**CENWS-OD-TS-DMMO**

**MEMORANDUM FOR: RECORD** **November 12, 2008**

**SUBJECT**: DMMP DETERMINATION ON THE SEDIMENT QUALITY OF THE EXPOSED SEDIMENT SURFACE AFTER DREDGING TO VERIFY COMPLIANCE WITH THE WASHINGTON STATE ANTIDEGRADATION POLICY FOR THE GRAYS HARBOR PUBLIC DEVELOPMENT AUTHORITY, SATSOP BARGE UNLOADING FACILITY, GRAYS HARBOR, WASHINGTON (NWS-2008-00670-SO).

1. **Introduction**. This memorandum reflects the consensus determination of the Dredged Material Management Program (DMMP) agencies (U.S. Army Corps of Engineers, Washington Departments of Ecology and Natural Resources, and the Environmental Protection Agency) regarding the quality of the sediment surface remaining after dredging the Barge Unloading Facility at the Chehalis River, which is owned and operated by the Satsop Development Park. The project area is on the southern bank of the Chehalis River at approximately River Mile 14.9, which is tidally influenced at the project site (Figure 1). This project involves maintenance dredging 7,000 cy of material from an existing barge slip and access channel. The dredged material will be trucked to an upland disposal site. Because this project does not involve in-water disposal, only a permit issued pursuant to Section 10 of the Rivers and Harbors Act is required from the Corps of Engineers.

2. **Background**. The barge slip site was originally constructed in the early 1980s to offload transformer and reactor components used in the Satsop nuclear power plant development. Components were brought by sea through Grays Harbor and up the Chehalis River. No nuclear components were ever transported through the barge slip facility. Prior to development of the barge slip, the area was cropland that extended to the bank of the river. No other development was historically present at the site or in the immediate project vicinity. Current and past land uses both upstream and downstream of the project site are mainly agricultural, composed of pasture lands and croplands near the project site. Maintenance dredging of the barge slip and debris removal in the navigation channel was last conducted in 1994, when the barge facility was used to remove equipment from the power facility. No sediment sampling was completed as part of the previous maintenance dredging project.

**Table 1. Project Summary**

| | |
|---|---|
| Proposed dredging volume | 7,000 cubic yards |
| Proposed disposal site | Upland; no return water |
| Project ranking | Low moderate |
| SAP received | August 13, 2008 |
| SAP approved | August 28, 2008 |
| Sampling dates | September 2, 2008 |
| Data report submitted | November 5, 2008 |
| DAIS Tracking number | GHPDA-1-A-F-262 |
| USACE Permit Application Number | NWS-2008-00670-SO |
| Recency Determination (LM rank = 5-7 yrs) | September 2013 – September 2015 |

3. **Project Sampling**. Core samples were collected using a telescoping auger with a three-inch mud bucket. Samples were collected from three locations (Figure 2) per the approved SAP. Samples of the proposed dredge material were composited from the three locations and submitted for one analysis. One sample of the post-dredge surface (Z-layer) was also submitted for analysis.

4. **Chemical Analysis**. Two samples—one composite of the proposed dredge material, and one of the Z-layer—were analyzed at Analytical Resources, Inc. for the DMMP Chemicals of Concern for the Grays Harbor area, with the exception of TBT, volatile organic compounds (VOAs) and guaiacols. There were no exceedances of any CoCs in either of the samples, and most chemicals were not even detected. Chemical results are compared with DMMP criteria in Table 2 and with SMS criteria in Table 3.

5. **Sediment Evaluation**. No suitability determination is required for the proposed dredged material to be disposed at the upland facility. Chemical results do not indicate that there will be a deterioration of sediment quality due to exposure of the post-dredge surface subsequent to dredging. The DMMP has thus verified that the project as proposed will be in compliance with the State of Washington anti-degradation policy.

