UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10

IN THE MATTER OF: HYLEBOS WATERWAY OF THE COMMENCEMENT BAY NEARSHORE/TIDEFLATS SUPERFUND SITE OCC TACOMA, INC. RESPONDENT. Proceeding Under Sections 106(a), 122(a),and 122(d)(3) of the Comprehensive Environmental Response, Compensation, and Liability Act as amended, 42 U.S.C §§ 9606(a), 9622(a), 9622(d)(3)).	U.S. EPA Docket No. 10-97-0011-CERCLA ADMINISTRATIVE ORDER ON CONSENT FOR REMOVAL ACTIVITIES EMBANKMENT AND AREA 5106

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I. INTRODUCTION

1. This Administrative Order on Consent (Order) is entered into voluntarily by the United States Environmental Protection Agency (EPA) and OCC Tacoma, Inc., (Respondent), a Delaware corporation and a wholly-owned subsidiary of Occidental Chemical Corporation, and OCC Tacoma's, successors and assigns. The Order concerns the preparation and performance of removal actions by Respondent and reimbursement of oversight costs. The actions to be performed by Respondent under this Order involve certain real property previously owned by Respondent located at 605 Alexander Avenue, Tacoma, Washington, (the Property), and certain adjoining property upon which releases of hazardous substances from the Property have come to be located (collectively, the Site). The Site is located within the Sediments Operable Unit (OU1) of the Commencement Bay/Nearshore Tideflats (CB/NT) Superfund Site, within the Mouth of the Hylebos Waterway problem area.

This Order requires the Respondent to conduct removal actions described herein to abate an imminent and substantial endangerment to the public health, welfare, or the environment that may be presented by the actual or threatened releases of hazardous substances at or from the Site.

II. JURISDICTION

2. This Order is issued under the authority vested in the President of the United States by Sections 106(a) and 122(a) of the Comprehensive Environmental Response, Compensation, and Liability

Act (CERCLA), as amended, 42 U.S.C. §§ 9606(a) and 9622(a). This authority was delegated to the Administrator of EPA on January 23, 1987, by Executive Order 12580, 52 Fed. Reg. 2926 (1987); further delegated to the EPA Regional Administrators on September 13, 1987, by EPA Delegation Nos. 14-14-A and 14-14B; and redelegated to Cleanup Unit Managers by Regional Redelegation Order R10 14-14-A and 14-14-B on March 25, 1996.

3. Respondent agrees to undertake all removal response actions required by the terms and conditions of this Order. In any action by EPA or the United States to enforce the terms of this Order, Respondent consents to, and agrees not to contest, the authority or jurisdiction of EPA to issue or enforce this Order, and agrees not to contest the validity of this Order or its terms.

III. PARTIES BOUND

4. This Order shall apply to and be binding upon EPA and Respondent, its directors, officers, employees, agents, successors and assigns. The signatory to this Order certifies that he/she is authorized to execute and legally bind Respondent to this Order. Changes in ownership or in corporate or other legal status, including, but not limited to, any transfer of assets or real or personal property, including the transfer of any portion of the Site owned by Respondent, or business organization, shall in no way alter Respondent's duties under this Order.

5. Respondent shall provide a copy of this Order to any subsequent owners or successors in interest of Respondent before any

controlling ownership rights, stock or assets in a corporate acquisition are transferred, if such transfer occurs before the completion of the removal actions required by this Order. Respondent shall notify EPA at least thirty (30) days prior to any such corporate transfer. Respondent shall provide a copy of this Order to all contractors, subcontractors, laboratories, and consultants retained to perform any work under this Order, within fourteen (14) days after the effective date of this Order, or the date such services are retained, whichever is later, and shall condition all contracts entered into hereunder to performance of the work in conformity with the terms of this Order. Any reference herein to the Order shall mean the Order, all Appendices thereto, any future modifications as provided by the terms of the Order as may be added hereafter, and any work plans, reports, plans, specifications, schedules, and appendices required by this Order which, upon approval of EPA, shall be incorporated into and enforceable under the Order. Notwithstanding the terms of any contract, Respondent is responsible for compliance with this Order and for ensuring that its parent company, subsidiaries, employees, contractors, consultants, subcontractors, agents, and attorneys comply with this Order.

IV. STATEMENT OF PURPOSE

6. In entering into this Order, the objectives of EPA and Respondent are: (a) to perform removal actions described herein to protect public health, welfare, or the environment, which removal actions are more specifically set forth in Section VIII, below, and

in the Scope of Work for the Embankment Area Removal Action (SOW), attached as Appendix 1 to this Order and by this reference is incorporated in and made a part of this Order, and the Area 5106 Sediment Engineering Evaluation/Cost Analysis (EE/CA) Work Plan (Work Plan), attached as Appendix 2 to this Order and by this reference is incorporated in and made a part of this Order; (b) to the extent practicable, perform such removal actions to contribute to the efficient performance of long-term remedial action of the Hylebos Waterway; and (c) provide for recovery by EPA of its response and oversight costs incurred with respect to the implementation of the removal actions and this Order. This Order does not require Respondent to implement any Removal Action Alternative for Area 5106, as defined in the Final EE/CA Report for Area 5106.

7. By entering into this Order, Respondent makes no admission of fact or liability nor does it waive any right, claim, remedy, appeal, cause of action, or defense, except as specifically described herein.

V. EPA'S FINDINGS OF FACT

The following paragraphs summarize the factual findings made by EPA in support of the Conclusions of Law and Determinations in this Order. Respondent neither admits nor denies the Introduction's statements, the EPA Findings of Fact or the EPA Conclusions of Law and Determinations, and reserves its rights to contest them, except in proceedings under this Order and as provided in Paragraphs 3 and 87.

8. The Hylebos Waterway is within the boundaries of the CB/NT

Superfund Site. The CB/NT Superfund Site is located in Tacoma, Washington, at the southern end of the main basin of Puget Sound. The Mouth of the Hylebos Waterway and Head of the Hylebos Waterway are two of eight problem areas that have been designated as Operable Unit One (OU1) of the CB/NT Superfund Site.

9. On September 8, 1983, EPA placed the CB/NT Site on the National Priorities List pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605.

10. Under a Cooperative Agreement with EPA, the Washington Department of Ecology (Ecology) conducted a Remedial Investigation and Feasibility Study (RI/FS) of the CB/NT Site. Within the Tideflats area of the CB/NT Site, the RI/FS evaluated the nature and extent of contamination in the Sitcum, Blair, Milwaukee, Hylebos, St. Paul, Middle, Thea Foss (formerly known as City), and Wheeler-Osgood Waterways. The final RI/FS was made available for public comment in February 1989.

11. Several chemicals were detected in the Mouth of the Hylebos Waterway sediments, including, but not limited to, polychlorinated biphenyls (PCBs), hexachlorobenzene, trichloroethane, tetrachloroethane, 1,2-dichlorobenzene, 1,3-dichlorobenzene, hexachlorobutadiene, and lead, which in certain forms are known to be toxic to humans and marine life and are designated as hazardous substances under Section 102(a) of CERCLA, as reported at 40 CFR Part 302.4.

12. The RI/FS evaluated chemicals detected at the CB/NT Superfund Site to identify those that pose the greatest risk to human

health and the environment. The technical approach was to establish information relating specific chemicals to biological effects in various aquatic organisms and to quantifiable human health risks. Problem chemicals were defined as those chemicals whose concentration exceeded the low apparent effects threshold (AET) in a particular problem area. The AET was defined as the chemical concentration above which toxicity or benthic effects are always observed in a data set developed specifically for the Puget Sound using three biological effects tests: amphipod mortality, oyster larvae abnormality, and benthic infaunal depressions. Sediment Quality Objectives (SQOs) were developed as the cleanup standards for the CB/NT site based on the low AET values for chemicals other than PCBs, and based on the human health risk assessment and levels found in Puget Sound reference areas for PCBs.

13. On September 29, 1989, EPA issued a Record of Decision (ROD) that selected the remedy for remediation of sediments for OU1 and sources of contamination (Operable Unit 05) in the Commencement Bay Nearshore/Tideflats (CB/NT) Superfund Site, including the Head and Mouth of the Hylebos Waterway. PCBs and hexachlorobenzene, which were among the chemicals detected at the Mouth of the Hylebos Waterway at levels exceeding the SQOs, were selected as chemical indicators of biological effects and human health risks at the Mouth of the Hylebos Waterway because these chemicals were found at the highest concentrations relative to SQOs over the greatest area. The ROD also determined that natural recovery will not sufficiently reduce contaminant concentrations in some areas of the Mouth of the Hylebos

Waterway within the ten (10) year period, so the ROD required active sediment cleanup with one (1) of the four (4) technology options as a component of the remedy.

14. Respondent, along with five other companies or entities, is performing pre-remedial design activities pursuant to the ROD on the Hylebos Waterway under an Administrative Order on Consent, dated November 25, 1993. Respondent is also performing corrective action on volatile organic compounds in groundwater underlying the Property and certain adjoining property pursuant to Part V of its RCRA permit (No. WAD 009242314).

15. An investigation into the bank area of the Property and the adjacent PRI Northwest property, between +18 feet mean lower low water level (MLLW) and 0 feet MLLW, found concentrations of contaminants significantly above the SQOS. 4.4' DDE, a pesticide, was detected as high as 23000 ug/kg, which is 1438 times the SQO. 4,4' DDE, and 4,4' DDT were also detected at levels as high as 856 and 647 times the SQO respectively. PCBs were detected as high as 22,300 ug/kg, which is approximately 50 times the SQO, and lead as high as 150,000 mg/kg, which is 333 times the SQO. Semivolatile organic compounds (SVOCs) were also detected at high levels in an area at the south end of the Property and extending onto the adjacent PRI Northwest property. Intertidal sampling conducted as part of the pre-remedial design studies also identified chemicals in the intertidal area similar in composition and concentration and on the adjacent PRI Northwest embankment. A removal of the contaminated soils in the bank area will eliminate the imminent and substantial threat of exposure

and continuing releases into the Waterway.

16. During pre-remedial design activities referenced in Paragraph 14, organic compounds have been detected in sediments adjacent to the Property, known as the Area 5106, at concentrations exceeding those detected during the RI/FS. The organic compounds that have been found in Area 5106 include trichloroethylene, tetrachloroethylene, vinyl chloride, hexachlorobenzene, and hexachlorobutadiene. Tetrachloroethane was detected at levels as high as 3,200 mg/kg, which is approximately 56,000 times the SQO. Trichloroethane was detected at levels as high as 1,600 mg/kg for which there is no sediment cleanup criteria in the ROD. The concentrations of contaminants found in the Area 5106 poses an ongoing, substantial threat of these hazardous substances being released into the Hylebos Waterway and being exposed to wildlife and aquatic organisms in the Waterway. Preliminary analysis of sampling results from the Area 5106 sediments suggest that, natural recovery is not likely and, if excavated, these sediments/sludges would exceed the RCRA Toxicity Characteristic Leachate Procedure (TCLP) criteria and may not be appropriate for disposal with other Hylebos Waterway sediments.

17. OCC Tacoma, Inc., a subsidiary of Occidental Chemical Corporation, and its predecessors formerly owned and operated a chemical plant on thirty-three (33) acres at the Mouth of Hylebos Waterway at 605 Alexander Avenue. The plant was continuously operated from 1928 until June, 1997 by OCC Tacoma, Inc. or its predecessors . At various times, the plant manufactured chlorine, sodium hydroxide,

calcium chloride, muriatic acid, ammonia, ammonium hydroxide trichloroethylene, tetrachloroethylene, sodium aluminate, and aluminu chloride. From approximately 1929 to 1970, effluents from chlorine production operations were discharged directly to the Hylebos Waterway through the main plant outfall. Wastes from the trichloroethylene and tetrachloroethylene production process were either discharged to the Hylebos Waterway, disposed of at a deep-water disposal site, temporarily held in on-site settling ponds, or disposed of off-site. Due to past operating practices, soil and groundwater on and under portions of the Property contain chlorinated organic compounds. Direct discharge of sludges and wastewaters as well as the soil and groundwater are potential sources of certain organic compounds detected in the Hylebos Waterway.

VI. EPA'S CONCLUSIONS OF LAW AND DETERMINATIONS

Based upon the Findings of Fact in Section V and the Administrative Record, EPA makes the following Conclusions of Law and Determinations.

18. The Site is a "facility" as defined in Section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

19. Substances and constituents thereof at the Site, and substances otherwise found at the Site and identified in Paragraphs 11 through 16, above, are "hazardous substance(s)" as defined in Section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

20. Respondent is a "person" as defined in Section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

21. Respondent is liable under Section 107(a) of CERCLA, 42 U.S.C. § 9607(a), as the "owner and operator" of the facility as defined by Section 101(20) of CERCLA, 42 U.S.C. § 9601(20), and within the meaning of Section 107(a)(1) of CERCLA, 42 U.S.C. § 9607(a)(1).

22. The conditions described in the Findings of Fact above constitute an actual or threatened "release" into the "environment," as defined by Sections 101(8) and (22) of CERCLA, 42 U.S.C. §§ 9601(8) and (22).

23. The conditions present at the facility constitute a threat to public health, welfare, or the environment based upon the factors in Section 300.415(b)(2) of the National Contingency Plan (NCP).

24. The actual or threatened release of hazardous substances from the Site may present an imminent and substantial endangerment to the public health, welfare, or the environment within the meaning of Section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

25. The actions required by this Order are necessary to protect the public health, welfare or the environment, are in the public interest, are not inconsistent with CERCLA and the NCP.

VII. NOTICE TO STATE

26. EPA has notified the State of Washington through its Department of Ecology (Ecology) of this action pursuant to Section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

VIII. ORDER AND WORK TO BE PERFORMED

27. Based upon the foregoing Findings of Fact, Conclusions of Law and Determinations, and the Administrative Record for this Order, it is hereby ordered and agreed that Respondent shall comply with the following provisions and perform the following actions, including, but not limited to, the attachments to this Order (if approved by EPA), all documents incorporated by reference into this Order, and all schedules and deadlines in this Order, attached to this Order, or incorporated by reference into this Order.

28. All work performed pursuant to this Order shall be under the direction and supervision of qualified persons. Within thirty (30) days after the effective date of this Order, and before any work under this Order begins at the Site, Respondent shall submit in writing the names, titles, addresses, and qualifications of all personnel, including contractors, subcontractors, laboratories, and consultants to be used in performing activities pursuant to this Order to EPA. Conestoga-Rovers & Associates has been identified as Respondent's primary contractor which EPA does not disapprove. EPA may inspect any laboratory used in performing activities pursuant to this Order to verify approved quality control procedures and protocols are maintained. If Respondent elects to use any additional contractors, subcontractors, or laboratories in performing work pursuant to this Order subsequent to commencement of activities at the Site, Respondent shall submit the information listed in this paragraph to EPA in writing at least ten (10) days prior to any such use. This Order is contingent on Respondent's demonstration to EPA's

satisfaction that Respondent is qualified to perform properly and promptly the actions set forth in this Order. EPA retains the right to disapprove of any, or all, of the contractors and/or subcontractors retained by Respondent. If EPA disapproves of a selected contractor, subcontractor, laboratory, or consultant, Respondent shall retain a replacement within fifteen (15) days following EPA's disapproval and shall notify EPA of that replacement company's or individual's name and qualifications within twenty (20) days of EPA's disapproval. If EPA subsequently disapproves of the replacement(s), EPA reserves the right to terminate this Order, conduct all or a portion of the removal and/or conduct or authorize any other response activities it deems necessary, and seek costs thereafter and take any appropriate enforcement action. During the course of the removal, Respondent shall notify EPA in writing of any changes or additions in the persons used to carry out such work, providing their names, titles and qualifications. EPA shall have the same right to approve changes and additions to personnel as it has hereunder regarding the initial notification.

29. Respondent shall conduct activities and submit deliverables for EPA review, comment, approval or modification as EPA may deem appropriate, and as provided in the SOW, attached as Appendix 1 to this Order, and as provided in the Work Plan, attached as Appendix 2 to this Order. All such work shall be conducted in accordance with the requirements of CERCLA, the NCP, and all applicable EPA guidance, including, but not limited to, Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA (EPA/540-R-

93-097), Guidance for Conducting Treatability Studies Under CERCLA (EPA/540/2-91/13a), Technology Screening Guide for Treatment of CERCLA Soils and Sludges (EPA/540/2-88/004), EPA Engineering Bulletins (series), Contaminants and Remedial Options at Solvent-Contaminated Sites (EPA/600/R-94/203), and Presumptive Remedies: Site Characterization and Technology Selection for CERCLA Sites with Volatile Organic Compounds in Soil (EPA 540-F-93-048), as well as guidances referenced therein, and guidances referenced in the SOW and the Work Plan, as such guidances may be amended or modified by EPA prior to implementation or performance of the work under this Order. Work conducted in compliance with all requirements of this Order will be deemed consistent with CERCLA and the NCP. The general activities Respondent is required to perform are identified below, including various deliverables to be submitted by Respondent for EPA review and approval. The specific tasks Respondent shall perform are described more fully in the SOW and in the Work Plan . All work performed pursuant to this Order shall be in accordance with the schedules, standards, specifications, and other requirements of this Order, including the SOW, and Work Plan, and other deliverables, as initially approved by EPA, or as may be amended or modified. For purposes of this Order, day means calendar day unless otherwise noted in the Order.

