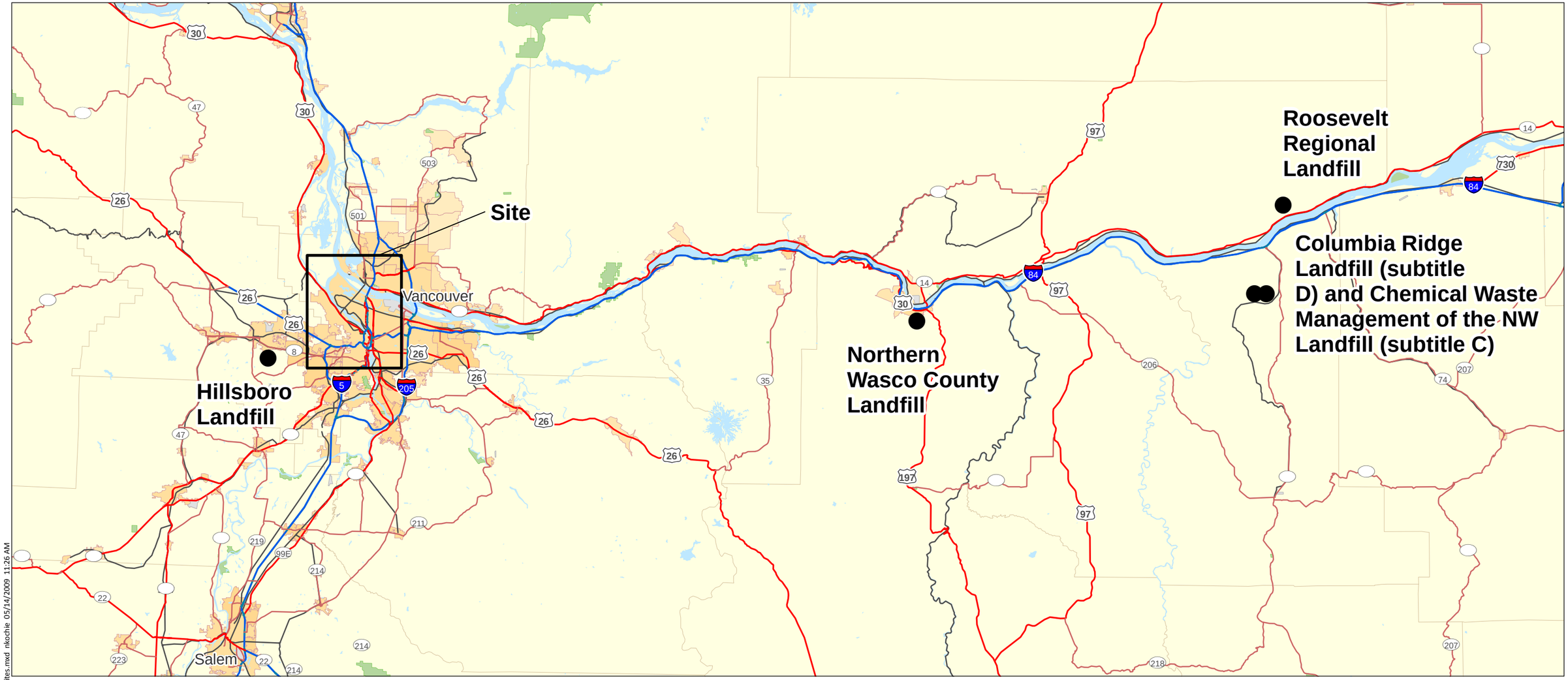
1 - The CERCLA evaluation criteria are documented in 40 CFR 300.430(e)(9). This table combines two of the criteria, State Acceptance and Community Acceptance, and excludes one criterion, Reduction of Toxicity, Mobility, or Volume Through Treatment, that does not apply to an evaluation strictly of disposal options. Reduction of TMV Through Treatment for complete remedial alternatives will be evaluated in the Feasibility Study.

2 - Overall Protection is defined as a general consideration drawing on other criteria, particularly Long-Term Effectiveness and Permanence, Short-Term Effectiveness, and Compliance with ARARs. This criterion provides an overall summary of the pros and cons of each Nearshore Disposal option.

3- Short-Term Effectiveness includes consideration of both the time required for the remedy to achieve protectiveness and hazards associated with the implementation of the remedy.

4 - Implementability includes consideration of both administrative factors (e.g., agency approvals required) and engineering factors (e.g., availability of specialized equipment)

The considerations identified in this table will be used to compare facilities within each facility category (Upland Disposal, Nearshore Disposal, Confined Aquatic Disposal), not to make comparisons between the categories of disposal facilities.