**Table 2. Chemical results compared with DMMP criteria [1]**

| Chemical | SL | BT | ML | Dredge Material | | Z Layer | |
|---|---|---|---|---|---|---|---|
| **GRAIN SIZE** | | | | | | | |
| % Gravel | --- | --- | --- | 0.2 | | 9.4 | |
| % Sand | --- | --- | --- | 11.4 | | 42.7 | |
| % Silt | --- | --- | --- | 59.5 | | 38.2 | |
| % Clay | --- | --- | --- | 15.3 | | 9.6 | |
| % Fines (clay+silt) | --- | --- | --- | 74.8 | | 47.8 | |
| **CONVENTIONALS** | | | | | | | |
| Total Solids, % | --- | --- | --- | 56 | | 56.7 | |
| Total Volatile Solids, % | --- | --- | --- | 6.1 | | 5.68 | |
| Total Organic Carbon, % | --- | --- | --- | 1.46 | | 1.39 | |
| Total Sulfides, mg/kg | --- | --- | --- | 26.3 | | 20.6 | |
| Total Ammonia, mg/kg | --- | --- | --- | 184 | | 110 | |
| **METALS** (mg/kg) | | | | | | | |
| Antimony | 150 | --- | 200 | 8 | U | 20 | U |
| Arsenic | 57 | 507.1 | 700 | 8 | U | 20 | U |
| Cadmium | 5.1 | 11.3 | 14 | 0.3 | U | 0.7 | U |
| Chromium | --- | 267 | --- | 33.6 | | 35 | |
| Copper | 390 | 1027 | 1,300 | 61.2 | | 66.3 | |
| Lead | 450 | 975 | 1,200 | 6 | | 7 | U |
| Mercury | 0.41 | 1.5 | 2.3 | 0.06 | U | 0.07 | U |
| Nickel | 140 | 370 | 370 | 28 | | 32 | |
| Selenium | --- | 3 | --- | 0.8 | U | 0.7 | U |
| Silver | 6.1 | 6.1 | 8.4 | 0.5 | U | 1 | U |
| Zinc | 410 | 2783 | 3,800 | 89 | | 98 | |

| Chemical | SL | BT | ML | Dredge Material | | Z Layer | |
|---|---|---|---|---|---|---|---|
| **ORGANICS** (µg/kg) | | | | | | | |
| Acenaphthylene | 560 | --- | 1,300 | 20 | U | 20 | U |
| Acenaphthene | 500 | --- | 2,000 | 20 | U | 20 | U |
| Anthracene | 960 | --- | 13,000 | 20 | U | 20 | U |
| Fluorene | 540 | --- | 3,600 | 20 | U | 20 | U |
| Naphthalene | 2,100 | --- | 2,400 | 20 | U | 20 | U |
| Phenanthrene | 1,500 | --- | 21,000 | 10 | J | 11 | J |
| 2-Methylnaphthalene | 670 | --- | 1,900 | 20 | U | 20 | U |
| Total LPAHs [2] | 5,200 | --- | 29,000 | 10 | J | 11 | J |
| Benzo(a)anthracene | 1,300 | --- | 5,100 | 20 | U | 20 | U |
| Benzo(a)pyrene | 1,600 | --- | 3,600 | 20 | U | 20 | U |
| Total Benzofluoranthenes (b+k+j) | 3,200 | --- | 9,900 | 20 | U | 20 | U |
| Benzo(g,h,i)perylene | 670 | --- | 3,200 | 20 | U | 20 | U |
| Chrysene | 1,400 | --- | 21,000 | 20 | | 20 | U |
| Dibenzo(a,h)anthracene | 230 | --- | 1,900 | 20 | U | 20 | U |
| Fluoranthene | 1,700 | 4,600 | 30,000 | 30 | | 17 | J |
| Indeno(1,2,3-c,d)pyrene | 600 | --- | 4,400 | 20 | U | 20 | U |
| Pyrene | 2,600 | 11,980 | 16,000 | 27 | | 14 | J |
| Total HPAHs [3] | 12,000 | --- | 69,000 | 57 | | 31 | J |
| **CHLORINATED HYDROCARBONS** (µg/kg) | | | | | | | |
| Hexachlorobenzene | 22 | 168 | 230 | 20 | U | 20 | U |
| Hexachlorobutadiene | 29 | --- | 270 | 20 | U | 20 | U |
| 1,2-Dichlorobenzene | 35 | --- | 110 | 20 | U | 20 | U |
| 1,3-Dichlorobenzene | 170 | --- | --- | 20 | U | 20 | U |
| 1,4-Dichlorobenzene | 110 | --- | 120 | 20 | U | 20 | U |
| 1,2,4-Trichlorobenzene | 31 | --- | 64 | 20 | U | 20 | U |
| **PHTHALATES** (µg/kg) | | | | | | | |
| Diethyl phthalate | 200 | --- | 1,200 | 20 | U | 18 | J |
| Dimethyl phthalate | 71 | --- | 1,400 | 20 | U | 20 | U |
| Di-n-butyl phthalate | 1,400 | --- | 5,100 | 20 | U | 20 | U |
| Butyl benzyl phthalate | 63 | --- | 970 | 20 | U | 20 | U |
| Bis(2-ethylhexyl) phthalate | 1,300 | --- | 8,300 | 20 | U | 32 | |
| Di-n-octyl phthalate | 6,200 | --- | 6,200 | 20 | U | 20 | U |
| **PHENOLS** (µg/kg) | | | | | | | |
| Pentachlorophenol | 400 | 504 | 690 | 99 | U | 100 | U |
| Phenol | 420 | --- | 1,200 | 20 | U | 20 | U |
| 2 Methylphenol | 63 | --- | 77 | 20 | U | 20 | U |
| 4 Methylphenol | 670 | --- | 3,600 | 20 | U | 20 | U |
| 2,4-Dimethylphenol | 29 | --- | 210 | 20 | U | 20 | U |
| **MISCELLANEOUS EXTRACTABLES** (µg/kg) | | | | | | | |
| Benzoic acid | 650 | --- | 760 | 200 | U | 200 | U |
| Benzyl alcohol | 57 | --- | 870 | 20 | U | 20 | U |