30. Embankment Area Removal Action

a. Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan/Health and Safety Plan (HSP): Within fourteen (14) days after the effective date of this Order, Respondent shall submit for EPA approval

a Sampling and Analysis Plan (SAP), Quality Assurance Project Plan (QAPP), and a Health and Safety Plan (HSP). Following EPA approval, or modification or revision as required by EPA, the SAP, any supplement to the SAP, the QAPP, and the HSP shall be incorporated in, and be an enforceable part of this Order.

b. Embankment Area Sampling: Within thirty (30) days after EPA approval of the SAP, QAPP and HSP, Respondent shall complete the work as outlined in the SAP. Leach tests and analyses of samples shall be completed in accordance with the schedule contained in the SAP as approved by EPA.

c. Interim Summary of Analytical Data: Within thirty (30) days after scheduled completion of SAP activities, as outlined in the SAP and approved by EPA, Respondent shall submit for EPA approval an Interim Summary of Analytical Data containing the information required in Task 3A of the attached SOW (Appendix 1).

d. Draft Embankment Area Characterization Report: Within sixty (60) days after EPA approval of the Interim Summary of Analytical Data, Respondent shall submit for EPA approval draft Embankment Area Characterization Report containing the information required in Task 3B of the attached SOW (Appendix 1).

E. Final Embankment Area Characterization Report: Within fourteen (14) days after approval of the draft Embankment Area Characterization Report, Respondent shall submit for EPA approval a final Embankment Area Characterization Report.

f. Data Gaps, Further Sampling, and Data Reporting: As necessary, and upon receipt of a written request from EPA, Respondent

shall prepare addenda to the SAP and QAPP to address the potential for further sampling in response to data gaps identified by EPA. Addenda shall be submitted for EPA approval within thirty (30) days after receipt of written request from EPA. Upon approval of the addenda by EPA in accordance with the schedule presented the in SAP addenda, as approved by EPA, Respondent shall initiate the sampling activities as outlined in the SAP and QAPP addenda. In accordance with the schedule presented in the SAP addenda, as approved by EPA, Respondent shall submit for EPA approval a Summary of Analytical Data containing information required in Task 4C of the attached SOW (Appendix 1).

g. Draft EE/CA Report. Within forty-five (45) days after EPA approval of the Embankment Area Characterization Report or completion of the work described in the SAP Addendum, whichever is later, Respondent shall submit for EPA approval a draft Engineering Evaluation/Cost Analysis (EE/CA) Report as further described in Task 5 of the attached SOW (Appendix 1).

h. Final EE/CA Report. Within fourteen (14) days after approval of the Draft EE/CA Report, Respondent shall submit for EPA approval a Final EE/CA Report. Upon approval by EPA, this Report, will be published for review during a period for public comment. Following the public comment period, EPA may: (i) select the proposed Removal Action Alternative that was published for comment; (ii) require Respondent to modify or revise the EE/CA Report and/or proposed Removal Action Alternative prior to EPA approval; or (iii) select another Removal Action Alternative. Upon approval by EPA, the EE/CA Report and the selected Removal Action Alternative shall be

incorporated in, and be an enforceable part of this Order.

i. Draft Phase I Removal Action Work Plan: Within forty-five (45) days after EPA approval of the final EE/CA, Respondent shall submit for EPA approval the Draft Phase I Removal Action Work Plan containing information required in Task 6A of the attached SOW (Appendix 1).

Respondent or EPA may identify at any time the potential to conduct Time-Critical Removal Actions, prior to implementation of the "hot spot" Phase I Removal Action, if data indicate significant levels of chemicals and if implementation of such time-critical removal actions are deemed technically feasible by EPA and Respondent. If Time-Critical Removal Actions are identified and requested in writing by EPA or identified in writing by Respondent, and approved by EPA, Respondent shall submit within thirty (30) days of receipt of the written identification and request and, upon approval by EPA, shall such Time-Critical Removal Actions in accordance with said Work Plan. A Removal Action Completion Report in accordance with subparagraph t. below shall also be submitted on any Time-Critical Removal Actions performed.

j. Final Phase I Removal Action Work Plan: Within fourteen (14) days after EPA approval of the draft Phase I Removal Action Work Plan, Respondent shall submit for EPA approval a final Phase I Removal Action Work Plan.

k. Phase I Removal Action Design Documents: Respondent shall submit Phase I Removal Action design documents for EPA review and approval, as the documents are generated by Respondent and in

accordance with the schedule contained in the approved Phase I Removal Action Work Plan.

l. Draft Phase II Removal Action Work Plan: In accordance with the schedule to be proposed in the final EE/CA by Respondent, and approved by EPA, Respondent shall submit for EPA approval the Draft Phase II Removal Action Work Plan containing information required in Task 6B of the attached SOW (Appendix 1).

m. Final Phase II Removal Action Work Plan: Within fourteen (14) days after EPA approval of the Draft Phase II Removal Action Work Plan, Respondent shall submit for EPA approval a final Phase II Removal Action Work Plan.

n. Phase II Removal Action Design Documents: Respondent shall submit Phase II Removal Action design documents for EPA review and approval, as the documents are generated by Respondent and in accordance with the approved schedule in the Phase II Removal Action Work Plan.

o. Draft Long Term Monitoring and Maintenance Plan: Within sixty (60) days after approval of the final Phase II Removal Action Work Plan, Respondent shall submit for EPA approval a draft Long Term Monitoring Plan containing information required in Task 8 of the attached SOW (Appendix 1).

p. Final Long Term Monitoring and Maintenance Plan: Within fourteen (14) days after EPA approval of the draft Long Term Monitoring and Maintenance Plan, Respondent shall submit for EPA approval the final Long Term Monitoring and Maintenance Plan.

q. Monitoring Data Reports: Respondent shall submit

Monitoring Data Reports for EPA review and approval according to a schedule to be proposed in the final Long Term Monitoring and Maintenance Plan as approved by EPA.

r. Implementation of Maintenance Activities: Maintenance shall be performed by Respondent as needed, as determined by EPA and Respondent, in accordance with a schedule to be determined by EPA.

s. Phase I and Phase II Removal Actions: Respondent shall complete removal actions in accordance with the activities and schedules specified in the Phase I and Phase II Removal Action Work Plans.

t. Draft Phase I and Phase II Removal Action Completion Reports. Within thirty (30) days after completion of Phase I Removal Action activities, specified in the Phase I Removal Action Work Plan, Respondent shall submit for EPA approval a draft Phase I Removal Action Completion Report containing information required in Task 7A of the attached SOW (Appendix 1). Similarly, within thirty (30) days after completion of Phase II Removal Action activities, as specified by the Phase II Removal Action Work Plan, Respondent shall submit for EPA approval a draft Phase II Removal Action Completion Report containing information required in Task 7B of the attached SOW.

u. Final Removal Action Completion Reports. Within fourteen (14) days after approval of the draft Phase I Removal Action Completion Report, Respondent shall submit for EPA approval a final Phase I Removal Action Completion Report. Similarly, within fourteen (14) days after approval of the draft Phase II Removal Action Completion Report, Respondent shall submit for EPA approval a final

Phase II Removal Action Completion Report. Upon approval by EPA, these Reports, shall be incorporated in, and be an enforceable part of this Order.

31. Area 5106 Removal Action

a. Draft Area 5106 Background Data Report: Within twenty one (21) days after the effective date of this Order, Respondent shall submit for EPA approval a Draft Area 5106 Background Data Report , containing the information required in Section 3.1.1 of the attached Work Plan (Appendix 2).

b. Final Area 5106 Background Data Report: Within fourteen (14) days after receipt of EPA approval of the draft Area 5106 Background Data Report, Respondent shall submit for EPA approval the final Area 5106 Background Data Report.

c. Draft and Final Sampling and Analysis Plan/Quality Assurance Project Plan: Within twenty-one (21) days after the effective date of this Order, Respondent shall submit for EPA approval a draft Sampling and Analysis Plan (SAP), and a draft Quality Assurance Project Plan (QAPP) containing the information required in Section 3.2.1 of the attached Work Plan (Appendix 2). Within fourteen (14) days after receipt of EPA approval of the draft SAP and the draft QAPP, Respondent shall submit for EPA approval the final SAP and the final QAAP. Following EPA approval, or modification or revision as required by EPA, the SAP, any supplement to the SAP and the QAPP shall be incorporated in, and be an enforceable part of this Order.

d. Area 5106 Sampling: Upon EPA approval of the SAP, QAPP and HSP, Respondent shall complete the work as outlined in the SAP

according to the Schedule presented in the SAP.

e. Draft Area 5106 Characterization Report: Within 120 days of the effective date of this Order, Respondent shall submit for EPA approval a draft Area 5106 Characterization Report containing information required in Section 3.2 of the attached Work Plan (Appendix 2).

f. Final Area 5106 Characterization Report: Within fourteen (14) days after receipt of EPA approval of the draft Area 5106 Characterization Report, Respondent shall submit for EPA approval the final Area 5106 Characterization Report.

g. Data Gaps, Further Sampling, and Data Reporting: As necessary, and upon receipt of a written request from EPA, Respondent shall prepare addenda to the SAP and QAPP to address the potential for further sampling in response to identified data gaps by EPA. Addenda shall be submitted for EPA approval within thirty (30) days after receipt of written request from EPA. Upon approval of the addenda by EPA, Respondent shall initiate the sampling activities as outlined in the SAP QAPP addenda.

h. Draft Supplementary Characterization Report: In accordance with the schedule outlined in the SAP addendum as approved by EPA, Respondent shall submit for EPA approval a draft Supplementary Characterization Report containing information required in Section 3.2.2 of the attached Work Plan (Appendix 2).

i. Final Supplementary Characterization Report: Within fourteen (14) days after receipt of EPA approval of the draft Supplementary Characterization Report, Respondent shall submit for EPA

approval the final Supplementary Characterization Report.

j. Draft Preliminary Treatment Technology Evaluation Report Within twenty-one (21) days after EPA approval of the final Area 510(Characterization Report, or the final Supplementary Area 510(Characterization Report, whichever is later, Respondent shall submit for EPA review and approval a draft Preliminary Treatment Technology Evaluation Report containing information required in the Section 3.4 of the attached Work Plan (Appendix 2).

k. Final Preliminary Treatment Technology Evaluation Report: Within fourteen (14) days after receipt of EPA approval of the draft Preliminary Treatment Technology Evaluation Report, Respondent shall submit for EPA approval the final Preliminary Treatment Technology Evaluation Report.

l. Draft Treatability Study Work Plan, SAP and QAPP: If required, and in accordance with the schedule presented in the final Preliminary Treatment Technology Evaluation Report as approved by EPA, Respondent shall submit for EPA review and approval a draft Treatability Study Work Plan, SAP and QAPP containing information required in Section 3.4 of the attached Work Plan (Appendix 2).

m. Final Treatability Study Work Plan, SAP and QAPP: Within fourteen (14) days of EPA approval of the draft Treatability Study Work Plan, SAP QAPP, Respondent shall submit for EPA approval the final Treatability Study Work Plan, SAP and QAPP.

n. Treatability Study: In accordance with the schedule presented in the final Treatability Study Work Plan, as approved by EPA, Respondent shall complete the treatability study.

o. Treatment Standards Technical Memorandum: Within fourteen (14) days after EPA approval of the final Preliminary Treatment Technology Evaluation Report, Respondent shall submit for EPA approval a Treatment Standards Technical Memorandum containing information required in Section 3.4 of the attached Work Plan (Appendix 2).

p. Draft Pilot-Scale Treatment Testing Work Plan, SAP and QAPP: In accordance with the schedule presented in the final Preliminary Treatment Technology Evaluation Report, as approved by EPA, Respondent shall submit for EPA review and approval a draft Treatment Work Plan, SAP and QAPP containing the information required in Section 3.4 of the attached Work Plan (Appendix 2).

q. Final Pilot-Scale Treatment Testing Work Plan, SAP and QAPP: Within fourteen (14) days of EPA approval of the draft Treatment Work Plan, SAP and QAPP, Respondent shall submit for EPA approval the final Treatment Work Plan, SAP and QAPP.

r. Draft Final Treatment Technology Evaluation Report: In accordance with the schedule presented in the final Preliminary Treatment Technology Evaluation Report, as approved by EPA, Respondent shall submit for EPA review and approval a draft Final Treatment Technology Evaluation Report containing the information required in Section 3.4 of the attached Work Plan (Appendix 2).

s. Final Final Treatment Technology Evaluation Report: Within 14 days after EPA approval of the draft Final Treatment Technology Evaluation Report, Respondent shall submit for EPA approval the final Final Treatment Technology Evaluation Report.

t. Draft Dredging Alternatives Evaluation Report: Within

sixty (60) days after EPA approval of the final Area 5106 Characterization Report, as approved by EPA, or the final Supplementary Area 5106 Characterization Report, as approved by EPA, whichever is later, Respondent shall submit for EPA review and approval a draft Dredging Alternatives Evaluation Report containing the information required in Section 3.5 of the attached Work Plan (Appendix 2).

u. Final Dredging Alternatives Evaluation Report: Within Fourteen (14) days after EPA approval of the draft Dredging Alternatives Evaluation Report or the Draft Supplementary Dredging Alternatives Report, as appropriate, Respondent shall submit for EPA approval the final Dredging Alternatives Evaluation Report.

v. Streamlined Risk Evaluation Report. Respondent shall submit for EPA approval a Streamlined Risk Evaluation Report containing information required in Section 3.7 of the attached Work Plan (Appendix 2). The draft and final versions of the Streamlined Risk Evaluation Report shall be included in, and submitted with, the draft and final EE/CA Reports.

w. Draft EE/CA Report. Within sixty (60) days after EPA approval of the final Final Treatment Technology Evaluation Report, as approved by EPA, Respondent shall submit for EPA approval a draft Engineering Evaluation/Cost Analysis (EE/CA) Report containing the information required in Section 3.10 of the attached Work Plan (Appendix 2).

x. Final EE/CA Report. Within fourteen (14) days after receipt of approval of the draft EE/CA Report, Respondent shall submit

for EPA approval a final Engineering Evaluation/Cost Analysis (EE/CA) Report. Upon approval by EPA, this Report, including the proposed Removal Action Alternative, will be published for review during a period for public comment. Following the public comment period, EPA may: (i) select the proposed Removal Action Alternative that was published for comment; (ii) require Respondent to modify or revise the EE/CA Report or proposed Removal Action Alternative prior to EPA approval; or (iii) select another Removal Action Alternative.

32. EPA reserves the right to comment on, modify, and direct changes for all deliverables. At EPA's discretion, Respondent shall correct all deficiencies and incorporate and integrate all information and comments supplied by EPA either in subsequent or resubmitted deliverables. For each and every deliverable, or other item required under this Order, if EPA disapproves or requires modification or revision of any deliverable, or other item, in whole or in part, Respondent shall submit a modified or revised version thereof to EPA which is responsive to all EPA directions, comments, or requirements within thirty (30) days after receiving such directions, comments or requirements from EPA, unless a shorter or longer time is specified by EPA, or Respondent properly invokes the dispute resolution procedures set forth in Section XVII of this Order.

33. EPA reserves the right to stop Respondent from proceeding at any time, either temporarily or permanently, on any task(s), activity(s) or deliverable(s) at or relating to the Site and/or the implementation of this Order.

34. If Respondent modifies or revises any deliverable, report,

plan, or other submittal after receipt of EPA comments, directions, or requirements, and EPA subsequently disapproves the revised submittal, or if subsequent submittals do not, in EPA's judgment, adequately address EPA's comments, directions or requirements for changes, EPA may seek stipulated or statutory penalties from Respondent pursuant to Section XVIII for violation of this Order; perform its own studies; complete the removal actions or any portion of one or both of the removal actions; and/or take any response action at the Site it deems necessary, in accordance with its authority, and seek reimbursement from Respondent for its costs therefor; and/or seek any other appropriate relief, subject to Respondent's right to invoke all remedies and defenses, including dispute resolution as provided in Section XVII.

35. In the event EPA takes over or causes others to perform some tasks, but does not remove Respondent's duty to complete the removal actions pursuant to this Order, Respondent shall incorporate and integrate information supplied by EPA as directed by EPA.

