

July 17, 1996

SUBJECT: EVALUATION OF TESTING CONDUCTED FOR THE NEARSHORE CONFINED DISPOSAL OF CONTAMINATED DREDGED MATERIAL FROM BETWEEN THE PORT OF EVERETT PIERS 1 AND 3 BEHIND A CONTAINMENT DIKE PROPOSED AS PART OF THE STAGE I MARINE TERMINAL IMPROVEMENTS PROJECT.

1. In August 1993, the Port of Everett proposed dredging from the north side of Pier 1 and the south side of Pier 3 to improve navigation [1]. The sediment was tested according to PSDDA evaluation procedures [2] and most of the material was determined to be unsuitable for disposal at the Port Gardner open-water site [3]. Of the 51,000 cubic yards proposed for dredging, 41,000 cubic yards were deemed unsuitable for PSDDA disposal.
2. Subsequent sediment testing was conducted between Piers 1 and 3 in January 1994 to determine the extent of contamination [2]. Surface grab samples were collected at six locations between Piers 1 and 3, but outside the areas tested under PSDDA. Grab samples were tested with bioassays only, with five of the six grab samples exceeding the State of Washington Sediment Quality Standard for the Microtox test. Cores were chemically analyzed at three locations. Although not as contaminated as the dredged material management units tested for PSDDA, two of the three locations had numerous exceedances of PSDDA SLs. The third location had no SL exceedances.
3. Due to the general contamination found in these studies, the Port decided to treat all post-industrial sediments between Piers 1 and 3 as contaminated material for disposal purposes. Additional testing was conducted on 21 cores in December 1995 to locate the contact between post-industrial sediments and native sands and to estimate the volume requiring remediation. It was determined that 131,000 cubic yards from between Piers 1 and 3 required disposal [4].
4. Stage I of the Port of Everett Marine Terminal Improvements Project includes construction of a medium-draft barge berth as part of the South Terminal facility. As part of the construction of the barge berth, the Port of Everett proposes to construct a containment dike behind which disposal of 131,000 cubic yards of contaminated sediments from between Piers 1 and 3 will occur [5]. The following summary reflects the regulatory agencies' (Corps, Department of Ecology and the Environmental Protection Agency) evaluation of the testing conducted for this disposal. This evaluation addresses only the nearshore confined disposal of contaminated sediment from between Piers 1 and 3 and does not address the suitability of sediments dredged as part of the construction of the medium-draft berth and containment dike. The suitability of those sediments for open-water disposal was addressed in a separate determination [6].

5. Elutriate testing was conducted to predict the contaminant concentrations associated with the dissolved and particulate phases of the effluent during disposal of dredged material behind the containment dike [7]. Sediment core samples were collected between Piers 1 and 3 from three dredged material management units (DMMUs 2, 3 and 8) that had failed PSDDA testing for open-water disposal. Sediment contaminant concentrations in these three areas were among the highest measured between Piers 1 and 3 during PSDDA testing. The original dredge and fill plan also included the confined disposal of sediment from the Everett Marina¹. For the elutriate test, sediments from Piers 1 and 3 and the Everett Marina were composited and tested together. Likewise, a mixture of seawater from both sites was used in the test.

A modified elutriate test, with a 24-hour settling time, was conducted [8]. Elutriate concentrations of antimony, acenaphthene, fluoranthene and phenol were elevated above that of the seawater mixture. However, none of the concentrations exceeded marine water quality criteria. Therefore, no adverse water-quality effects are predicted from the disposal operation.

6. Two mobility tests were conducted, a sequential batch leach test and a column leach test. Both leach tests were based on protocols developed by the Corps of Engineers Waterways Experiment Station [9].

Sediment samples from Piers 1 and 3 for these tests were identical to those collected for elutriate testing. However, for the mobility tests, sediments from between Piers 1 and 3 were not composited with those from the Everett Marina. Therefore, because the sediment contaminant concentrations in the sampled areas were among the highest measured during PSDDA testing, use of sediment samples from these areas represented a near worst-case scenario for mobility testing.

Freshwater for the mobility tests was collected from a groundwater monitoring well on the beach, adjacent to the proposed confined nearshore disposal site. This groundwater represented that which would be expected to flow through the fill and contribute to leaching of contaminants. Water samples collected for mobility testing were maintained in an anaerobic condition to mimic the natural state of groundwater on site.