| Chemical | SL | BT | ML | Dredge Material | | Z Layer | |
|---|---|---|---|---|---|---|---|
| Dibenzofuran | 540 | --- | 1,700 | 20 | U | 20 | U |
| Hexachloroethane | 1,400 | --- | 14,000 | 20 | U | 20 | U |
| N-Nitrosodiohenylamine | 28 | --- | 130 | 20 | U | 20 | U |
| **VOLATILE ORGANICS** (µg/kg) | | | | | | | |
| Ethylbenzene | 10 | --- | 50 | --- | | --- | |
| Tetrachloroethene | 57 | --- | 210 | --- | | --- | |
| Trichloroethene | 160 | --- | 1,600 | --- | | --- | |
| Total Xylene (sum of o-,m-,p-) | 40 | --- | 160 | --- | | --- | |
| **PESTICIDES** (µg/kg) | | | | | | | |
| Aldrin | 10 | --- | --- | 0.98 | U | 0.98 | U |
| Chlordane | 10 | 37 | --- | 0.98 | U | 0.98 | U |
| DDD | | | | 2 | U | 2 | U |
| DDE | | | | 2 | U | 2 | U |
| DDT | | | | 2 | U | 2 | U |
| Total DDT | 6.9 | 50 | 69 | 2 | U | 2 | U |
| Dieldrin | 10 | --- | --- | 2 | U | 2 | U |
| Heptachlor | 10 | --- | --- | 0.98 | U | 0.98 | U |
| Lindane | 10 | --- | --- | 0.98 | U | 0.98 | U |
| **PCBs** (µg/kg) | | | | | | | |
| Aroclor 1016 | | | | 20 | U | 20 | U |
| Aroclor 1221 | | | | 20 | U | 20 | U |
| Aroclor 1232 | | | | 20 | U | 20 | U |
| Aroclor 1242 | | | | 20 | U | 20 | U |
| Aroclor 1248 | | | | 20 | U | 20 | U |
| Aroclor 1254 | | | | 20 | U | 20 | U |
| Aroclor 1260 | | | | 20 | U | 20 | U |
| Total PCBs | 130 | | 3,100 | 20 | U | 20 | U |

Notes for Tables:

[1] Dredged Material Management Program (DMMP) Criteria Guideline Chemistry Values updated July 2008; ScreeningLevel (SL), Bioaccumulation Trigger (BT), and Maximum Level (ML).