36. The absence of express EPA comment, approval or disapproval of any submission within any specified time period shall not be construed as approval by EPA. Respondent is responsible for the timely preparation of deliverables pursuant to this Order.

37. Respondent shall, prior to the shipment pursuant to this Order of hazardous substances from the Site to an out-of-state waste management facility, comply with requirements of 40 CFR § 300.440.

IX. MODIFICATION OF THE SOW OR WORK PLAN

38. If, at any time, Respondent identifies a need for additional data, Respondent shall submit a memorandum to the EPA OSC within twenty (20) days after such need has been identified explaining the need for and the nature of the data sought. EPA, in its discretion, will determine whether the additional data proposed to be collected by Respondent shall be incorporated into reports and deliverables. Additional work conducted by Respondent that is determined to be appropriate for the removal action pursuant to this Paragraph and approved by EPA, shall be deemed to be consistent with CERCLA, the NCP, and applicable EPA guidance.

39. In addition to the requirements of Section 103 of CERCLA, 42 U.S.C. § 9603, and all other applicable statutory or regulatory reporting requirements, Respondent shall immediately notify EPA and Ecology of any conditions at the Site which may pose an immediate threat to human health or welfare or the environment. If any incident, or change in site conditions, during the activities conducted pursuant to this Order causes or threatens to cause an additional release of hazardous substances from the Site or an endangerment of the public health, welfare, or the environment, the Respondent shall immediately take all appropriate action to prevent, abate or minimize such release, or endangerment caused or threatened by the release. Respondent shall also immediately notify the OSC or, in the event of his/her unavailability, shall notify the Regional Duty Officer, Emergency Response Unit, EPA Region 10, at (206) 553-1263 of the incident or site conditions. In addition to the authorities of the

NCP, EPA may modify or amend any work to be performed pursuant to this Order or require additional work if EPA determines that such modification or amendment is warranted by the immediate threat or in response to unanticipated conditions or changed circumstances threatening human health or the environment. Respondent shall confirm its willingness to perform the modified or amended work within twenty four (24) hours of notice from EPA, or in such longer period of time that EPA may be grant. EPA reserves its right to conduct all or part of such modified or amended work with or without a notice and request to Respondent under this paragraph and to seek reimbursement of cost from Respondent, and/or to seek any other appropriate relief.

40. EPA may determine that, in addition to tasks defined in the SOW and Work Plan, other additional work may be necessary to accomplish the objectives of the removal action and this Order. EPA may request Respondent to perform any such additional work or other response activity in addition to the work initially approved or modified, if EPA determines that such actions are necessary. Any additional work requested in connection with Area 5106 and subtidal zone shall be limited to the scope of activities required for preparation of the EE/CA Report. Respondent shall confirm its willingness to perform any such additional work in writing within fifteen (15) days after receipt of the EPA request, or properly invoke the dispute resolution procedures set forth in Section XVII of this Order. Subject to the resolution of any dispute, Respondent shall implement the additional tasks EPA determines are necessary consistent with the foregoing. The additional work shall be completed according

to the standards, specifications, and schedule set forth or approved by EPA in a written modification to the SOW or Work Plan. EPA reserves the right to conduct all or part of such work itself, to seek reimbursement of costs from Respondent, and/or to seek any other appropriate relief.

X. QUALITY ASSURANCE

41. All sampling and analyses performed pursuant to this Order shall conform to EPA direction, approval, and guidance regarding sampling, quality assurance/quality control (QA/QC), data validation, and chain of custody procedures. Respondent shall ensure that the laboratory used to perform the analyses participates in a QA/QC program that complies with the appropriate EPA guidance. Respondent shall use the following documents as appropriate as guidance for QA/QC and sampling: "Quality Assurance/Quality Control Guidance for Removal Activities: Sampling QA/QC Plan and Data Validation Procedures," OSWER Dir. No. 9360.4-08. As indicated in the SOW for the Embankment Area Removal Action (Appendix 1), the Quality Assurance Project Plan (QAPP) shall be developed in accordance with EPA guidance and requirements of the EPA Contract Laboratory Program (CLP) and the Puget Sound Estuary Program (PSEP). The QAPP developed for the Hylebos Waterway pre-remedial design work, and approved by EPA, shall be utilized to the extent applicable. Upon request by EPA, Respondent shall have such a laboratory analyze samples submitted by EPA for quality-assurance monitoring. Respondent shall provide to EPA the quality assurance/quality control procedures followed by all sampling teams

and laboratories performing data collection and/or analysis. Upon request by EPA, Respondent shall allow EPA or its authorized representatives to take split and/or duplicate samples of any samples collected by Respondent while performing work under this Order pursuant to Paragraph 47 below.

XI. PROPOSED ENGINEERING ANALYSIS/COST ASSESSMENT REPORT, PUBLIC COMMENT, ADMINISTRATIVE RECORD

42. EPA retains full authority and responsibility for all aspects of public participation as set forth in CERCLA and the NCP, or as EPA may deem appropriate, including the release to the public of the proposed Embankment EE/CA Report and Area 5106 EE/CA Report. As requested by EPA, Respondent shall provide information supporting EPA's community relations programs related to the work performed pursuant to this Order, and shall participate in public meetings which may be held or sponsored by EPA to explain activities at or concerning the work performed pursuant to this Order.

43. EPA will determine the contents of the administrative record file for the selection of the removal actions. Respondent does not waive any rights or claims it may have regarding the adequacy of the administrative record. Respondent shall upon request submit documents developed pursuant to this Order to EPA upon which approval of both EE/CA Reports and Action Memoranda may be based. Upon request by EPA, Respondent shall submit copies of plans, task memoranda, including all documentation of field modifications, recommendations for further action, quality assurance memoranda and audits, raw data,

field notes, laboratory analytical reports, and other reports to EPA except those documents that are privileged. Upon request by EPA, Respondent shall also submit copies of any previous non-privileged studies conducted under state, local or other federal authorities relating to response selection under this Order, and all communications between Respondent and state, local, or other federal authorities concerning response selection. EPA shall maintain a community information repository at or near the Site to house a copy of the administrative record.

XII. PROGRESS REPORTS AND MEETINGS

44. Respondent shall make presentations at, and participate in, meetings and telephone conferences at the request of EPA during the initiation, conduct, and completion of the removal actions. In addition to discussion of the technical aspects of the removal actions, topics will include anticipated problems or new issues. Meetings and telephone conferences will be scheduled when EPA or Respondent deem it necessary .

45. In addition to the deliverables set forth in this Order, until the termination of this Order, Respondent shall provide monthly progress reports to EPA following the effective date of this Order. These progress reports shall: (1) describe the actions which have been taken to comply with this Order during the previous month; (2) list all sampling and test results and all other data reports received by the Respondent in the previous month; (3) describe all work planned for the next month with schedules relating such work to the overall

project schedule, including percentage of completion data; (4) describe all problems encountered and any anticipated problems, any actual or anticipated delays, and all solutions developed and implemented or planned to address any actual or anticipated problems or delays; and (5) include all other elements specified in the Work Plan.

During implementation of field work under both Embankment Area Work Plans, Respondent shall submit weekly progress reports containing the information required by this Paragraph and in accordance with Task 7A of the SOW (Appendix 1).

XIII. SAMPLING, ACCESS, AND DATA AVAILABILITY/ADMISSIBILITY

46. Tabular summaries of all validated results of sampling, tests, modeling or other data generated by Respondent, or on Respondent's behalf, pursuant to this Order, shall be submitted to EPA in the subsequent monthly progress report as described in Section XII of this Order. All unvalidated data, laboratory data and all laboratory analytical reports shall be submitted to EPA upon its request. EPA will make available to the Respondent validated data generated by EPA pursuant to Paragraph 47 below, and unvalidated data if relied upon by EPA for making Response action decisions.

47. Respondent shall notify EPA, Ecology, and the Trustees representatives designated in Section XIV of this Order at least fourteen (14) days prior to conducting any field events described in any approved Work Plan(s) or sampling and analysis plan. At EPA's verbal or written request, or the request of EPA's OSC or Ecology's

Project Manager or their designees, Respondent shall allow split or duplicate samples to be taken by EPA and Ecology and their authorized representatives and designees of any samples collected by the Respondent in implementing this Order. EPA will notify Respondent before conducting any sampling at the Site for purposes of this removal action. At Respondent's verbal or written request, EPA and Ecology shall allow Respondent to take split or duplicate samples of any samples collected by EPA or Ecology.

48. EPA, Ecology and the Trustees and their designated representatives, shall at all reasonable times have full access to, and authority to freely move about those portions of the Site owned by Respondent where work is to be carried out pursuant to this Order. EPA, Ecology and the Trustees and their designated representatives will comply with the Health and Safety Plan developed under this Order. EPA and Ecology and their designated representatives, also shall have such full access, including to laboratories, for purposes of inspecting conditions, activities in implementing the requirements of this Order, records, operating logs, and contracts related to work carried out under this Order; reviewing the progress of the Respondent in carrying out the terms of this Order; conducting tests as they or their authorized representatives or designees deem necessary; using a camera, sound recording device or other documentary type equipment; and verifying the data submitted to them by the Respondent. The Respondent shall allow these persons to inspect and copy all non-privileged records, files, photographs, documents, sampling and monitoring data, and other non-privileged or non-confidential writings

related to work undertaken in carrying out this Order. Copies of al other information or records created, maintained or received by Respondent or its agents, employees, accountants, contractors or consultants which are prepared pursuant to this Order, including but not limited to: contractual documents, work orders, disposal records, and any other records or documents not previously required herein shall promptly be made available to EPA on request as soon as practicable, but in any event within thirty (30) days of Respondent's receipt of EPA's request. In response to any reasonable request made by Respondent, EPA will allow Respondent to inspect or copy at their own expense non-privileged records, files, photographs, documents, sampling and monitoring data and other non-privileged writings of EPA related to the work undertaken under this Order. Nothing herein shall be interpreted as limiting or affecting EPA's right of entry or inspection authority under federal law.

49. Respondent may assert a claim of business confidentiality covering part or all of the information submitted to EPA pursuant to this Order in accordance with Section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7), and 40 C.F.R. Part 2, Subpart B. This claim shall be asserted in the manner described by 40 C.F.R. 2.203(b). If no such claim accompanies the information when it is submitted to EPA, it may be made available to the public by EPA without further notice to Respondent. Analytical and other data specified in Section 104(e)(7)(F) of CERCLA shall not be claimed as confidential by the Respondent. EPA shall disclose information covered by a business confidentiality claim only to the extent permitted by, and by means

of, the procedure set forth at 40 C.F.R. Part 2, Subpart B.

50. Respondent reserves its right to assert privilege and work-product protections as to communications by, between or with attorneys and their employees, consultants or agents, and as to the opinions, impressions, theories and conclusions of Respondent's employees, consultants, attorneys, or other agents that were generated at the request of or under the direction the attorney in anticipation of litigation. In the event privilege is asserted, Respondent shall provide EPA with the date, author, recipient, or addressee, title, or description of the subject of the opinion or conclusion and the privilege asserted by Respondent.

51. For purpose of response actions contemplated by this Order, Respondent shall not object to the validity and use of any data gathered, generated, or evaluated by EPA, Ecology, or Respondent in the performance or oversight of any work which has been verified according to the quality assurance/quality control (QA/QC) procedures required by this Order or any EPA-approved EE/CA, work plan or sampling and analysis plan, or which is contained in a report submitted by Respondent and approved by EPA under this Order. If Respondent objects to any use of any other data relating to the removal action, Respondent shall submit a report to EPA which identifies and explains Respondent's objections, describes any proposed acceptable uses of the data, and specifically identifies any proposed limitations on the use of the data. This report must be submitted to EPA within thirty (30) after such data's use is made known to Respondent, or Respondent's opportunity to object to such

data shall be waived. Notwithstanding anything to the contrary in this Paragraph, Respondent does not waive its right to dispute any conclusions or decisions made by EPA based on such data.

52. The Property was recently purchased by Pioneer Chlor Alkali Company, Inc. Respondent has an agreement with Pioneer Chlor Alkali Company, Inc., that Respondent shall have access to all portions of Property necessary for Respondent to conduct the removal actions required by this Order. If not included in its existing agreement, Respondent shall use its best efforts to obtain an agreement with Pioneer Chlor Alkali Company, Inc., to provide access for EPA, Ecology and the Trustees, and their representatives and designees, at all reasonable times and authority to freely move about the Site where work is to be carried out pursuant to this Order. EPA, Ecology and the Trustees and their designated representatives will comply with the Health and Safety Plan developed under this Order. Any such access agreement shall also specify that Respondent is not the governments' representatives with respect to any liability associated with activities required by this Order. If the Site areas that are to be used for access or are within the scope of the removal action, are owned in whole or in part by any other parties other than Respondent, Respondent shall obtain, or use its best efforts to obtain, written site access agreement(s) from the present owner(s) for Respondent, EPA, Ecology, and the Trustees not less than ninety (90) days or such shorter time period approved by EPA prior to a field sampling event that will require access. Copies or written acknowledgment of all access agreements shall be provided to EPA prior

to the initiation of any field activities. If Respondent is unable to obtain access agreements within the time referenced above, Respondent shall immediately notify EPA of their failure to obtain access. EPA may extend the schedule or modify the SAP, if deemed necessary by EPA, if delays in performance of work will result from the Respondent's inability to obtain access agreements to a location deemed necessary by EPA after Respondent has used best efforts and notified EPA in a timely manner, as specified in this Paragraph. EPA may obtain access for Respondent, or perform tasks or activities under its own authority in the event Respondent cannot obtain access agreements. In the event EPA performs any tasks or activities and does not terminate this Order, Respondent shall perform all other activities not requiring such access, and shall reimburse EPA for all costs EPA incurs in performing any tasks or activities incurred in connection to this Order. Respondent shall integrate the results of any tasks or activities undertaken by EPA into Respondent's deliverables. Furthermore, the Respondent agrees to indemnify the United States for any liability arising out of the performance of any such tasks or activities by EPA to the extent set forth in Paragraph 95 of this Order. Respondent shall also reimburse EPA for all costs and attorney fees incurred by the United States to obtain access pursuant to this Order.

XIV. DESIGNATED PROJECT COORDINATOR, ON-SCENE COORDINATOR, NOTICES AND SUBMISSIONS

53. Respondent has designated Alastair J. H. McGregor of Glenn Springs Holdings, Inc., an affiliate of Respondent, as its

Project Coordinator, who shall be responsible for the administration of all of Respondent's actions under this Order. Communications between Respondent and EPA shall be directed through the Project Coordinator by facsimile and mail, with copies to such other persons as EPA may designate. Communications include, but are not limited to, all documents, reports, approvals, and other correspondence submitted under this Order.

54. EPA has designated Ken Marcy of the Emergency Response/Site Cleanup Unit 1, Environmental Cleanup Office, as its On-Scene Coordinator (OSC).

55. EPA's OSC shall have the authority lawfully vested in an On-Scene Coordinator by the NCP, and shall have the authority, in accordance with the requirements of the NCP, to halt any work required by this Order and to take any necessary response action when he or she determines conditions at the Site may present an imminent and substantial endangerment to the public health or welfare or the environment. The absence of the EPA OSC from the area under study pursuant to this Order shall not be cause for any stoppage or delay of any work, unless specifically directed by the OSC.

56. EPA and Respondent shall have the right to change their designated OSC or Project Coordinator. EPA shall notify the Respondent, and Respondent shall notify EPA ten (10) days before such a change is made. Notification may initially be made orally, but shall be followed by written notice. EPA retains the right to disapprove of any subsequent Project Coordinator named by Respondent.

57. Within thirty (30) days after the effective date of this

Order, Respondent shall submit to EPA in writing the name, title, qualifications, experience, professional affiliations, and background, of the individual selected as Respondent's Project Coordinator. EPA retains the right to disapprove of any Project Coordinator named by Respondent. If EPA disapproves of Respondent's selected Project Coordinator, Respondent shall retain another Project Coordinator and shall notify EPA of that person's name, title, qualifications, and background within ten (10) days of EPA's disapproval.

58. EPA will arrange for a qualified person to assist in its oversight and review of the conduct of the removal action, as authorized by Section 104(a) of CERCLA, 42 U.S.C. § 9604(a). The oversight assistant may observe work and make inquiries in the absence of EPA, but is not authorized to modify any work plan.