¹ 4,300 cubic yards from the Everett Marina maintenance dredging project were found unsuitable for PSDDA open-water disposal in 1989. Samples of this material were collected for elutriate and mobility testing in anticipation of disposal in the nearshore fill. However, subsequent to elutriate testing, bulk sediment chemical testing indicated that contaminant concentrations had decreased sufficiently since 1989 to permit the material to be disposed at the Port Gardner open-water site. Further testing of the Everett Marina sediment for confined disposal was eliminated.

7. The sequential batch leach test simulates the equilibrium distribution that develops between pore water and sediment and evaluates changes in this equilibrium distribution over time with leaching of the sediment contaminants by upland groundwater. Seven cycles of freshwater leaching were conducted. Because metals were not determined to be problem chemicals to the same extent as the organics during the PSDDA evaluation, only the latter were analyzed. PAHs, phenol and dibenzofuran were detected in the leachate, with the highest leachate concentrations occurring during the second and third leach cycles. However, marine water quality criteria were not exceeded during any of the leach cycles.

8. The column leach test was conducted to simulate advective-dispersive effects on leachate quality and to demonstrate that the local equilibrium assumptions and data from the sequential batch leach test can be used to predict contaminant mobility in a nearshore confined disposal facility. The column leach test was conducted in two rounds. The first round was abandoned when air penetrated the system and rendered the testing invalid. Groundwater was re-collected and another column leach test ensued. The system remained anaerobic the second time and the test results were considered valid.

The second column leach test ran for 82 days, in which time more than fifteen porewater volumes of groundwater flowed through the column. Both inorganic and organic analyses were made on the leachate samples. The inorganic results were consistently below the marine chronic water quality criteria with three exceptions. Copper, mercury and zinc each exceeded its respective water quality criterion in a single leachate sample. The regulatory agencies regarded these as outliers and accepted the testing laboratory's explanation of laboratory contamination to explain these three occurrences [7]. The organic results included detectable concentrations in the leachate for acenaphthene, phenol and 4-methylphenol. However, no marine water quality criteria were exceeded for these organics at any time during the test.

9. The results of the mobility testing indicated that while detectable concentrations of some contaminants were found in the leachate from the Piers 1 and 3 dredged material, no marine water quality criteria were exceeded. Therefore, even direct exposure to leachate would not produce adverse biological effects. Based on these results, the regulatory agencies determined that fate and transport modeling would not be required for this project.

10. This memorandum documents the evaluation of testing conducted for the nearshore confined disposal of contaminated dredged material. The conclusions reached are based on the simulated conditions, which include a minimum 24-hour effluent retention time in the disposal facility and the maintenance of contaminated sediment in a saturated state in the nearshore fill. This evaluation does not constitute final agency approval of the project.

References:

- [1] Port of Everett, 1993, *Sampling and Analysis Plan for Piers 1 and 3, Port of Everett, Washington*, prepared by Pentec Environmental Inc., Edmonds, Washington.
- [2] Port of Everett, 1994, *Marine Terminal Sediment Studies, Volume 2 - Piers 1 & 3, Puget Sound Dredged Disposal Analysis and Sediment Management Standards Sediment Characterization*, prepared by Pentec Environmental Inc., Edmonds, Washington.
- [3] Memorandum for Record, 1994, *Determination of the Suitability of Dredged Material Tested under PSDDA Guidelines for the Port of Everett Piers 1 and 3 Maintenance Dredging Project for Disposal at the PSDDA Port Gardner Open-water Nondispersive Site*, prepared by Seattle District for the PSDDA agencies.
- [4] Port of Everett, 1996, *Dredge and Fill Plan, Marine Terminal Improvement Project, Port of Everett, Washington*, prepared by Hartman Associates Inc., Seattle, Washington.
- [5] Port of Everett, 1996, *Stage I Marine Terminal Improvements, Addendum to the Port of Everett Comprehensive Scheme of Harbor Improvements, Final Environmental Impact Statement*, Everett, Washington.
- [6] Memorandum for Record, 1996, *Determination of the Suitability of Dredged Material for the Port of Everett Stage I Marine Terminal Improvements Project for Disposal at the PSDDA Port Gardner Open-Water Nondispersive Site*, prepared by Seattle District for the PSDDA agencies.
- [7] Port of Everett, 1996, *Medium-draft Nearshore Confined Disposal Facility Pre-design Data Collection*, prepared by Aura Nova Consultants, Inc., Bothell, Washington and Pentec Environmental, Inc., Edmonds, Washington.
- [8] US Army Corps of Engineers Waterways Experiment Station, 1985, *Interim Guidance for Predicting Quality of Effluent Discharged from Confined Dredged Material Disposal Areas-Test Procedures*, EEDP-04-2: Environmental Effects of Dredging, Technical Notes.
- [9] Myers, T.E., Brannon, J.M. and Price, C.B., 1992, *Recent developments in leachate testing and evaluation*. Miscellaneous Paper D-92-2. Vicksburg, MS: U.S. Army Engineer Waterways Experiment Station.