Potential Disposal Sites

Miles
0 6.5 13 19.5 26

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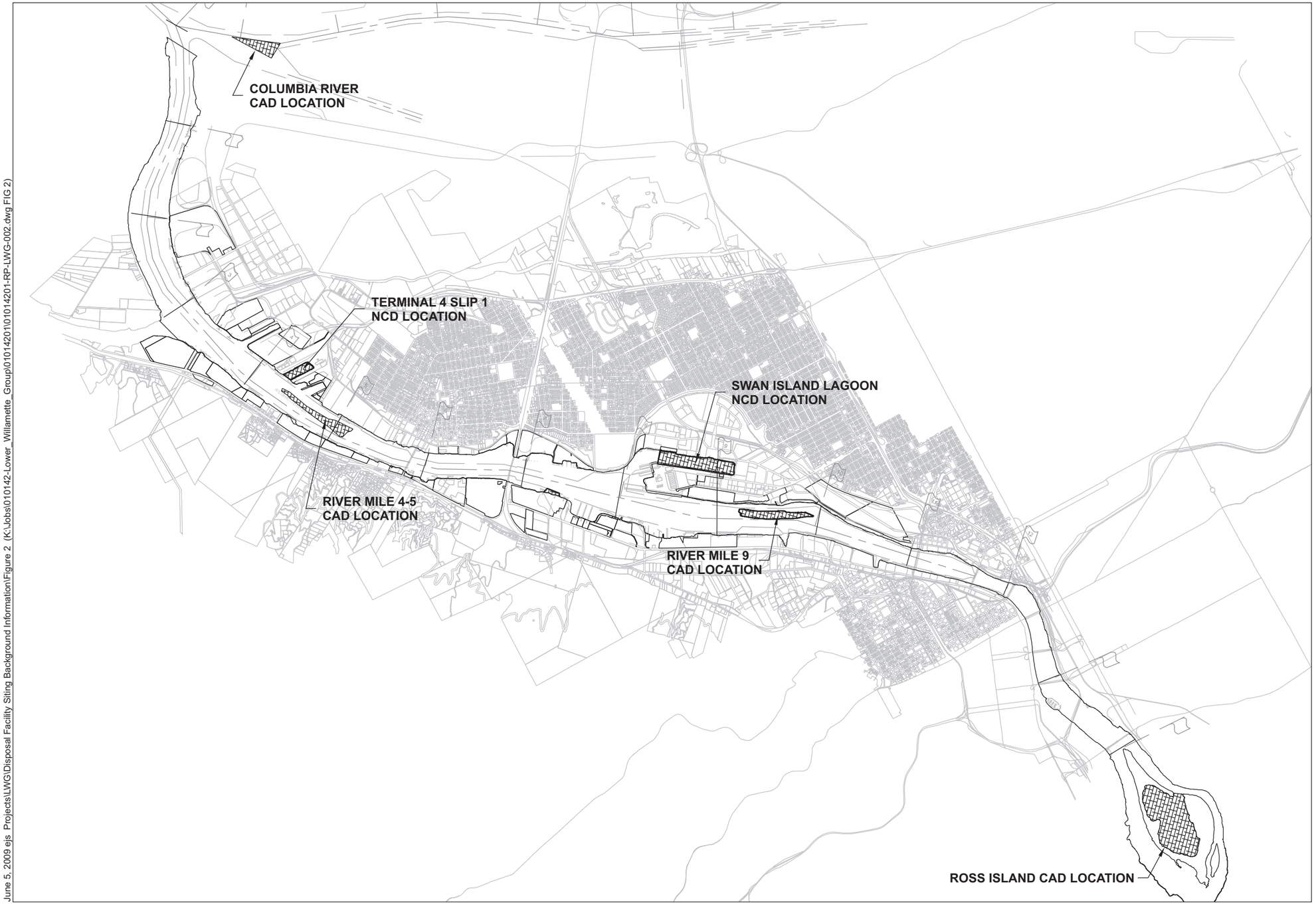
Figure 1
Potential Upland Disposal Sites
Lower Willamette Group



SOURCE: Drawing prepared from data provided by Metro RLIS and the US Army Corps of Engineers.
HORIZONTAL DATUM: Oregon State Plane North, NAD83 (International Feet).
VERTICAL DATUM: North American Vertical Datum of 1998 (NAVD88).

NOTES:
CAD - Confined Aquatic Disposal
NCD - Nearshore Confined Disposal

June 5, 2009 ejs Projects\LWG\Disposal Facility Siting Background Information\Figure 2 (K:\Jobs\010142-Lower_Willamette_Group\010142\01014201-RP-LWG-002.dwg FIG 2)

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0 1
Scale in Miles

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Figure 2
Potential Portland Harbor CAD and Nearshore Disposal Sites
Lower Williamette Group