59. Documents including work plans, reports, approvals, disapprovals, and other correspondence which must be submitted under this Order, shall be sent to the individuals at the addresses specified below, unless those individuals give written notice of a change to the other parties. All notices and submissions shall be considered effective one business day after receipt by Respondent's Project Coordinator, unless otherwise provided.

a. Four (4) copies of documents to be submitted to EPA shall be forwarded to:

Ken Marcy
U.S. Environmental Protection Agency
1200 Sixth Avenue, ECL-117
Seattle, Washington 98101

b. One (1) copy of documents to be submitted to EPA shall be forwarded to:

Russell McMillan
Washington Department of Ecology
Southwest Regional Office
P.O. Box 47775
Olympia, Washington 98504

c. One (1) copy of documents to be submitted to EPA shall be forwarded to:

Robert A. Taylor
National Oceanic and Atmospheric Administration
Damage Assessment and Restoration Center
7600 Sand Point Way NW, BIN C15700
Seattle, Washington 98115

d. One (1) copy of documents to be submitted to EPA shall be forwarded to:

John Wakeman
U.S. Army Corps of Engineers
4735 E. Marginal Way South
Seattle, WA 98124

e. One (1) copy of documents to be submitted to EPA shall be forwarded to:

Larry Vanselow
Roy F. Weston, Inc.
700 Fifth Ave, Suite 5700
Seattle, WA 98104

f. Documents to be sent to the Respondent shall be forwarded to:

Alastair J. H. McGregor
Glen Springs Holdings, inc.
1795 Baseline Road
Grand Island, N.Y. 14072-1027

Frank A. Rovers
Conestoga-Rovers & Associates
2055 Niagra Falls Boulevard
Suite 3
Niagra Falls, NY 14304

Maury Wassmann
OCC Tacoma, Inc.
709 Alexander Avenue
Tacoma, WA 98412

John Wheeler
Occidental Chemical Corporation
Occidental Tower
5005 LBJ Freeway
Dallas, Texas 75244

XV. COMPLIANCE WITH OTHER APPLICABLE LAWS

60. All actions required to be taken pursuant to this Order shall be performed in accordance with the requirements of all applicable local, state, and federal laws and regulations except as provided in CERCLA Section 121(e) and 40 CFR § 300.415(i). In accordance with 40 CFR § 300.415(i), all on-site actions required pursuant to this Order shall, to the extent practicable, as determined by EPA, considering the exigencies of the situation, attain applicable or relevant and appropriate requirements (ARARs) under federal environmental, and state environmental laws. No local, state, or federal permit shall be required for any portion of any activity pursuant to this Order conducted entirely on-Site. Off-Site disposal of hazardous substances shall comply with all applicable provisions of CERCLA, RCRA, CWA, the implementing regulations respectively thereunder, and EPA guidances and policies. Respondent shall identify ARARs in the Work Plan.

XVI. RECORD PRESERVATION

61. All records and documents created by Respondent, or on Respondent's behalf, which relate to the implementation of this Order shall be preserved by Respondent for a minimum of ten (10) years following completion of the removal actions required by this Order. After this ten (10) year period, Respondent shall notify EPA at least ninety (90) days before any records are scheduled to be destroyed. If EPA requests that the documents be saved, Respondent shall, at no cost to EPA, either maintain the documents or give EPA the non-privileged documents requested or true and accurate copies of these documents. In addition, Respondent shall provide non-privileged records and documents retained under this section at any time before expiration of the ten year period at the written request of EPA.

XVII. DISPUTE RESOLUTION

62. The parties to this Order shall attempt to resolve, expeditiously and informally, any disagreements concerning this Order.

63. If Respondent objects to any EPA notification or action taken pursuant to this Order, the Respondent shall notify EPA in writing of its objection within ten (10) days of receipt of such notification or actual notice of such action, unless the objection has been informally resolved. Respondent's written objection required by this Section shall include, but not be limited to, any factual data, analysis, supporting documentation or legal opinion that supports Respondent's position.

64. EPA and the Respondent shall have twenty (20) days from

receipt of the notification of objection to reach agreement. This negotiation period may be extended at the sole discretion of EPA. If agreement is reached, it will be reduced to writing and will become a fully enforceable part of this Order. If agreement cannot be reached on any issue within this twenty (20) day period, the Unit Manager of the Emergency Response/Site Cleanup Unit 1, will issue a written decision to the Respondent. Respondent's obligations under this Order shall not be tolled by submission of any objection for dispute resolution under this Section, unless agreed to by EPA.

65. Respondent shall either implement EPA's decision or, within ten (10) days after Respondent's receipt of EPA's decision, submit a written appeal from the decision to the Director of the Office of Environmental Cleanup (Director). Respondent's written appeal shall include a presentation of the basis of the appeal, either legal or technical, and all supporting documentation. The Director will provide a written statement of EPA's decision reached with respect to the dispute in question. Prior to issuing the decision, the Director shall provide the Respondent with an opportunity to meet with the Director.

66. Following resolution of the dispute, as provided by this Section, Respondent shall fulfill the requirement that was the subject of the dispute in accordance with the agreement reached or with EPA's decision, whichever occurs. No EPA decision made pursuant to this Section shall constitute a final agency action giving rise to judicial review.

XVIII. STIPULATED PENALTIES

67. For each day that Respondent fails to complete a designated deliverable in a timely manner, fails to produce a designated deliverable of acceptable quality to EPA, or otherwise fails to perform in accordance with the requirements of this Order, Respondent shall be liable for stipulated penalties in accordance with this section. Penalties for late submittals shall accrue from the due date and extend until received. EPA will provide written notice for violations that are not based on timeliness. Penalties for violations that are not based on timeliness shall accrue from the date of Respondent's receipt of the written notice indicating the violation has occurred and extend through the period of correction. Where a revised submission by Respondent is required, stipulated penalties shall accrue from receipt of notice until a satisfactory deliverable is produced. Payment shall be due within thirty (30) days after receipt of a demand letter from EPA unless dispute resolution is invoked in accordance with Paragraph 72 below.

68. Respondent shall pay interest on the unpaid balance, which shall begin to accrue at the end of the thirty (30) day period, at the rate established by the Department of Treasury pursuant to 31 U.S.C. § 3717. Respondent shall further pay a handling charge of one (1) percent, to be assessed at the end of each thirty-one (31) day period, and a six (6) percent per annum penalty charge, to be assessed if the penalty is not paid in full within ninety (90) days after it is due.

69. Respondent shall make all payments by forwarding a check to:

Mellon Bank
EPA-Region 10 ATTN: Superfund Accounting
P.O. Box 360903M
Pittsburgh, Pennsylvania 15251

Checks should state the name of the Site, the Site identification number (102J), and the title and docket number of this Order. A copy of the check and accompanying transmittal letter shall be forwarded to the EPA OSC.

70. For the submission of draft and revised major deliverables described in Paragraphs 30 and 31 of this Order, stipulated penalties shall accrue in the amount of $500.00 per day, per violation, for the first seven (7) days of noncompliance; $750.00 per day, per violation, for the eighth (8th) through fourteenth (14th) day of noncompliance; $1,500.00 per day, per violation, for the fifteenth (15th) day through the thirtieth (30th) day; and $3,000.00 per day, per violation, for the thirtieth (30th) day and beyond.

71. For the monthly progress reports, and for any failure to perform in accordance with the requirements of this Order, stipulated penalties shall accrue in the amount of $250.00 per day, per violation, for the first seven (7) days of noncompliance; $500.00 per day, per violation, for the eighth (8th) through fourteenth (14th) day of noncompliance; $1,000.00 per day, per violation, for the fifteenth (15th) day through the thirtieth (30th) day; and $2,000.00 per day, per violation, for the thirtieth (30th) day and beyond.

72. Respondent may dispute EPA's right to the stated amount of penalties or interest thereon by invoking the dispute resolution procedures under Section XVII herein. Penalties shall accrue but need not be paid during a properly invoked dispute resolution period.

However, stipulated penalties shall not accrue with respect to a decision by the Director of the Office under Paragraph 65 above during the period, if any, beginning on the 21st day after the date that Respondent's written appeal is received until the date that the Director issues a final decision regarding such dispute. In any such appeal if Respondent does not prevail it may ask the Director to waive penalties that accrued during the Director's consideration of the appeal. If Respondent prevails upon resolution, no penalties or interest shall be paid.

73. In the event EPA provides for corrections to be reflected in the next deliverable and does not require resubmission of the initial deliverable, stipulated penalties, if any, on the initial deliverable shall cease to accrue on the day of such decision by EPA and will be payable in accordance with Paragraph 67 of this Order. Stipulated penalties, if any, for alleged failure to produce a deliverable of acceptable quality as an initial submission of that deliverable shall accrue from receipt of notice until the resubmission is approved by EPA in accordance with Paragraph 67 of this Order.

74. The stipulated penalties provisions of this Order do not preclude EPA from pursuing any other remedies or sanctions which are available to EPA because of the Respondent's failure to comply with this Order, including but not limited to conduct of all or part of the removal action by EPA. EPA will elect to assess either stipulated or statutory penalties for any given violation of this Order. EPA reserves its right to seek treble damages for work it may perform as provided by Section 107(c)(3) of CERCLA. If EPA elects to assess

statutory penalties, EPA and Respondent agree that the procedures in 40 C.F.R. Part 22 shall govern the assessment and judicial review of such penalties. Payment of stipulated or statutory penalties does not alter Respondent's obligation to complete performance under this Order.

XIX. FORCE MAJEURE

75. Force majeure, for purposes of this Order, is defined as any event arising from causes beyond the control of Respondent or any entity controlled by Respondent, including Respondent's agents, consultants, contractors and subcontractors, which delays the timely performance of any obligation under this Order notwithstanding Respondent's best efforts to avoid such delay. The requirement that Respondent use best efforts to avoid the delay includes using best efforts to anticipate potential force majeure events and using best efforts to address the effects of any force majeure event: (1) as it is occurring; and (2) following the potential force majeure event, such that the delay is minimized to the greatest extent practicable. Increased costs or expenses of any work to be performed under this Order, or the financial difficulty of Respondent to perform any such work shall not constitute force majeure events.

76. If any event occurs or has occurred which may delay the performance of any obligation under this Order, regardless of whether caused by a force majeure event, Respondent shall verbally notify the EPA OSC or, in his or her absence, the Unit Manager of the Emergency Response Unit, EPA Region 10, within forty-eight (48) hours after Respondent knew that any event would cause a delay. Within seven (7)

days thereafter, Respondent shall provide in writing the reasons for the delay; the anticipated duration of the delay; all actions taken or to be taken to prevent or minimize the delay; a schedule for the implementation of any measures to be taken to mitigate the effect of the delay; and a statement as to whether Respondent believes the event may cause or contribute to an endangerment to public health, welfare or the environment. Respondent shall exercise best efforts to avoid or minimize any delay and any effects of any delay. Failure to comply with the above requirements shall preclude Respondent from asserting any claim of force majeure.

77. If EPA agrees that the delay or anticipated delay is attributable to force majeure, the time for performance of the obligations under this Order that are directly affected by the force majeure event shall be extended by EPA for a period not to exceed the actual duration of the delay attributed to the force majeure event. An extension of the time for performance of the obligation directly affected by the force majeure event shall not extend the time for performance of any other unrelated obligations.

78. If EPA does not agree that the delay or anticipated delay has been or will be caused by a force majeure event, or does not agree with Respondent as to the appropriate length of any extension due to force majeure, the issue shall be subject to the dispute resolution procedures set forth in Section XVII of this Order. In dispute resolution, Respondent shall have the burden of demonstrating by a preponderance of the evidence that the delay or anticipated delay has been or will be caused by a force majeure event, that the duration of

the delay was or will be warranted under the circumstances, that Respondent did exercise or is exercising due diligence by using its best efforts to avoid and mitigate the effects of the delay, and that Respondent has complied with all of the requirements of Paragraph 74 above.

79. Should Respondent establish the existence of a force majeure event, the delay at issue shall not be deemed to be a violation of, or non compliance with, the affected obligation(s) of this Order.

XX. REIMBURSEMENT OF RESPONSE AND OVERSIGHT COSTS

80. Respondent shall reimburse EPA for all response costs paid or incurred but not yet paid by the United States in connection with this removal action prior to the effective date of this Order. Following the issuance of this Order, EPA shall submit to the Respondent on a periodic basis an accounting of all response costs incurred by the United States with respect to this Order. Response costs may include, but are not limited to: costs incurred by the United States in drafting, reviewing, and/or negotiating this Order, the SOW, and the Work Plan; overseeing Respondent's implementation of the requirements of this Order; or activities performed by the United States as part of the removal action, including any costs incurred to obtain access, conduct community relations. Additionally, costs shall include all direct and indirect costs with respect to this Order, including but not limited to, time and travel costs of EPA personnel and associated indirect costs, contractor costs, cooperative agreement

costs, compliance monitoring, including the collection and analysis of split samples, inspection of removal activities, Site visits, discussions regarding disputes that may arise regarding this Order, review and approval or disapproval of submissions, and costs of doing or redoing any of Respondent's tasks. Summaries, including EPA's certified Agency SCORES Reports, or such other summary as certified by EPA, shall serve as the basis for the payments. Within ten (10) days of receipt of an EPA summary, Respondent may request supporting documentation from EPA substantiating the costs sought by EPA.

81. Respondent shall within thirty (30) days of receipt of the bill or receipt of supporting documentation, if requested pursuant to Paragraph 80, above, remit a certified or cashier's check for the amount of those costs. Interest shall accrue on the unpaid balance from the date of receipt of the bill. The interest rate shall be the rate of interest on investments for the Hazardous Substances Superfund in Section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

82. Checks in payment of Response and Oversight Costs should be made payable to the Hazardous Substances Superfund and should state the name of the Site, the Site identification number (102J), and the title and docket number of this Order. Checks should be forwarded to:

Mellon Bank
EPA-Region 10 ATTN: Superfund Accounting
P.O. Box 360903M
Pittsburgh, Pennsylvania 15251

83. Copies of the transmittal letter and check should be sent simultaneously to the EPA OSC.

84. Disputes concerning EPA's payment demands shall be made and decided in accordance with Section XVII of this Order. Respondent

agrees to limit any disputes concerning costs to accounting errors an the inclusion of costs outside the scope of this Order or no authorized by statute. Respondent shall identify any contested cost and the basis of its objection in writing. All undisputed costs shal be remitted by Respondent in accordance with the schedule set fort above. Disputed costs shall be paid into an escrow account b Respondent while any such dispute is pending. Respondent bears the burden of establishing an EPA accounting error or the inclusion of an cost outside the scope of this Order or not authorized by statute. Interest shall accrue during any cost dispute.

XXI. RESERVATIONS OF RIGHTS AND REIMBURSEMENT OF OTHER COSTS

85. EPA reserves the right to bring an action against Respondent under Section 107 of CERCLA, 42 U.S.C. § 9607, for recovery of all response costs incurred by the United States which are not reimbursed by Respondent, including past costs, any costs incurred in the event that EPA performs the removal action or any part thereof, and any future costs incurred by the United States in connection with response activities under CERCLA at the Site, or the CB/NT Superfund Site. Respondent reserves the right to bring any claim under CERCLA or any other applicable law it may have against the United States or any department, agency, instrumentality, or representative thereof, for recovery of any and all response costs or damages paid or incurred by, or on behalf of, Respondent or others with respect to the ownership and/or operation of the Site or of the CB/NT Superfund Site (collectively the "Sites") or any portions thereof and/or the

generation, storage, treatment, handling, transportation, release or disposal of any hazardous substances on the Sites, or which may have come to be located on the Sites by, or on behalf of, the United States or any department, agency, instrumentality, or representative thereof; provided, however, this reservation of rights shall not apply to any claims against the United States based on any acts or omissions by EPA.

86. EPA reserves the right to bring an action against Respondent to enforce any provision or requirement of this Order or any requirement developed pursuant to this Order, to enforce the cost reimbursement requirements of this Order, and to collect stipulated penalties assessed pursuant to Section XVIII of this Order or to seek penalties pursuant to Section 109 of CERCLA, 42 U.S.C. § 9609 if stipulated penalties were not already assessed.

87. Except as expressly provided in this Order, each party reserves all rights, claims, privileges, and defenses it may have and nothing in this Order shall affect EPA's response, enforcement or other statutory and/or regulatory authority, including the right to perform response activities or to seek injunctive relief, stipulated penalties, or statutory penalties, and/or punitive damages.

88. Following satisfaction of the requirements of this Order, Respondent shall have resolved its liability to EPA for the work performed and response costs paid by Respondent pursuant to this Order. Respondent is not released from any liability, if any, for any past response costs or response actions taken beyond the scope of this Order regarding other removals, other operable units, pre-remedial

design, remedial design and remedial action of the Hylebos Waterway or any other problem area in the CB/NT Site, or any activities pursuant to Section 121(c) of CERCLA, 42 U.S.C. § 9621(c).