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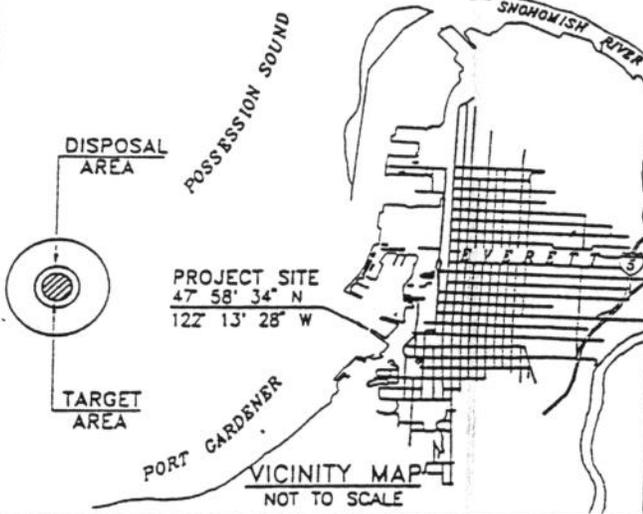
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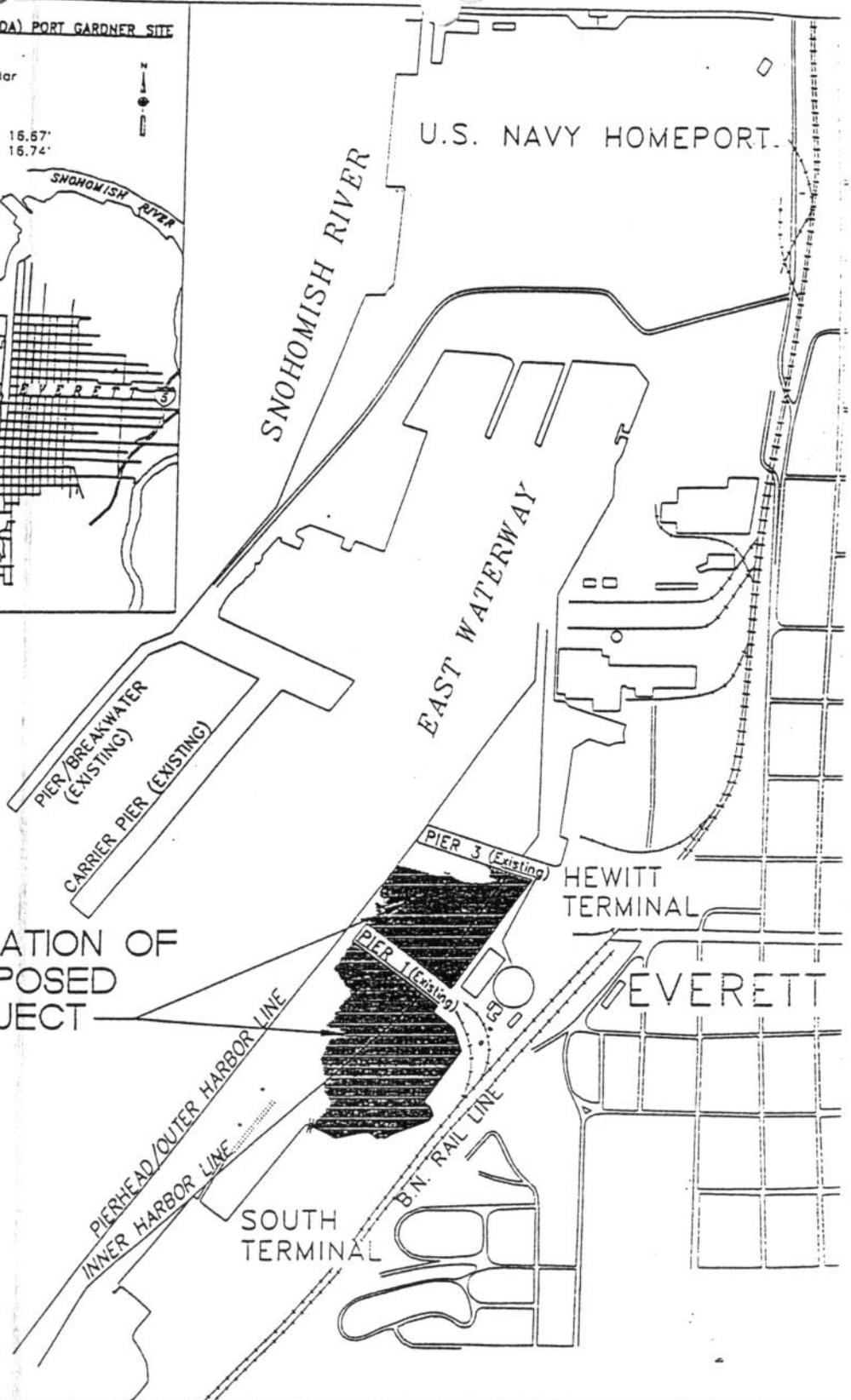
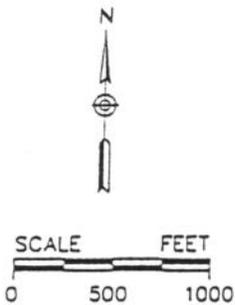
PUGET SOUND DREDGE DISPOSAL ANALYSIS (PSDDA) PORT GARDNER SITE