[2] Total LPAHs = The sum of Acenaphthylene, Acenaphthene, Anthracene, Fluorene, Napthalene and Phenanthrene.

[3] Total HPAHs = The sum of Benzo(a)anthracene, Benzo(a) pyrene, Total Benzofluoranthenes, Benzo(g,h,i)perylene, Chrysene, Dibenzo(a,h)anthracene, Fluoranthene, Indeno(1,2,3-c,d)pyrene and Pyrene.

-- = Not available or not applicable

J Estimated concentration when the value is less than ARI's established reporting limits

U Indicates that the target analyte was not detected at the reported concentration

**Table 3. Chemical results compared with SMS criteria**

| Chemical | SQS | CSL | Dredge Material | | Z Layer | |
|---|---|---|---|---|---|---|
| **GRAIN SIZE** | | | | | | |
| % Gravel | --- | --- | 0.2 | | 9.4 | |
| % Sand | --- | --- | 11.4 | | 42.7 | |
| % Silt | --- | --- | 59.5 | | 38.2 | |
| % Clay | --- | --- | 15.3 | | 9.6 | |
| % Fines (clay+silt) | --- | --- | 74.8 | | 47.8 | |
| **CONVENTIONALS** | | | | | | |
| Total Solids, % | --- | --- | 56 | | 56.7 | |
| Total Volatile Solids, % | --- | --- | 6.1 | | 5.68 | |
| Total Organic Carbon, % | --- | --- | 1.46 | | 1.39 | |
| Total Sulfides, mg/kg | --- | --- | 26.3 | | 20.6 | |
| Total Ammonia, mg/kg | --- | --- | 184 | | 110 | |
| **METALS** (mg/kg dry wt.) | | | | | | |
| Antimony | --- | --- | 8 | U | 20 | U |
| Arsenic | 57 | 93 | 8 | U | 20 | U |
| Cadmium | 5.1 | 6.7 | 0.3 | U | 0.7 | U |
| Chromium | 260 | 270 | 33.6 | | 35 | |
| Copper | 390 | 390 | 61.2 | | 66.3 | |
| Lead | 450 | 530 | 6 | | 7 | U |
| Mercury | 0.41 | 0.59 | 0.06 | U | 0.07 | U |
| Nickel | --- | --- | 28 | | 32 | |
| Selenium | --- | --- | 0.8 | U | 0.7 | U |
| Silver | 6.1 | 6.1 | 0.5 | U | 1 | U |
| Zinc | 410 | 960 | 89 | | 98 | |
| **ORGANICS** (mg/kg OC) | | | | | | |
| Acenaphthylene | 66 | 66 | 1.4 | U | 1.4 | U |
| Acenaphthene | 16 | 57 | 1.4 | U | 1.4 | U |
| Anthracene | 220 | 1,200 | 1.4 | U | 1.4 | U |
| Fluorene | 23 | 79 | 1.4 | U | 1.4 | U |
| Naphthalene | 99 | 170 | 1.4 | U | 1.4 | U |
| Phenanthrene | 100 | 480 | 0.7 | J | 0.8 | J |
| 2-Methylnaphthalene | 38 | 64 | 1.4 | U | 1.4 | U |
| Total LPAHs [2] | 370 | 780 | 0.7 | J | 0.8 | J |
| Benzo(a)anthracene | 110 | 270 | 1.4 | U | 1.4 | U |
| Benzo(a)pyrene | 99 | 210 | 1.4 | U | 1.4 | U |
| Total Benzofluoranthenes6 | 230 | 450 | 1.4 | U | 1.4 | U |
| Benzo(g,h,i)perylene | 31 | 78 | 1.4 | U | 1.4 | U |
| Chrysene | 110 | 460 | 1.4 | | 1.4 | U |
| Dibenzo(a,h)anthracene | 12 | 33 | 1.4 | U | 1.4 | U |
| Fluoranthene | 160 | 1,200 | 2.1 | | 1.2 | J |