XXII. CONTRIBUTION PROTECTION

89. With regard to claims for contribution against Respondent or its affiliates for matters addressed in this Order, the Parties hereto agree that Respondent and its affiliates are entitled to protection from contribution actions or claims to the fullest extent provided by section 113(f)(2) of CERCLA, 42 U.S.C. Sections 9613(f)(2). Nothing in this Order precludes the United States from asserting any claims, causes of action or demands against any persons not parties to this Order (except for Respondent's affiliates) for indemnification, contribution, or cost recovery. Nothing in this Order precludes Respondent from asserting any claims, causes of action or demands against any persons not parties to this Order for indemnification, contribution or cost recovery.

XXIII. DISCLAIMER

90. By signing this Order and taking actions under this Order, Respondent neither admits nor denies the Introduction's statements, the EPA Findings of Fact or the EPA Conclusions of Law and Determinations. Furthermore, Respondent's execution of and activities under this Order shall not be considered an admission of liability and is not admissible as evidence against it in any

judicial or administrative proceeding other than a proceeding by EPA or the United States to enforce this Order or any judgment relating to it. Respondent retains its right to assert claims against other potentially responsible parties and other persons with respect to the Site, and the CB/NT Superfund site. However, Respondent agrees not to contest the validity of this Order, or the procedures underlying or relating to it, in any action brought by the United States, including EPA, to enforce its provisions.

XXIV. OTHER CLAIMS

91. In entering into this Order, Respondent waives any right to seek reimbursement under Section 106(b) of CERCLA, 42 U.S.C. § 9606(b) for work covered by this Order. Respondent also waives any right to present a claim under Sections 111 or 112 of CERCLA, 42 U.S.C. §§ 9611, 9612 for work covered by this Order. Respondent further waives all other statutory and common law claims against EPA, including, but not limited to, contribution and counterclaims, relating to or arising out of conduct of the removal action. This Order does not constitute any decision on preauthorization of funds under Section 111(a)(2) of CERCLA, 42 U.S.C. § 9611(a)(2).

92. Nothing in this Order shall constitute or be construed as a covenant not to sue or release from any claim, cause of action or demand in law or equity against any person, firm, partnership, subsidiary or corporation not a signatory to this Order (other than Respondent's affiliates), including agencies of the United States other than EPA, for any liability it may have arising out of or relating in any way to the generation, storage, treatment,

handling, transportation, release, or disposal of any hazardous substances, pollutants, or contaminants at, from, or taken to the Site.

93. Respondent shall not seek to recover any costs or attorneys fees from EPA with regard to any matter connected with implementation of this Order.

XXV. FINANCIAL ASSURANCE, INSURANCE, AND INDEMNIFICATION

94. Respondent shall establish and maintain financial security for performance of the work and any other obligations required under this Order. Within thirty (30) days after the effective date of this Order and on the anniversary date of this Order thereafter until this Order is terminated under Paragraph 100 below, Respondent shall establish and maintain financial security in one or more of the following forms: (a) A surety bond guaranteeing performance of the work; (b) one or more irrevocable letters of credit equaling the total estimated cost of the work; (c) a trust fund; (d) a guarantee to perform the work required under this Order by a direct or indirect parent corporation. EPA acknowledges that a corporate guarantee from any of Respondent's parent corporations would be an acceptable financial assurance mechanism, if it can meet the requirements for a corporate guarantee under 40 C.F.R. Section 264.143.

a. Prior to commencement of any work under this Order, Respondent shall secure, and shall maintain in force for the duration of this Order, and for two (2) years after the completion

of all activities required by this Order, Comprehensive General Liability ("CGL") and automobile insurance, naming as an additional insured the United States. The CGL insurance shall include Contractual Liability Insurance in the amount of $ 1 million per occurrence, and Umbrella Liability in the amount of $2 million per occurrence.

b. For the duration of this Order, Respondent shall satisfy, or shall ensure that its contractors or subcontractors satisfy, all applicable laws and regulations regarding the provision of employer's liability insurance and workmen's compensation insurance for all persons performing work on behalf of the Respondent, in furtherance of this Order.

c. If Respondent demonstrates by evidence satisfactory to EPA that any contractor or subcontractor maintains insurance equivalent to that described above, or with respect to that contractor or subcontractor Respondent need provide only that portion of the insurance described above which is not maintained by the contractor or subcontractor.

d. Prior to commencement of any work under this Order, and annually thereafter on the anniversary of the effective date of this Order, Respondent shall provide to EPA certificates or declarations of such insurance.

95. At least seven (7) days prior to commencing any work under this Order, Respondent shall certify to EPA that the required insurance has been obtained by that contractor.

96. The Respondent agrees to indemnify and hold the United

States Government, its agencies, departments, agents, and employees harmless from any and all claims or causes of action arising from or on account of acts or omissions of Respondent, its employees, agents, servants, receivers, successors, or assignees, contractors, subsidiaries and parent company and its employer agents, and servants in carrying out activities under this Order provided that this Order shall not indemnify nor hold harmless the United States or any Department, agency, instrumentality, or representative thereof which may have liability or responsibility under CERCLA for any generation, storage, treatment, handling, transportation, release or disposal of any hazardous substance on the Site or which may have come to be located on the Site by them or on their behalf. The United States Government or any agency or authorized representative thereof shall not be held as a party to any contract entered into by Respondent in carrying out activities under this Order.

XXVI. EFFECTIVE DATE AND SUBSEQUENT AMENDMENT

97. The effective date of this Order shall be the date it is signed by EPA. Except when expressly stated otherwise herein, all time periods referred to in this Order shall be construed as calendar days, rather than business or working days. Any time period scheduled to begin on the occurrence of an act or event shall begin on the day after the act or event. If the final day of any time period falls on a Saturday, Sunday, or legal holiday, the time period shall be extended to the next regular business day.

98. In addition to the procedures set forth elsewhere in this Order, this Order may be amended by agreement between EPA and Respondent. Amendments shall be in writing and shall be effective when signed by EPA. EPA OSCs do not have the authority to sign any amendment to this Order.

99. No informal advice, guidance, suggestions, or comments by EPA regarding reports, plans, specifications, schedules, or any other writing submitted by Respondent will be construed as relieving Respondent of its obligation to obtain such formal approval as may be required by this Order. Any deliverables, plans, technical memoranda, reports (other than monthly progress reports) specifications, schedules and attachments required by this Order or developed pursuant to this Order, are, upon approval by EPA, incorporated in, and made an enforceable part of, this Order by this reference.

XXVII. TERMINATION AND SATISFACTION

100. This Order shall terminate when either: (1) Respondent demonstrates in writing and certifies to the satisfaction of EPA that all activities required by this Order, including any additional work pursuant to paragraph 40, payment of all costs subject to reimbursement under Section XX, and any stipulated penalties demanded by EPA pursuant to Section XVIII and upheld after dispute resolution, if any, have been performed, and EPA has approved the certification set forth in Paragraph 101, below; or

(2) the obligation for any remaining work required by this Order is assumed under a different agreement with EPA that is in full force and effect. Section XXII (Contribution Protection) and Respondent's obligation to comply with Sections XVI (Record Preservation), XX (Reimbursement of Response and Oversight Costs), and XXI (Reservations of Rights and Reimbursement of Other Costs), of this Order shall remain in full force and effect without time or other limitation.

101. The following certification shall be signed by a responsible official on behalf of Respondent:

> In accordance with 28 U.S.C. § 1746, I certify under penalty of perjury under the laws of the United States that to the best of my knowledge, after appropriate inquires of all relevant persons involved in the preparation of information contained in and accompanying this certification, the information contained in and accompanying this certification is true, accurate, and complete. Dated this __ day of _____, 199_.

For purposes of this Order, a responsible official is a corporate official in charge of a principal business function.

IT IS SO ORDERED, this 6 day of NOVEMBER, 1997

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

By: _____

Chris Field, Manager
Emergency Response/Site Cleanup
Unit 1
EPA Region 10

RESPONDENT hereby consents to the issuance of this ORDER, and agre to abide by each and every provision herein, and to perform each and every task or requirement herein.

BY: Keith C. McDole
Title: Sr. Vice President and Secretary

DATE: October 30, 1997

Amendment
Administrative Order On Consent For Removal Activities Embankment and Area 5106
EPA Docket No. 10-97-0011-CERCLA

Occidental Chemical Corporation ("Occidental"), the United States Environmental Protection Agency ("EPA"), and the Washington Department of Ecology ("Ecology") agree to amend the Administrative Order on Consent for Removal Activities Embankment and Area 5106, EPA Docket No. 10-97-0011-CERCLA ("AOC") pursuant to Paragraph 98 of the AOC as follows.

This amendment reflects agreement amongst EPA, Ecology, and Occidental that A) additional site characterization needs to be conducted, both in upland areas and beneath the Hylebos Waterway, to adequately determine the nature and extent of soil, ground water, surface water, and sediment contamination; B) feasible alternatives to address remaining contamination of all media need to be developed and evaluated; and C) an integrated remedy or set of remedies needs to be selected and designed which will satisfy EPA and Ecology requirements under CERCLA, MTCA, and RCRA. Accordingly, the attached SOW includes the CERCLA remedial process elements of RI/FS, RD, and interim response actions.

1. Pursuant to Paragraph 40 of the AOC, Occidental shall implement the attached Statement of Work ("SOW"). The SOW is attached to this Amendment as Attachment A and and provides for environmental investigation, alternatives analyses, interim response actions to address pH contaminated groundwater, response action selection, and remedial design. All work plans, schedules and other tasks required by the SOW shall be performed pursuant to the terms and conditions of the AOC and subject to approval by EPA and/or Ecology. In addition, all work plans, schedules and other tasks required by the SOW shall be conducted consistent with the Model Toxics Control Act ("MTCA"), Resource Conservation and Recovery Act ("RCRA"), and the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA").

2. EPA and Ecology have entered into a Memorandum of Understanding ("MOU") that provides a framework for coordination and cooperation between the two agencies. The MOU designates the "lead agency" for particular activities that will be performed pursuant to this Amendment, and explains how decision-making responsibilities will be allocated. EPA and Ecology expect that implementation and oversight of this Amendment will be consistent with the MOU. Nothing in this Amendment is intended to provide Occidental or any other third-party with any rights or obligations regarding the MOU.

3. Until the AOC, as amended, is superceded by another legal mechanism (e.g., a consent decree) requiring implementation of recommended alternatives to be developed under the SOW, Occidental shall continue to maintain and operate the Groundwater Treatment System according to the current Corrective Action Plan

and current Corrective Action Monitoring Plan which has been developed under the expired RCRA permit No. WAD00924314. Occidental shall continue to monitor and report hydraulic responses of injection and extraction wells according to the procedures and schedule specified in the Corrective Action Monitoring Plan. Occidental shall continue to redevelop or replace injection and extraction wells with new wells as necessary according to the criteria specified in the Corrective Action Monitoring Plan.

4. The definition of the Site contained in Paragraph 1 of the AOC shall be changed to the following:

> The Site shall mean that portion of segment 5 of the Mouth of the Hylebos Waterway Problem Area and those portions of the upland properties described in the next sentence where Waste Materials have or may come to be located as a result of releases or threatened releases of Waste Materials from operations related to the production, processing, formulation or disposal of chemical materials or products. Accordingly, the Occidental Site shall include, but not be limited to the following: Area 5106; the Occidental Embankment Area; the Pioneer Property located at 605 Alexander Avenue; locations of groundwater contaminant plumes and contaminated sediments on the Port of Tacoma property located at 401 Alexander Avenue to the north of the Pioneer Property; locations of contaminated sediments and groundwater contaminant plumes on the Mariana Properties property located at 709 Alexander Avenue and the Port of Tacoma property located at 721 Alexander Avenue to the south of the Pioneer Property; and other areas of Segment 5 of the Mouth of the Hylebos Waterway Problem Area where releases of Waste Materials from such properties have come to be located and those areas necessary to stage or implement related work. The Occidental Site does not include the release of total petroleum hydrocarbon, BTEX or other constituents of concern from petroleum product storage operations currently or historically located on the 709 Alexander Avenue property or 721 Alexander property which has been identified in shallow groundwater underlying the 709 Alexander Avenue property or the 721 Alexander property and determined to be moving towards the Blair Waterway. Attachment B to this Amendment is a map that generally depicts the Site.

5. Ecology shall be added as a party to the AOC. Ecology shall have the authority to enforce the terms and conditions of the AOC as appropriate as such relate to the work performed pursuant to this Amendment. The terms and condition of the AOC applicable to EPA shall be applicable to Ecology.

6. Consistent with Section XVIII of the AOC ("Stipulated Penalties"), Ecology shall also have the authority to assess and collect stipulated penalties . However, in no event will Occidental be required to pay duplicative stipulated penalties to EPA

and Ecology. Payments of stipulated penalties owed, if any, to the State shall be mailed to the Department of Ecology, Cashiering Section, P.O. Box 5128, Lacey, WA 98509-5128.

7. Consistent with Section XX of the AOC ("Reimbursement of and Oversight Response Costs"), Occidental shall also reimburse the State for all response costs paid or incurred by the State in connection with this Amendment. Occidental shall pay the required amount of such response costs within thirty (30) days of receiving from Ecology an itemized statement of such costs that includes a summary of costs incurred, an identification of involved staff, and the amount of time spent by involved staff members on the project. A general description of the work pertinent to such costs will be provided if requested by Occidental. Ecology will prepare and provide Occidental with itemized statements on a quarterly basis. In addition, within ninety (90) days of the effective date of this Amendment, Occidental shall pay the State $458,259.17 in reimbursement of response costs that the State has incurred in connection with the Occidental Site prior to June 30, 2004. Failure to pay response costs within thirty (30) days of receipt of the itemized statement will result in interest charges in accordance with WAC 173-340-550. All payments owed to the State pursuant to this Amendment will be sent to the Department of Ecology, Cashiering Section, P.O. Box 5128, Lacey, WA 98509-5128.

8. Consistent with Section XVII of the AOC ("Dispute Resolution"), in the event that Occidental objects to notification provided by or action undertaken by Ecology, the Section Supervisor for Hazardous Waste and Toxic Reduction for the Southwest Regional Office shall resolve the initial dispute related to such objection. Any subsequent and timely written appeal of such initial dispute decision shall be resolved by the Program Manager of Ecology's Hazardous Waste and Toxics Reduction Program.

9. The Unilateral Administrative Order (Area 5106), EPA Docket No. CERCLA 10-2002-0066 (the "UAO") is hereby terminated. Remaining additional response actions, required by EPA on March 25, 2003 under authority of the UAO, have been incorporated into the attached Occidental Site SOW. Occidental reserves any defenses it may have to any subsequent action brought by EPA, except for those based upon principles of waiver, res judicata, collateral estoppel, issue preclusion, claims-splitting, or other defenses based upon any contention that the claims raised by EPA in the subsequent proceeding are barred by the termination of the UAO

10. Ecology Enforcement Order DE 95TC-S242, issued to PRI Northwest, Inc. and Occidental Chemical Corporation, effective September 5, 1995, is held in abeyance until a consent decree or administrative order implementing the selected remedies for the Mariana property takes effect.

12. The AOC as modified by this Amendment contains the entire agreement between EPA, Ecology and Occidental. No statements, promises or inducements made by any party or its representatives that are not contained in this Amendment shall be valid or binding.

Occidental, EPA and Ecology have executed this document to signify their agreement to the foregoing effective as of the date of EPA's execution as set forth below. This agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one the same instrument.

AGREED for Occidental Chemical Corporation

By: Jo Ellen Drisko

Name: JO ELLEN DRISKO

Title: VICE-PRESIDENT

Date: 19 JANUARY 2005

AGREED for Washington Department of Ecology

By: _____

Name: _____

Title: _____

Date: _____

AGREED for United States Environmental Protection Agency

By: _____

Name: _____

Title: _____

Date: _____

11. Unless expressly modified by this Amendment, the terms and conditions of the AOC shall apply to all work or other activities required by the Amendment.

12. The AOC as modified by this Amendment contains the entire agreement between EPA, Ecology and Occidental. No statements, promises or inducements made by any party or its representatives that are not contained in this Amendment shall be valid or binding.

Occidental, EPA and Ecology have executed this document to signify their agreement to the foregoing effective as of the date of EPA's execution as set forth below. This agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one the same instrument.

AGREED for Occidental Chemical Corporation

By:_____

Name:_____

Title:_____

Date:_____

AGREED for Washington Department of Ecology

By: K Seiler

Name: K SEILER

Title: SWRO HWTR Section Manager

Date: 1/28/05

AGREED for United States Environmental Protection Agency

By:_____

Name:_____

Title:_____

Date:_____

11. Unless expressly modified by this Amendment, the terms and conditions of the AOC shall apply to all work or other activities required by the Amendment.

12. The AOC as modified by this Amendment contains the entire agreement between EPA, Ecology and Occidental. No statements, promises or inducements made by any party or its representatives that are not contained in this Amendment shall be valid or binding.

Occidental, EPA and Ecology have executed this document to signify their agreement to the foregoing effective as of the date of EPA's execution as set forth below. This agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one the same instrument.