TYPE: Nondispersive
 AREA: 318 Acres DEPTH: 420 ft.
 SITE DIMENSIONS: 4200 ft. by 4200 ft. circular
 DISPOSAL ZONE: 1800 ft. Diameter
 TARGET AREA: 1200 ft. Diameter
 BARGE POSITIONING METHOD: GPS
 NAD 27 LOCATION: Lat 47° 58.86' Long 122° 16.67'
 NAD 83 LOCATION: Lat 47° 58.85' Long 122° 16.74'



PORT GARDNER

LOCATION OF PROPOSED PROJECT



PURPOSE: Modernize & Upgrade Existing Port Facilities & Construct New Berth Facility

- DATUM: MLLW = 0.0' N.O.S.
 ADJACENT PROPERTY OWNERS:
1. City of Everett (South)
 2. Scott Paper Co. (North)
 3. Burlington Northern RR (East)
 4. State DNR (West)

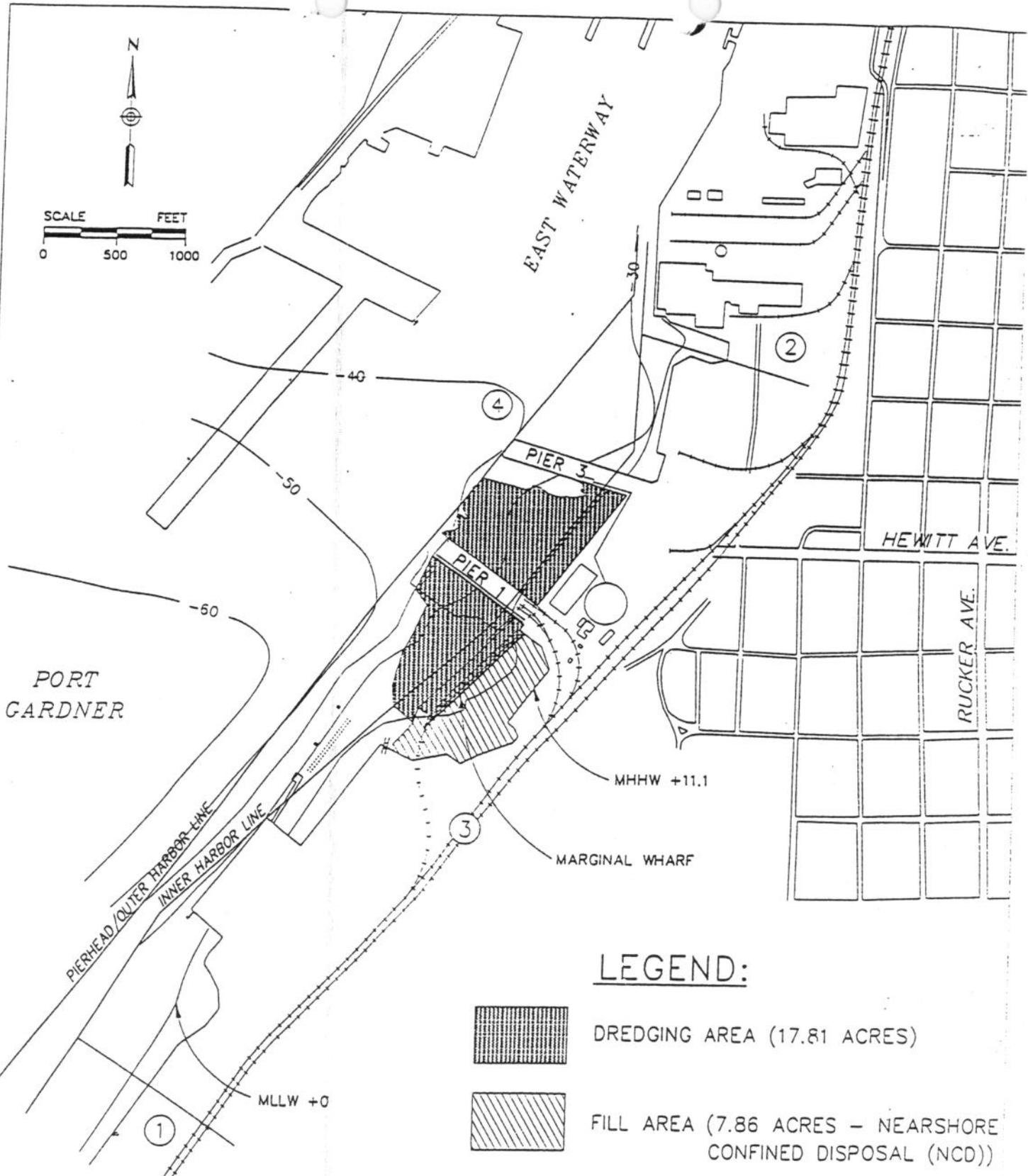
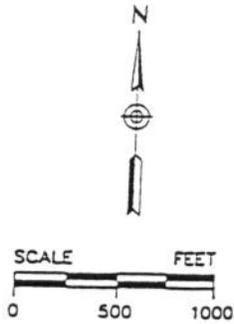
LOCATION AND VICINITY MAP

REF: 96-2-00815

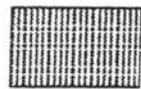
STAGE 1 MARINE TERMINAL IMPROVEMENTS

IN: Port Gardner AT: Everett
 COUNTY OF: Snohomish STATE: WA
 APPLICATION BY: Port of Everett
 SHEET: 1 of 12 DATE: 7/29/96

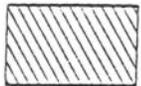
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LEGEND:



DREDGING AREA (17.81 ACRES)



FILL AREA (7.86 ACRES - NEARSHORE CONFINED DISPOSAL (NCD))

PURPOSE: Modernize & Upgrade Existing Port Facilities & Construct New Berth Facility

DATUM: MLLW = 0.0' N.O.S.
ADJACENT PROPERTY OWNERS:

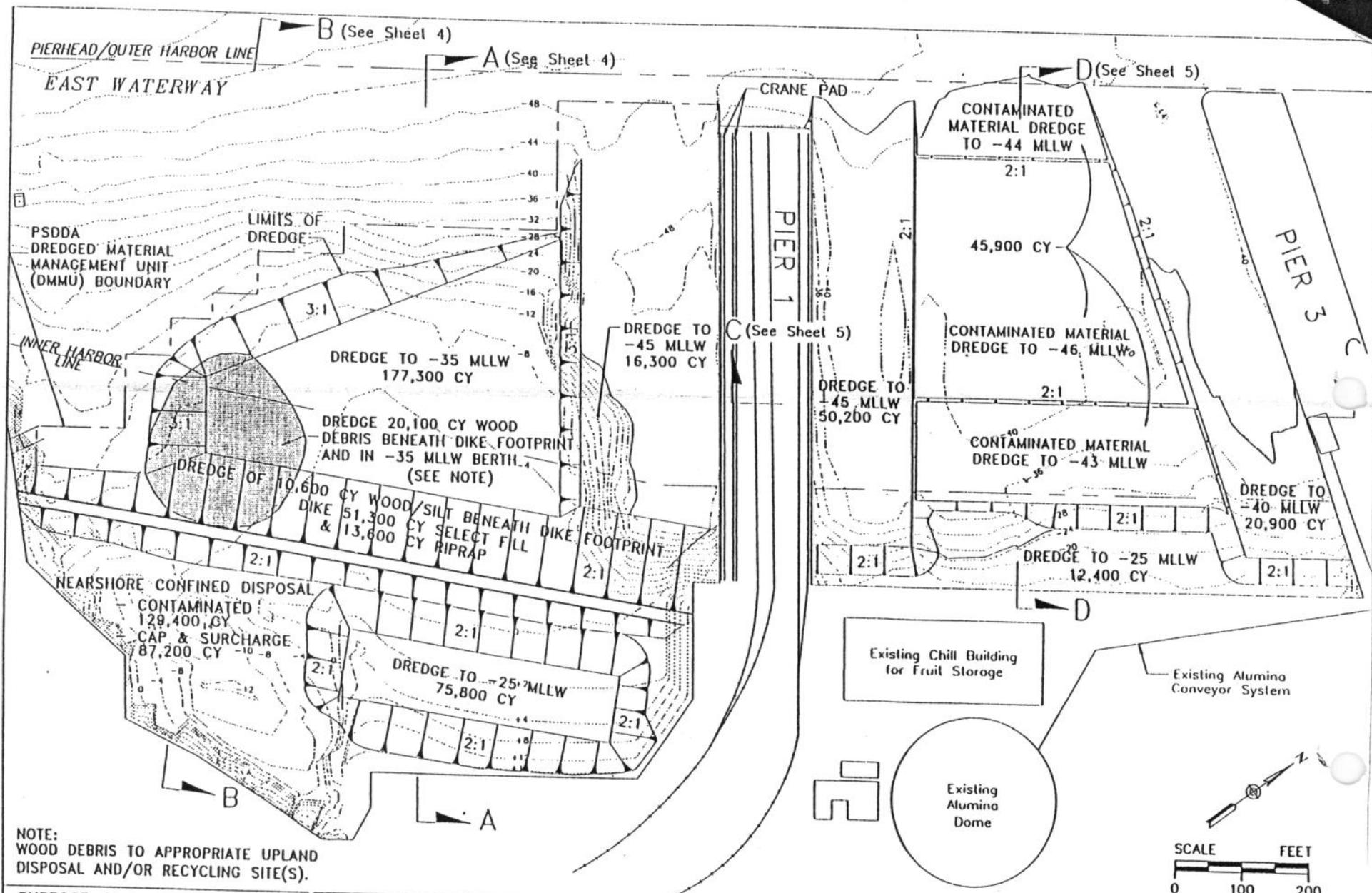
1. City of Everett (South)
2. Scott Paper Co. (North)
3. Burlington Northern RR (East)
4. State DNR (West)

PLAN VIEW

REF: 96-2-00815

STAGE 1 MARINE TERMINAL IMPROVEMENTS

IN: Port Gardner AT: Everett
 COUNTY OF: Snohomish STATE: WA
 APPLICATION BY: Port of Everett
 SHEET: 2 of 12 DATE: 7/29/96



NOTE:
WOOD DEBRIS TO APPROPRIATE UPLAND
DISPOSAL AND/OR RECYCLING SITE(S).

PURPOSE: Modernize & Upgrade Existing Port
Facilities & Construct New Berth Facility

DATUM: MLLW = 0.0' N.O.S.

- ADJACENT PROPERTY OWNERS:
1. City of Everett (South)
 2. Scott Paper Co. (North)
 3. Burlington Northern RR (East)
 4. State DNR (West)

DREDGING PLAN

REF: 96-2-00815

STAGE 1 MARINE TERMINAL IMPROVEMENTS

IN: Port Gardner AT: Everett
 COUNTY OF: Snohomish STATE: WA
 APPLICATION BY: Port of Everett
 SHEET: 3 of 12 DATE: 7/29/96