| Chemical | SQS | CSL | Dredge Material | | Z Layer | |
|---|---|---|---|---|---|---|
| Indeno(1,2,3-c,d)pyrene | 34 | 88 | 1.4 | U | 1.4 | U |
| Pyrene | 1,000 | 1,400 | 1.8 | | 1.0 | J |
| Total HPAHS | 960 | 5,300 | 5.3 | | 2.2 | J |
| **CHLORINATED HYDROCARBONS** (mg/kg OC) | | | | | | |
| Hexachlorobenzene | 0.38 | 2.3 | 1.4 | U | 1.4 | U |
| Hexachlorobutadiene | 3.9 | 6.2 | 1.4 | U | 1.4 | U |
| 1,2-Dichlorobenzene | 2.3 | 2.3 | 1.4 | U | 1.4 | U |
| 1,3-Dichlorobenzene | -- | --- | -- | -- | -- | -- |
| 1,4-Dichlorobenzene | 3.1 | 9 | 1.4 | U | 1.4 | U |
| 1,2,4-Trichlorobenzene | 0.81 | 1.8 | 1.4 | U | 1.4 | U |
| **PHTHALATES** (mg/kg OC) | | | | | | |
| Diethyl phthalate | 61 | 110 | 1.4 | U | 1.3 | J |
| Dimethyl phthalate | 53 | 53 | 1.4 | U | 1.4 | U |
| Di-n-butyl phthalate | 220 | 1,700 | 1.4 | U | 1.4 | U |
| Butyl benzyl phthalate | 4.9 | 64 | 1.4 | U | 1.4 | U |
| Bis(2-ethylhexyl) phthalate | 47 | 78 | 1.4 | U | 2.3 | |
| Di-n-octyl phthalate | 58 | 4,500 | 1.4 | U | 1.4 | U |
| **PHENOLS** (µg/kg dry wt.) | | | | | | |
| Pentachlorophenol | 360 | 690 | 99 | U | 100 | U |
| Phenol | 420 | 1,200 | 20 | U | 20 | U |
| 2 Methylphenol | 63 | 63 | 20 | U | 20 | U |
| 4 Methylphenol | 670 | 670 | 20 | U | 20 | U |
| 2,4-Dimethylphenol | 29 | 29 | 20 | U | 20 | U |
| **MISCELLANEOUS EXTRACTABLES** | | | | | | |
| Benzoic acid (µg/kg dry wt.) | 650 | 650 | 200 | U | 200 | U |
| Benzyl alcohol (µg/kg dry wt) | 57 | 73 | 20 | U | 20 | U |
| Dibenzofuran (mg/kg OC) | 15 | 58 | 1.4 | U | 1.4 | U |
| Hexachloroethane (mg/kg OC) | -- | -- | -- | -- | -- | -- |
| N-Nitrosodiohenylamine (mg/kg OC) | 11 | 11 | 1.4 | U | 1.4 | U |
| **PCBs** (mg/kg OC) | | | | | | |
| Aroclor 1016 | -- | -- | 1.4 | U | 1.4 | U |
| Aroclor 1221 | -- | -- | 1.4 | U | 1.4 | U |
| Aroclor 1232 | -- | -- | 1.4 | U | 1.4 | U |
| Aroclor 1242 | -- | -- | 1.4 | U | 1.4 | U |
| Aroclor 1248 | -- | -- | 1.4 | U | 1.4 | U |
| Aroclor 1254 | -- | -- | 1.4 | U | 1.4 | U |
| Aroclor 1260 | -- | -- | 1.4 | U | 1.4 | U |
| Total PCBs (mg/kg OC) | 12 | 65 | 1.4 | U | 1.4 | U |