AGREED for Occidental Chemical Corporation

By:_____

Name:_____

Title:_____

Date:_____

AGREED for Washington Department of Ecology

By:_____

Name:_____

Title:_____

Date:_____

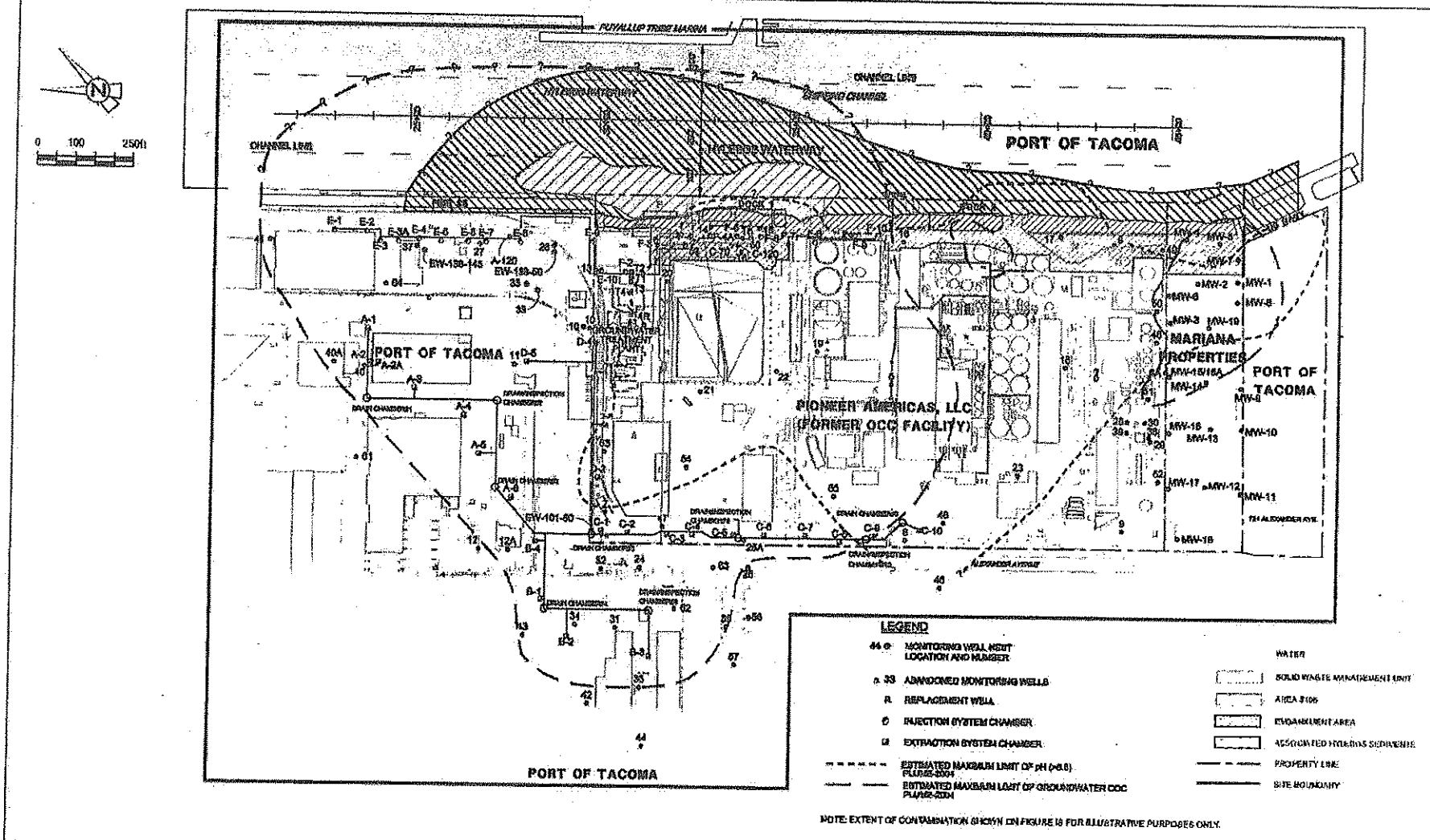
AGREED for United States Environmental Protection Agency

By: Sheila M Eckman

Name: Sheila M. Eckman

Title: Unit Manager, Environmental Cleanup Office

Date: 2/1/05



Appendix B

OCCIDENTAL SITE PLAN
GROUNDWATER AND SEDIMENT REMEDIATION
Occidental Chemical Corporation, Tacoma, Washington

04-0220 FigAppendix-B.ai 07843-00(059)GN-NF002 NOV 05/2004

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, WA 98101

01 FEB 2005

Reply To
Attn Of: ORC-158

Received
2/3/05
RFB

Robert F. Bakemeier
Bakemeier, P.C.
Island Corporate Center
7525 S.E. 24th Street
Suite 610
Mercer Island, WA 98040

Elliot Furst
Assistant Attorney General
Washington Attorney General's Office
2425 Bristol Court SW, 2nd Floor
P.O. Box 40117
Olympia, WA 98504-0117

Re: Occidental Site - AOC Amendment

Dear Robert and Elliot:

This letter transmits fully executed copies of the Amendment to Administrative Order on Consent for Removal Activities For Removal Activities Embankment and Area 5106, EPA Docket No. 10-97-0011-CERCLA (the "Amendment"). The Amendment became effective today.

The effective date of the Amendment triggers the start date for commencement of response actions required by the Statement of Work for the Administrative Order on Consent, Groundwater and Sediment Remediation ("SOW"). Table 10.1 of the SOW is the Milestone Schedule and identifies the delivery dates of required documents. The first document required by the SOW that has not yet been submitted to EPA or the Washington Department of Ecology is the draft SAP and QAPP. Pursuant to our conversation of this morning, this letter documents our agreement that the draft SAPP and QAPP is due three weeks from the effective date of the Amendment. Thus, Occidental is required to submit this document by February 22, 2005.

If you have any questions or comments regarding this letter, please give me a call at (206) 553-1218.

Sincerely,

Ted Yackulic
Assistant Regional Counsel

cc: Leon Wilhelm
Jonathan Williams

ROBERT F. BAKEMEIER
BAKEMEIER, P.C.

TELEPHONE: 206-230-0600
FACSIMILE: 206-230-0602
EMAIL: rfb@rfblaw.com

LAW OFFICE
A PROFESSIONAL CORPORATION

ISLAND CORPORATE CENTER
7525 S.E. 24TH STREET, SUITE 610
MERCER ISLAND, WASHINGTON 98040

February 8, 2005

F. Allen Meek, Jr.
Vice President of Operations
Glenn Springs Holdings, Inc.
2480 Fortune Drive, Suite 300
Lexington, KY 40509

Maury Wassmann
Glenn Springs Holdings, Inc.
709 Alexander Avenue
Tacoma, WA 98401

John R. Wheeler
Associate General Counsel
Occidental Chemical Corporation
Occidental Tower
P.O. Box 809050
Dallas, Texas 75380

Re: OxyChem – Former Tacoma Facility

Dear Al, Maury and John:

Enclosed for your files are the following materials that I have received from EPA regarding the recent amendment of the 1997 Administrative Order on Consent ("AOC") for the "Occidental Site" in Tacoma: (1) a letter dated February 1, 2005 from Ted Yackulic confirming that start date for the new Statement of Work ("SOW"); (2) a copy of the fully executed AOC Amendment; and (3) Appendix B to the AOC Amendment (the new "Occidental Site" map). Note that Appendix A to the AOC Amendment is the new SOW printed and previously distributed by CRA on January 28, 2005.

Very truly yours,

Robert F. Bakemeier

Enclosures

ATTACHMENT A

STATEMENT OF WORK
FOR THE ADMINISTRATIVE ORDER ON CONSENT

GROUNDWATER AND SEDIMENT REMEDIATION

OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

PRINTED ON:

JANUARY 12, 2005

TABLE OF CONTENTS

LIST OF FIGURES
(Following Report)

LIST OF TABLES
(Following Report)

GLOSSARY

AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
BA	Biological Assessment
BGS	Below Ground Surface
CAMP	Corrective Action Monitoring Plan
CB/NT	Commencement Bay Nearshore/Tideflats
CDF	Confined Disposal Facility
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLT	Column Leach Test
CWA	Clean Water Act
CMP	Compliance Monitoring Plan
COC	Constituent of Concern
CQAP	Construction Quality Assurance Plan
CRA	Conestoga-Rovers & Associates
DCE	Dichloroethene
Ecology	Washington Department of Ecology
EE/CA	Engineering Evaluation/Cost Analysis
Embankment Area	The area along Hylebos Waterway on the former OCC Facility and the Mariana Property, from 0 feet MLLW to about +18 feet MLLW and up to 100 feet inland
ESA	Endangered Species Act
ESD	Explanation of Significant Differences
Facility	The Former OCC Facility at 605 Alexander Avenue, Tacoma
FSAP	Field Sampling and Analysis Plan
GMP	Groundwater Monitoring Plan
GOMP	Groundwater Operation and Maintenance Plan
HASP	Health and Safety Plan
HCB	Hexachlorobenzene
HCBD	Hexachlorobutadiene
HCC	Hylebos Cleanup Committee
HDPE	High Density Polyethylene
HRC	Hydrogen Releasing Compounds
Mariana Property	The property at 709 Alexander Avenue, Tacoma, previously owned by PRI Northwest and now owned by OCC.
MLLW	Mean Lower Low Water

MTCA	Washington Model Toxics Control Act
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NMFS	National Marine Fisheries Service
OCC	Occidental Chemical Corporation
OCCT	OCC Tacoma, Inc.
OMP	Operation and Maintenance Plan
ORC	Oxygen Releasing Compounds
PCE	Tetrachloroethene
P&IDs	Process and Instrumentation Diagrams
Pioneer	Pioneer Americas, LLC
PRB	Permeable Reactive Barrier
PRD	Pre-Remedial Design
PRI	PRI Northwest, Inc.
PTTE	Preliminary Treatment Technology Evaluation
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
Remedial Level	Concentration to evaluate performance of a selected remedy according to MTCA regulations in WAC 173-340-200
RI/FS	Remedial Investigation/Feasibility Study
RFA	RCRA Facility Assessment
RFI-I	RCRA Facility Investigation
ROD	Record of Decision
RSE	Remedial System Evaluation
SAP	Sampling and Analysis Plan
SDI	Subtidal Discharge Investigation
SEPA	State Environmental Policy Act
SMS	Washington State Sediment Management Standards
SOW	Statement of Work for the Administrative Order on Consent
SPLP	Synthetic Precipitation Leaching Procedure
SQO	Sediment Quality Objective
SQS	Sediment Quality Standard
SVE	Soil Vapor Extraction
SVOC	Semi-Volatile Organic Compounds
TCE	Trichloroethene
UAO	Unilateral Administrative Order
Upland Area	Portion of the Site inland from the Embankment Area
USACE	US Army Corp of Engineers
USEPA	United States Environmental Protection Agency

VC	Vinyl Chloride
VOC	Volatile Organic Compounds
Waterway	Hylebos Waterway
WMU	Waste Management Unit
WQC	Water Quality Criteria
WES	USACE Waterway Experiment Station

1.0 INTRODUCTION

1.1 GENERAL

Occidental Chemical Corporation (OCC) has been working with the United States Environmental Protection Agency (USEPA) and the Washington Department of Ecology (Ecology) since the late 1970s to address environmental issues associated with the historic operations at the former OCC Facility (Facility), located at 605 Alexander Avenue in Tacoma, Washington. To date, work performed by OCC to address the impacts to groundwater, surface waters and sediments at the Occidental Site (Site) under USEPA oversight, includes investigations, feasibility studies, alternative evaluations, treatability and pilot studies, remedial design and construction, and monitoring activities (see Section 2.0).

Until recently the remedial activities at the Site have been performed as separate removal actions or corrective actions. It has become evident to USEPA, Ecology, and OCC that the remaining environmental issues at the Site are interrelated and therefore should be integrated under a single Administrative Order on Consent (AOC). This "Statement of Work for the Administrative Order on Consent" (SOW) outlines the work activities that OCC will perform to address the remaining environmental issues at the Site and is organized as follows:

i) Section 1.0 – Introduction: provides the general introduction, purpose, scope, site description and organization of the project;

ii) Section 2.0 – Summary of Work Performed to Date: provides a comprehensive summary of the remedial activities performed at the Site under previous administrative mechanisms;

iii) Section 3.0 – Summary of Current Site Conditions: provides a summary of current site conditions to provide the overall context and focus of the future work activities described in Sections 5.0 through 9.0;

iv) Section 4.0 - Remedial Objectives and Performance Standards: provides the remedial objectives, performance standards and Applicable or Relevant and Appropriate Requirements (ARARs) for the remedial actions;

v) Section 5.0 – Site Characterization: describes the specific tasks that OCC will perform to implement supplemental field investigations and prepare a characterization report;

vi) Section 6.0 – pH Source Control: describes the specific tasks that OCC will perform to design, evaluate, pilot test and implement interim pH source control measures at the Site;

vii) Section 7.0 – Groundwater Remediation: describes the specific tasks that OCC will perform to evaluate remedial alternatives and design a selected remedial action(s) for the groundwater at the Site;

viii) Section 8.0 – Sediment Remediation: describes the specific tasks that OCC will perform to evaluate remedial alternatives and design selected remedial action(s) for the Embankment Area, Area 5106 and the associated Hylebos sediments;

ix) Section 9.0 – 3D Groundwater Flow Modeling: describes the specific tasks that will be performed to develop and calibrate a 3D groundwater flow model for the evaluation of groundwater and sediment remedial alternatives; and

x) Section 10.0 – Schedule: provides the milestone schedule for submitting deliverables required under this SOW.

xi) Section 11.0 – Electronic Data Submittal: describes the requirements for submittal of data to Ecology and USEPA in electronic format.

In this SOW, north will be considered to be "plant north", or true northwest; that is, parallel to the Hylebos Waterway (Waterway), and toward its mouth.

1.2 PURPOSE AND SCOPE

The purpose of this SOW is to set forth the requirements for investigation and characterization of the Site and the evaluation, selection, and design of the remedial actions that OCC is required to perform under the AOC for Groundwater and Sediment Remediation. This SOW addresses all investigation, characterization, evaluation, and design of new remedial activities and/or projects previously designated as removal actions or corrective actions, including:

i) Groundwater Remediation – investigation, characterization, evaluation and design of selected remedial action(s) for impacted groundwater at the former OCC Facility located at 605 Alexander Avenue [now owned by Pioneer Americas, LLC (Pioneer)] and adjacent properties including the 721 Alexander property owned by the Port of Tacoma and U.S. Navy.

ii) Embankment Area Removal Action – investigation, characterization, evaluation and design of selected remedial action(s) for the impacted intertidal sediments along the embankment located at the former OCC Facility and at 709 Alexander Avenue (now owned by Mariana Properties, Inc.).

iii) Area 5106 Removal Action – investigation, characterization, dredging, treatment and dewatering of Area 5106 Sediment for placement in the Nearshore Confined Disposal (NCD) Facility located at the Port of Tacoma's "Slip 1", and the investigation, characterization, evaluation and design of selected additional response actions.

iv) Associated Hylebos Sediments – investigation, characterization, evaluation and design of selected remedial action(s) for intertidal and subtidal Hylebos Waterway sediments at the Site.

This SOW presents the specific requirements for the integration of the above (previously separate) projects.

1.3 SITE DESCRIPTION

The following subsections present a general description of the Site.

1.3.1 LOCATION

The Site is located in the Commencement Bay tideflats area on the peninsula between the Hylebos and Blair Waterways. The Site is comprised of the properties located at 605 and 709 Alexander Avenue in Tacoma, Washington as well as portions of the adjacent Port of Tacoma properties to the north, south, and west. The Site is bounded on the west, north and south by property owned by the Port of Tacoma or U.S. Navy, and on the east by the Hylebos Waterway (Waterway).

The Site location map is presented on Figure 1.1. Site plans for the groundwater and sediment remediation areas are presented on Figures 1.2 and 1.3, respectively. The Site is defined to include areas beyond the former OCC facility boundaries where waste materials associated with past OCC operations are known or suspected to have been released. This includes soil, ground water, sediment, and surface water. The boundaries shown on figure 1.2 and 1.3 are approximate, based upon existing information, and subject to change as new information becomes available.

1.3.2 PROPERTY OWNERSHIP

Prior to 1920, the properties which comprise the Site were undeveloped tidal mudflat. Between 1920 and 1936, the area was filled with approximately 16 feet of dredge material, primarily sand, as part of an upland expansion project.

Pioneer Americas, LLC currently owns the Facility, having acquired it from OCC in June 1997. A predecessor of OCC began operations on the property in 1929 and acquired additional adjacent parcels over time. Other owners and/or operators of all or a portion of the Facility have included Hooker-Detrex Corporation, the United States Navy, Todd Shipyards, and the Defense Plant Corporation.

OCC Tacoma, a wholly owned subsidiary of OCC, acquired the Mariana property from PRI Northwest, Inc. in 1997. In 2001, OCC Tacoma merged back into OCC and the property was conveyed to Mariana Properties, an affiliate of OCC. Previous owners of the Mariana property included Fletcher Oil which acquired it in 1938 from Norton and Mary Clapp. Tesoro Petroleum, Inc. and United Independent Oil Company, Inc. also leased portions of the Mariana property in the 1970's.

1.3.3 LAND USE

The Site is located in the industrial tideflats area of Tacoma, Washington. The zoning of the properties which comprise the Site is "S-10", Port Industrial Shoreline District, "M-3", Heavy Industrial District, and "PMI", Port Maritime Industrial. Restrictive covenants restricting land use on the Facility to non-residential industrial use are contained and set forth in the Quit Claim Deed (Corrected) recorded on April 28, 1997 in the records of the Pierce County Auditor (Recording No. 9704280734). Pertinent property owned by the Port of Tacoma is the subject of a restrictive covenant recorded on May 5, 2003 in the records of the Pierce County Auditor (Recording No. 200305050452) that prohibits groundwater extraction, supply or use for drinking or other human consumption or domestic use of any kind.

The nearest residential properties are approximately 1 mile to the east, on the bluff across the Waterway from the Facility, 3/4 mile across the Waterway to the northeast, and approximately 3 miles to the south.

Currently, the Facility is owned and operated by Pioneer Americas, LLC as a liquid caustic storage and transfer facility. The Mariana property is currently used for the offices of Glenn Springs Holdings, Inc.

1.3.4 SURFACE CHARACTERISTICS

Surface cover on the Site primarily consists of asphalt paving and buildings. Areas of gravel or vegetative cover are also present. The surface characteristics of the Site are shown on Figure 1.4.

1.3.5 HISTORICAL PROCESSES

The historic processes conducted at the Facility included:

Process	*Period of Operation*
Chlorine/Caustic Soda	1929 to 2002
Sodium Hypochlorite	1974 to 1992
Trichloroethene/Tetrachloroethene (TCE/PCE)	1947 to 1973
Ammonia	1952 to 1992
Muriatic Acid	1936 to 2002
Calcium Chloride	1964 to 2002
Fish Oils Hydrogenation	1939 to 1952
Aluminum Chloride	1942 to 1945
Sodium Aluminate	1959 to 1960

The locations and descriptions of the processes are shown on Figure 1.5.

Historic activities conducted on the Mariana property included the operation of:

i) a bulk petroleum fuel storage and distribution terminal between the 1930s and 1980s;
ii) a tetraethyl lead plant, blending lead with gasoline in the late 1970s and early 1980s; and
iii) a topping plant for crude oil distillation in the 1970s and early 1980s.

Historic activities conducted on the 721 Alexander property included the operation of a fuel distribution depot and bulk petroleum storage depot from 1936 through 1965 and as

a petroleum storage facility from 1966 through 1983. Since 1983 the property has been used as a materials storage yard.

1.3.6 WASTE MANAGEMENT UNITS

Seventeen Waste Management Units (WMUs) were historically located on the Facility. The locations of the WMUs and the chemicals associated with them are shown on Figure 1.6.

WMUs are not known to have been present on the Mariana Property. However, storage tanks and transfer facilities were present. Above-ground petroleum storage tanks were cleaned in 1989 and all tanks were removed from the property by 1997. Structures associated with the topping plant were removed in 1985. Solid wastes associated with the Facility's former N Landfill may have extended onto the Mariana property in the berm area along the Waterway at the east end of the property.

1.4 PROJECT ORGANIZATION

The SOW will be implemented by OCC under the administrative oversight of the USEPA and Ecology. Conestoga-Rovers & Associates (CRA), OCC's technical consultant, will be responsible for the site investigations, engineering evaluations, design, construction, and monitoring required for the remedial actions. A project organizational chart is presented on Figure 1.7.

2.0 SUMMARY OF WORK PERFORMED TO DATE

The following sections provide a summary of the remedial activities performed at the Site by OCC under previous administrative mechanisms.

2.1 GROUNDWATER REMEDIATION

The RCRA Facility Investigation (RFI) and groundwater remedy selection for the Facility were conducted pursuant to the requirements of the Joint Permit for the Storage of Dangerous Waste (Permit), WAD009242314, dated November 1988. USEPA and Ecology jointly administered the Permit. A RCRA Facility Assessment (RFA) was completed by USEPA and reported in February 1988 in a memorandum from C. Massimino (USEPA) to File and copied to S. Robb of Ecology. The RFA concluded that hazardous constituents were released from past WMUs and that a Facility-wide RCRA Facility Investigation (referred to as RFI-I) was required to define the nature and extent of impacted groundwater for the development of a corrective action program.

Based on the RFI-I, the Permit was modified to include the basic requirements for the groundwater remediation system. These requirements and the Permit condition in which they are contained included:

i) the type of system (V.D.1);
ii) performance criteria (V.D.1. i through iii);
iii) design parameters (V.D.2 through V.D.7);
iv) quality of injection water (V.D.10, modified August 26, 1996); and
v) groundwater cleanup standards (Tables 8 or 9 of the Permit).

The groundwater COCs included in the Permit were developed based on analyses of Appendix IX parameters in groundwater samples as described in the memorandum from C. Massimino (USEPA) to File dated April 1988.

Subsequently, OCC designed and constructed a groundwater remediation system consisting of groundwater extraction, treatment and injection. OCC has operated the system and monitored its performance in accordance with the Correction Action Plan (CAP) and Corrective Action Monitoring Plan (CAMP) since 1996. The CAMP has historically utilized potentiometric surface maps, drawn using monitoring data from monitoring wells as well as injection and extraction wells, to evaluate the effectiveness of

the hydraulic barrier to prevent upland contaminated ground water from discharging into the Waterway. Until recently, the quality of subtidal sediments located waterward of the injection system had not been evaluated, and subtidal samples of groundwater discharging into the Waterway had not been taken.

The performance of the groundwater remediation system has been evaluated annually in accordance with the requirements of the CAMP. Some limited modifications to the system and/or its operating parameters have been implemented based on these performance evaluations. In 2003, a contractor (Geotrans) retained by USEPA's RCRA program conducted a Remedial System Evaluation that suggested modifications to the existing system including modifications to the methods used to monitor its performance.

Between May 1996 and February 2004, approximately 68,000 pounds of chlorinated organic chemical mass have been removed through the operation of the groundwater remediation system. OCC has not estimated the total mass of chlorinated organic chemicals released to the environment.

2.1.1 HISTORIC PROCESSES AND CLOSURES

The TCE/PCE process, which ceased operation in 1973, was dismantled in 1979. In 1980 and 1981, after the decommissioning of the TCE/PCE process, an extensive soil sampling and analytical program was conducted to delineate the extent of soil in the vadose zone containing chlorinated organics at concentrations greater than 150 milligrams per kilogram (mg/kg). These soils were excavated in 1981 and disposed of off-Site. The analytical data from soil analyses in this area were previously submitted to USEPA/Ecology and were most-recently summarized in the "Draft Work Plan, Focused Remedial Investigation/Feasibility Study" dated August 2002.

Approximately 1,850 cubic yards (cy) of soil were removed from the areas shown on Figure 2.1 as "approximate limit of excavated area" during this program. The excavation was backfilled with clean soil. The excavation project was conducted under the oversight of Ecology. Ecology field inspection reports are presented in the letter from J. Oberlander (Ecology) to L. Feller (OCC) dated June 16, 1981. Additional soils were removed from the TCE/PCE process area and disposed off-site in 1993/1994 during the construction of the groundwater treatment plant.

2.1.2 WASTE MANAGEMENT UNITS AND CLOSURES

Prior to and subsequent to the RFI-I, OCC identified and characterized the WMUs at the facility. Where feasible to reduce their continued impact to site groundwater, OCC implemented soil removal programs for closure of numerous WMUs. Descriptions and the activities or closures associated with the WMUs, shown on Figure 1.6 are described as follows:

WMU A: WMU A was used as a settling pond for the effluent from the former TCE/PCE process. The effluent contained a slurry of lime, calcium chloride, and trace organics. A RCRA closure of WMU A was not conducted because the area predates the RCRA requirements; however, after the decommissioning of the TCE/PCE process, but prior to OCC's RCRA Application, the solids in the pond were removed and disposed of off-Site.

In 1980, soil sampling and analyses were conducted within and surrounding the former WMU A on two occasions. The analytical data resulting from these soils analyses were previously submitted to USEPA/Ecology and were most-recently summarized in the "Draft Work Plan, Focused Remedial Investigation/Feasibility Study" dated August 2002.

WMU B: WMU B, which was also known as Railcar Storage Area TC2, contained acid/organic waste from the chlorine plant stored in railroad tank car(s). USEPA and Ecology approved a clean closure of WMU B in 1995 without any soil removal activities. The certification of Closure was presented in the letter from T. Vasko (OCC) to R. Smith (USEPA) and B. Warren (Ecology) dated March 9, 1995. A letter presenting "Verification of closure for Rail Storage Area TC-2" was sent from L. Wilhelm (Ecology) to M. Wassmann (OCC) April 19, 1995. The closure was based upon soils analytical data which demonstrated that none of the chemicals being analyzed for were present in the soils at concentrations which exceeded the MTCA Method B values. These analytical data were previously submitted to USEPA/Ecology and were most-recently summarized in the "Compilation of Soils and Related Data, Corrective Action Monitoring Program" dated January 1999.

WMU C: WMU C is a former landfill located at the north end of the Facility embankment along the Waterway. The landfill was used between 1949 and 1971 for disposal of unused lime and calcium chloride. Soil samples were collected and analyzed from WMU C in 1993, 1994, and 1996. The WMU C soils analytical data were previously

submitted to USEPA/Ecology and were most-recently summarized in the "Summary of Previous Investigations" dated March 2004.

WMU D: WMU D consisted of drainage ponds for the TCE/PCE manufacturing process. A RCRA closure of WMU D was not conducted. However, after the decommissioning of the TCE/PCE process, but prior to OCC's RCRA Application, the solids in the pond were removed and disposed of off-Site. The excavated area, which included WMU D, is shown on Figure 2.1. The excavation was conducted under the oversight of Ecology. Ecology field inspection reports are presented in the letter from J. Oberlander (Ecology) to L. Feller (OCC) dated June 16, 1981.

In 1980, soil sampling and analyses were conducted within and surrounding former WMU D in conjunction with the decommissioning of the TCE/PCE process. The analytical data resulting from these soils analyses were previously submitted to USEPA/Ecology and were most-recently summarized in the "Draft Work Plan, Focused Remedial Investigation/Feasibility Study" dated August 2002.

WMU E: WMU E, located within the limits of WMU A, was used as a drum storage area, and was closed in conjunction with WMU A. The location of WMU E is shown on Figure 1.6. There are no records of soil sampling conducted within the limit of WMU E.

WMU F: WMU F was the location for barges used in the settling out of the slurry from the TCE/PCE manufacturing process (see description of WMU A above). WMU F is located within the limit of the Area 5106 Sediment remediation area.

WMU G: WMU G was used as a settling pond for the effluent from the TCE/PCE manufacturing process (see description of WMU A above). The contents of the pond were removed and disposed of off-Site prior to OCC's RCRA Application. The salt pad, which has an asphalt base, was then constructed over the location of WMU G. There are no records of soil sampling conducted in this area.

WMU H: WMU H consisted of a series of settling ponds for the effluent from the TCE/PCE manufacturing process (see description of WMU A above) and was used between 1949 and 1952. When the ponds were decommissioned, the contents were removed and disposed of off-site. Remaining soils above the water table were excavated during the TCE/PCE decommissioning to the depth of the water table surface and disposed of off-site. Analytical soil samples were collected from three locations within

WMU H in 1996. The WMU H soils analytical data were previously submitted to USEPA/Ecology and were most-recently summarized in the "Summary of Previous Investigations" dated March 2004.

WMUs I and J: WMU I and WMU J, also known as Railcar Storage Area TC3 and TC1, respectively, contained organic waste from the chlorine plant stored in railroad tank cars. A clean closure of WMU I and WMU J was approved by USEPA and Ecology in 1990 without any soil removal activities. The certification of closure was presented in the letter from B. Moore (OCC) to C. Findley (USEPA) and H. Steeley (Ecology) dated May 1, 1990. A provisional approval of the closures was provided in the letter from H. Steeley (Ecology) to B. Moore (OCC) dated August 20, 1990. The criterion for clean closure of these units was that analyte concentrations in all samples be lower than Site-specific background. The analytical data resulting from these soils analyses were previously submitted to USEPA/Ecology and were most-recently summarized in the "Draft Work Plan, Focused Remedial Investigation/Feasibility Study" dated August 2002.

WMU K (Elementary Neutralization Unit): WMU K was used between approximately 1929 and 2002 for the neutralization of sulfuric acid with sodium hydroxide in the chlorine caustic process. Between 1929 and 1988, WMU K was located in the hot well trench west of injection well F-10. In 1988, an additional neutralization unit was added in the chlorine/caustic process area. (Both locations of WMU K are shown on Figure 1.6). No organic chemicals are associated with the unit. There are no records of soil sampling conducted in these areas.

WMU L: WMU L, also known as the Graphite Pile, was used from 1978 to 1980 to store graphite wastes generated by the breakdown of S-3 electrolytic cells. These wastes included halogenated hydrocarbons, lead and carbon. There are no records of soil sampling conducted in this area.

WMU M: WMU M was used as an intermittent graphite pile from 1950 through 1978 to store graphite wastes generated by the breakdown of S-3 electrolytic cells. These wastes included halogenated hydrocarbons, lead, and carbon. There are no records of soil sampling conducted in this area.

N Landfill: The N Landfill was used from 1929 through 1971. This landfill received various plant process solid wastes, including corrosives, chlorinated organics, and lead.

A characterization of the N Landfill was conducted in 1996 during the investigation referred to as the "PRI Source Identification Program". Soil samples were collected during the N Landfill characterization. The analytical data resulting from these soils analyses were previously submitted to USEPA/Ecology and were most recently summarized in the "Summary of Previous Investigations" dated March 2004.

WMU O: WMU O was used as a sodium aluminate pit from 1959 through 1960. Wastes stored within this pit included sodium hydroxide, sodium aluminate, and aluminum oxide. There are no records of soil sampling conducted in this area.

WMU P: WMU P, which was also known as the Waste Pile Area, was located adjacent to WMU Q, the Drum Storage Area. The waste pile was in a completely enclosed building authorized to store 40 cubic yards of solid regulated waste. Materials stored within the building originated from the renewal of the S-3 graphite anode electrolytic cells used in producing hydrogen and chlorine gases and sodium hydroxide solution from the electrolysis of a sodium chloride solution. The waste materials consisted of waste graphite (carbon) blades, butts, and stubs contaminated with lead and halogenated hydrocarbon residues, lead dross, and sealing mastic. The criterion for clean closure of WMU P was that analyte concentrations in all samples be lower than Site-specific background. Soils that did not meet the closure criteria were excavated and disposed off-site. Confirmatory sampling was conducted following completion of the excavation. USEPA and Ecology approved a clean closure of WMU P in 1990. The certification of closure was presented in the letter from B. Moore (OCC) to C. Findley (USEPA) and H. Steeley (Ecology) dated May 1, 1990. A provisional approval of the closures was provided in the letter from H. Steeley (Ecology) to B. Moore (OCC) dated August 20, 1990. The analytical data resulting from these soils analyses were previously submitted to USEPA/Ecology and were most recently summarized in the "Draft Work Plan, Focused Remedial Investigation/Feasibility Study" dated August 2002.

WMU Q: WMU Q, which is also known as the Drum Storage Area, has been used since the end of 1980 to store regulated wastes. Drums and other portable containers are stored in a designated container (drum) storage area located in the southwest portion of the Facility. Possible wastes stored in the drum storage area include: chlorinated hydrocarbons, carbon tetrachloride, 1,1,1-trichloroethane, sodium hydroxide, sodium chloride, lab packs, contaminated clothing, spent graphite electrode blades, butts, mastic, and lead dross, halogenated hydrocarbon contaminated residues, waste asbestos, electrostatic precipitator filter media, lead contaminated soils, corrosive solids, brine filter cake, and calcium chloride filter cake. Clean closure of WMU Q was certified by

Ecology in the letter from L. Wilhelm (Ecology) to M. Wassmann (OCC) dated August 1, 1995 ("Verification of Closure for Drum Storage Area"). The area continues to be maintained for drummed waste storage within the scope of the 90-day storage exemption under RCRA pursuant to WAC 173-303-200. There is no record of soil sampling conducted within the limit of WMU Q.