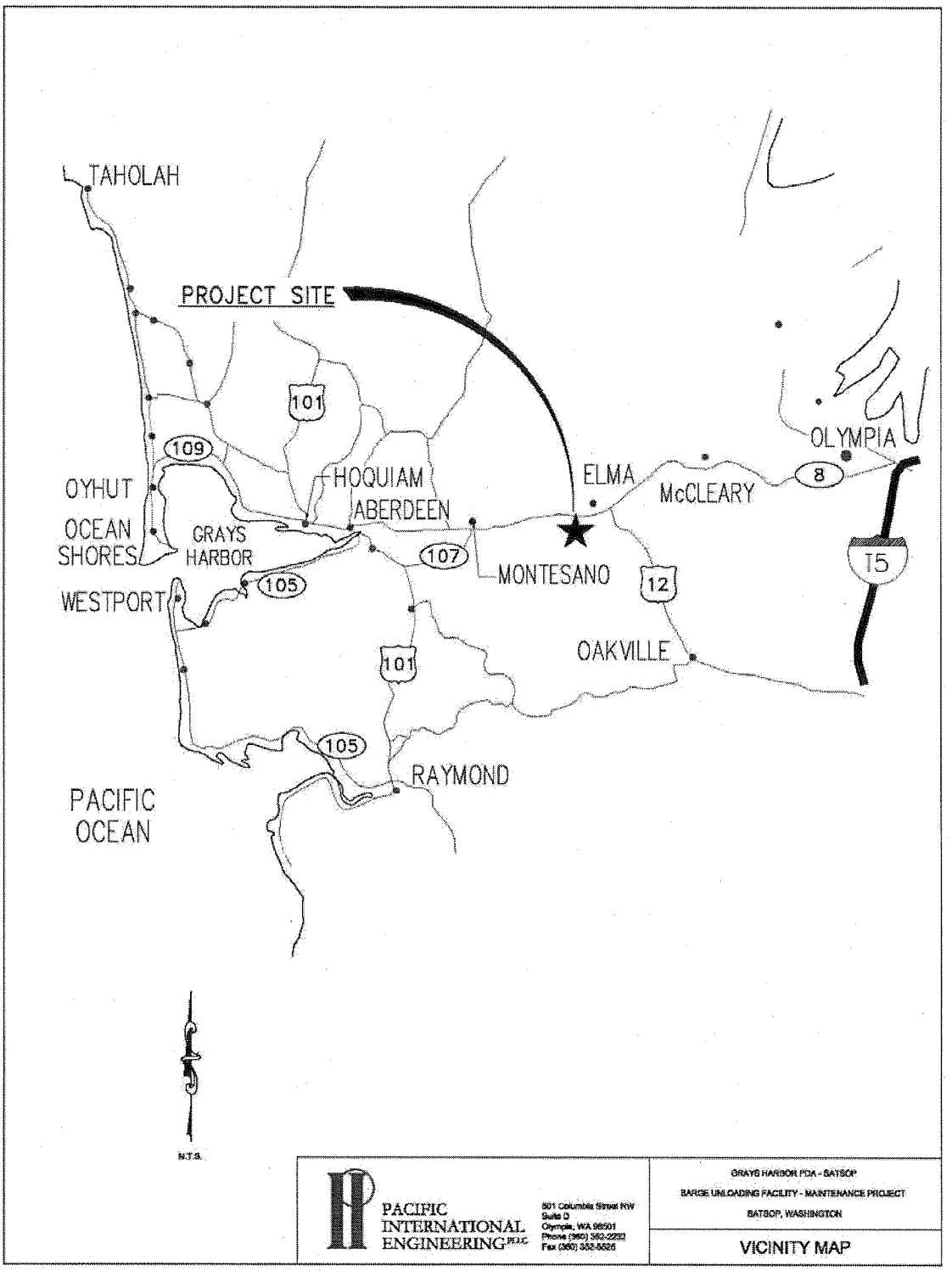


**Figure 1. Project vicinity map**

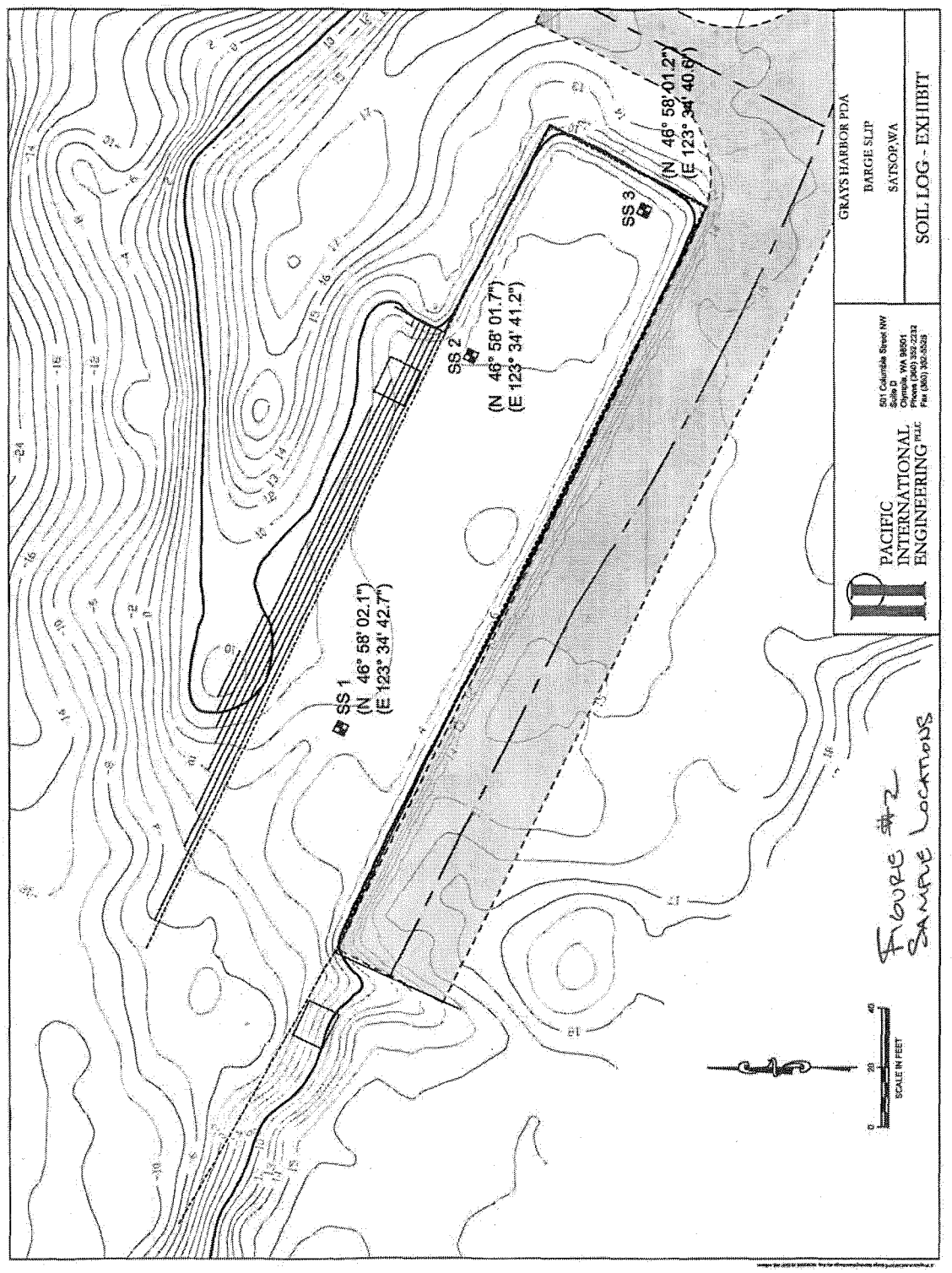


**Figure 2. Project area and sample locations**

Concur:

12/9/08
Date

Lauran Cole Warner, Seattle District Corps of Engineers

12/8/2008
Date

Erika Hoffman, Environmental Protection Agency

Dec 8, 2008
Date

Laura Inouye, Washington Department of Ecology

8-Dec-08
Date

Courtney Wasson, Washington Department of Natural Resources

Copies furnished:

DMMP Signatories
Jim Green, Corps
Eric Russell, Russell and Associates
Mike Daniels, PIE
DMMO file