2.1.3 HISTORIC INVESTIGATIONS

Numerous focused investigations of soil, groundwater, surface water, and sediment have been conducted at the Site. The first report to integrate existing information into a conceptual site model was produced by Tetra Tech for Ecology in 2003. A list of the major investigations and a brief description of the purpose of each is presented in Table 2.1. A list of historic reports is presented in Table 2.2.

2.2 EMBANKMENT AREA REMOVAL ACTION

On September 29, 1989, a Record of Decision (ROD) was issued by the USEPA for the Commencement Bay Nearshore/Tideflats (CB/NT) Superfund Site, which includes the Waterway. As required by the ROD, the Hylebos Cleanup Committee (HCC) conducted a Hylebos Waterway Pre-Remedial Design (PRD) Study to provide additional information for implementation of the ROD. The PRD Study included the collection and analysis of sediment samples from the Waterway in 1994, including samples from within the Embankment Area.

In November 1997, the USEPA and OCC Tacoma, Inc. (OCCT) entered into an Administrative Order of Consent (AOC) for Removal Activities on the Embankment Area and Area 5106, Docket No. 10-97-0011-CERCLA. The AOC required that a non-time critical removal action be conducted on the Embankment Area, which includes the embankments along the property at 605 Alexander Avenue formerly owned by OCC (presently owned by Pioneer Americas, LLC) and the adjacent property at 709 Alexander Avenue formerly owned by PRI Northwest, Inc. (presently owned Mariana Properties, Inc.) (See Figures 1.1 and 1.3.) The removal action was separated from the broader Waterway remedial action due to the types and concentrations of contaminants present in Embankment Area materials and the level of urgency the threats from these contaminants pose to human health and the environment.

The AOC also addressed contaminated sediment in the Waterway referred to as Area 5106 Sediment. However, the contaminant concentrations, the recommended removal action and its implementation schedule were substantially different from that outlined in the Embankment Area Removal Action. Therefore, the Area 5106 Removal Action was addressed separate from the Embankment Area Removal Action (See Section 2.3).

2.2.1 EMBANKMENT AREA CHARACTERIZATION

An investigation was performed to characterize the source, nature, and extent of the chemicals within the Embankment Area. Initially, the investigation focused on historical operations and waste management practices at the Facility. Based on available information, it was determined that the chemicals within the Embankment Area resulted from historical operations which included:

i) chemical production activities;

ii) ship building activities from World War II through 1946; and

iii) ship yard and ship demolition activities from 1946 to the mid 1980s.

Prior to the 1997 AOC, OCCT performed an investigation in 1996 designed to define chemical presence in the Embankment Area materials. The analytical data for the soil, sediment, and fill indicated that chemicals were detected at levels exceeding the Sediment Quality Objectives (SQOs) established in the CB/NT ROD for the sediment operable unit. The chemical exceedances were present across the entire Embankment Area, thereby establishing the need for a removal action.

Subsequently, as part of the 1997 AOC, USEPA and OCC agreed that further characterization was required to evaluate removal action alternatives. In accordance with the AOC, OCC prepared as Sampling and Analysis Plan (SAP), a Quality Assurance Project Plan (QAPP) and a Health and Safety Plan (HASP), all of which were approved by USEPA on December 24, 1997. OCC began implementation of the approved SAP on January 6, 1998.

OCC submitted an Interim Data Report to USEPA on February 16, 1998. A meeting was held on February 18, 1998 with the USEPA, Ecology and the US Army Corp of Engineers (USACE) to review and discuss the preliminary embankment data. Based on the preliminary data, it is determined that additional upland borehole sampling and

analysis would not be required. In lieu of the additional upland borehole sampling, samples of the embankment sediments were collected from test trenches as outlined in Amendment No. 1 to the SAP approved by USEPA on February 25, 1998.

OCC submitted the Interim Summary of Analytical Data to USEPA on April 28, 1998. In August 1998, at the request of USEPA, OCC prepared an outline of a sampling program utilizing piezometers to sample leachate from the embankment. On August 28, 1998 USEPA directed OCC to prepare a work plan to perform further sampling and analysis utilizing the piezometer methodology.

OCC submitted the Draft Embankment Area Characterization Report to USEPA on September 18, 1998. The draft characterization report included a Draft Work Plan for the Supplemental Embankment Characterization required by USEPA to further characterize the water quality discharging from the Embankment Area. The Work Plan for the Supplemental Embankment Characterization was finalized and approved by USEPA on October 30, 1998. Piezometers were installed on November 3, 1998.

The Final Embankment Characterization Report and the Final Supplement A to the Embankment Area Characterizations Report were approved by USEPA on January 13, 1999 and July 21, 1999, respectively. The characterization, performed in 1998 and presented in the above reports is summarized as follows:

i) *Identification and Characterization of Hot Spots* – Hot Spots were defined as areas distinct from the rest of the embankment due to their relatively higher levels of leachable chemical concentrations. Consequently, the identification and characterization of hot spots was based upon the chemical characteristics of leachate prepared from solid samples using the Synthetic Precipitation Leaching Procedure (SPLP). The concentrations of the constituents in the synthetic leachate were compared to relevant marine Water Quality Criteria (WQC) to determine whether hot spots could be identified.

   The SPLP leachate chemistry exceeded the marine WQC throughout the embankment. However, the relative magnitude and distributions of the exceedances indicated that there were no identifiable hot spots within the Embankment Area;

ii) *Leachate Characterization* – Groundwater, seep, and piezometer samples were collected to characterize the leachate from the embankment materials. The

leachate from the embankment materials was characterized by the presence of metals (copper, lead, nickel, silver, and zinc) which exceeded their respective acute and chronic marine WQC. Leachate characterization also included sampling and analysis of "milky" seeps located below 0 mean lower low water (MLLW); and

iii) *Physical Characterization* – The physical characterization of the Embankment Area was defined through topographic survey, installation of boreholes and test trenches, and physical testing. The composition of the fill beneath the embankment surface cover generally consists of silty sand with varying amounts of gravel, crushed rip rap, and varied debris. The debris is primarily concrete, anodes, and sludge/fibrous material but also includes red brick, yellow brick, glass, wood, metal clay pipe, brown/black powder, white fiber, and plastic. The embankment surface cover is primarily anthropogenic fill.

2.2.2 ENGINEERING EVALUATION / COST ANALYSIS

As required under the AOC, OCC prepared and submitted a Draft Engineering Evaluation/Cost Analysis (EE/CA) Report to USEPA on December 30, 1999. The draft report was subsequently revised as follows.

- May 1, 2000 – OCC submitted a redline version of the Draft EE/CA Report based on USEPA comments.
- July 28, 2000 – OCC submitted a redline of the revised Draft EE/CA Report based on further USEPA comments.
- December 20, 2000 – OCC submitted a redline of the revised Draft EE/CA report based on additional USEPA comments.
- May 18, 2001 – OCC submitted a revised redline of the Draft EE/CA Report based on revisions requested by USEPA.

The EE/CA Report was finalized on June 20, 2001 to reflect language required by USEPA and Ecology to address the "milky seep" issue. OCC submitted copies of the finalized EE/CA Report to USEPA for distribution and public comment as requested by USEPA. USEPA placed the EE/CA report for public comment on July 13, 2001.

Five potential removal action alternatives were considered for detailed evaluation and analysis in the EE/CA. Three of the five potential alternatives were selected for

evaluation based upon the Site characterization, the nature and extent of contamination, and the removal action goals and objectives:

i) Alternative A – No Action
   - no removal action would be performed,
   - long-term annual inspection, sampling, and analysis would be performed to monitor the embankment over time;

ii) Alternative B – Partial Embankment Removal and Capping:
   - a portion of the impacted embankment materials would be excavated and disposed of at an upland commercial disposal site,
   - the excavated materials would be replaced with clean fill overlain with an armored surface layer,
   - the excavated material would be dewatered prior to disposal. The resulting water would be treated to meet relevant marine WQC,
   - long-term inspection and monitoring would be performed to ensure the continued effectiveness of the cap; and

iii) Alternative C – Embankment Capping:
   - the embankment slope would be capped utilizing an armored sand cap,
   - long-term inspection and monitoring would be performed to ensure the continued effectiveness of the cap.

Each of the alternatives was evaluated against short-term and long-term aspects of the broad CERCLA criteria: effectiveness, implementability, and costs. The EE/CA Report recommended the construction of a permeable cap (Alternative C) over the embankment to meet the stated remedial objectives. The permeable cap design was to be verified by the construction and monitoring of a pilot cap over a portion of the Embankment Area.

Following the public comment period, an Action Memorandum was issued by USEPA on December 18, 2001 to document USEPA's approval of the non-time critical Embankment Area Removal Action. However, the Decision Memorandum and the attached Responsiveness Summary also stated that:

i) Ecology will be working with OCC under a RCRA permit to evaluate and implement source control measures for the elevated pH groundwater;

ii) the source controls will be implemented as quickly as possible and will take effect prior to the completion of the Embankment Area Removal Action; and

iii) final design of the Embankment Area cap will address any residual high pH discharges remaining after successful implementation of source control efforts.

2.2.3 PILOT CAP DESIGN

At the request of USEPA, OCC agreed to expedite the design of the pilot cap (in advance of the final approval of the EE/CA Report) in an attempt to construct the pilot cap prior to the fish window closure of March 15, 2002. To that end, OCC prepared a 95% Design Report for Phase I – Pilot Cap Construction and submitted it to USEPA on December 12, 2001. USEPA reviewed the 95% Design Report and transmitted comments to OCC on January 3, 2002. Based on those comments, it was determined that it was not possible to complete the pilot cap construction by the USEPA deadline of February 15, 2002.

In April 2002, USEPA and OCC agreed to place the final design of the pilot cap on hold until the pH issues raised by Ecology could be addressed (See Section 2.2.5).

In August 2003, USEPA requested that design of the pilot cap continue in order to complete its construction by February 15, 2004. Subsequently, OCC completed the design and submitted the Draft 100% Design Report for Phase I – Pilot Cap Construction to USEPA and Ecology on September 16, 2003. The submitted report incorporated USEPA's comments dated January 3, 2002 regarding the Draft 95% Design Report and OCC responses to those comments. In response, USEPA provided preliminary comments via e-mail on October 16, 2003 that 1) restated previous agency concerns regarding the viability of a permeable cap on portions of the embankment, 2) pointed out the need to incorporate Ecology's RCRA program requirements into the design, and 3) explained that ground water discharging from the subtidal portion of the pilot cap should be monitored to test its performance. Concurrently, OCC proposed a new drain tile/embankment cap system concept (See Section 2.2.6) on October 30, 2003. In light of this development, USEPA did not provide any further comments on the September 2003 Pilot Cap design.

2.2.4 WORK PLAN

During October 2003, OCC prepared a Work Plan for the Embankment Area Removal Action as requested by USEPA. With USEPA agreement, the Work Plan was not submitted as scheduled pending the outcome of a meeting on October 30, 2003 to discuss a new drain tile/embankment cap system concept proposed by OCC (See Section 2.2.6).

Following discussions concerning the proposed drain tile/embankment cap system concept, OCC submitted a combined Draft Work Plan for Groundwater Remediation and the Embankment Area Removal Action to USEPA and Ecology on December 22, 2003. The Draft Work Plan was based on the proposed drain tile/embankment cap system as the remedial action to address groundwater containment and the embankment area issues along the Waterway. Subsequently, OCC and the agencies agreed that the drain tile/embankment cap system would be only one of several remedial alternatives evaluated.

Based on agency comments, a revised Draft Work Plan was prepared and submitted to USEPA and Ecology on March 31, 2004. The scope of the revised Draft Work Plan was expanded to include all future work on the Site including the groundwater remediation, the Embankment Area Removal Action and the additional response actions for the Area 5106 Removal Action. The revised Draft Work Plan included:

i) supplemental field investigations;

ii) pH Source Control;

iii) evaluations of groundwater remedial alternatives; and

iv) evaluation of remedial capping alternatives.

In accordance with the agency request to OCC on May 12, 2004, the Draft Work Plan was converted to a Draft Statement of Work (SOW) and submitted to USEPA/Ecology on May 18, 2004 and September 3, 2004. The Draft SOWs revised the Draft Work Plan to incorporate agency comments of April 23, 2004 and July 20, 2004. USEPA and Ecology subsequently issued a revised draft SOW on October 16, 2004. This SOW has been finalized based upon the USEPA/Ecology revised draft SOW.

2.2.5 RAPID PH ASSESSMENT

USEPA and Ecology directed OCC to perform an assessment of groundwater pH within the Embankment Area. As requested, OCC submitted a Field Sampling and Analysis Plan (FSAP) for the Rapid pH Assessment to USEPA and Ecology on September 18, 2002. OCC submitted the Final FSAP to USEPA on November 7, 2002. The FSAP was approved by USEPA but did not address Ecology suggestions dated October 22, 2002.

The field sampling activities were conducted by OCC between November 2002 and January 2003 as outlined in the approved FSAP. OCC prepared a Draft Rapid pH

Assessment Report and submitted it to USEPA on February 12, 2003. Following review of the data, USEPA required additional field sampling and analysis for pH Assessment. As requested by USEPA, OCC prepared a Scope of Work for Additional Rapid pH Assessment and submitted it to USEPA on May 9, 2003. USEPA approved the Scope of Work for Additional Rapid pH Assessment on October 8, 2003.

Following the initial discussions concerning the new drain tile/embankment cap system (See Section 2.2.6), it was agreed that the work outlined in the approved Scope of Work for Additional Rapid pH Assessment would be performed as part of the Supplemental Field Investigations required under Task A3 (Section 5.3) of this SOW. OCC, however, agreed to expedite this work and subsequently completed the field activities between January and February 2004. The Rapid pH Assessment report will be revised and finalized under Task B1 (Section 6.1) of this SOW.

2.2.6 DRAIN TILE/EMBANKMENT CAP SYSTEM

In October 2003, OCC proposed a drain tile/embankment cap system as a potential remedial action that addresses both the groundwater containment and the embankment area issues along the Hylebos. Meetings were held between OCC, USEPA and Ecology on October 30, 2003 and November 12, 2003 to discuss the concept and how to evaluate the feasibility of designing and constructing the proposed drain tile/embankment cap system.

OCC agreed to perform groundwater flow modeling to evaluate the anticipated effectiveness of the proposed drain tile/embankment cap system. OCC, USEPA and Ecology, worked together to develop the modeling methodology and input parameters that was incorporated into the Modeling Plan prepared under Task D1 of this SOW.

In an effort to expedite the project, OCC prepared the Modeling Plan and commenced modeling prior to final approval of this SOW. Subsequently, OCC, USEPA and Ecology agreed that the drain tile/embankment cap system would only be one of several alternatives evaluated for remediation of the site groundwater and sediment.

2.3 AREA 5106 REMOVAL ACTION

On September 29, 1989, a ROD was issued by USEPA for the Commencement Bay Nearshore/Tideflats (CB/NT) Superfund Site, which includes the Waterway. As required by the ROD, the Hylebos Cleanup Committee (HCC) conducted a Hylebos

Waterway Pre-Remedial Design (PRD) Study to provide additional information for implementation of the ROD. The PRD Study included the collection and analysis of sediment samples from the Hylebos Waterway in 1994, including one sample (described as very soft and gelatinous with a pH of 9.4) from a location identified as Station 5106. This location is downstream from the 11th Street bridge, in the area known as the mouth of the Hylebos Waterway, and about 100 feet into the Hylebos Waterway from the bank of the former OCC Facility. The analytical results from the Station 5106 sample showed a mixture of chlorinated organic chemicals totaling about 0.65 percent with tetrachloroethene (PCE) at 0.32 percent and trichloroethene (TCE) at 0.16 percent as the principal constituents. Additional samples taken in the vicinity of Station 5106 confirmed the earlier sample results. The test results indicated that the sediments in the vicinity of Station 5106 were not appropriate for disposal with the remainder of the Waterway sediments under any of the disposal options being considered in the PRD Study and therefore, needed to be addressed independently.

In November 1997, USEPA and OCCT entered into an AOC (Docket No. 10-97-0011-CERCLA) to address the sediments in the vicinity of Station 5106, hereafter referred to as Area 5106 Sediment, as a non-time-critical removal action under the CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The AOC also addressed the embankments of the properties at 605 and 709 Alexander Avenue, referred to as the Embankment Area. However, the embankment chemistry and concentrations, the recommended removal action, and its implementation schedule were substantially different from that outlined for the Area 5106 Removal Action. Therefore, the Embankment Area Removal Action was addressed separate from the Area 5106 Removal Action (See Section 2.2).

The scope of the Area 5106 Removal Action was to address sediment with different chemical constituents and concentration than those found in surrounding Waterway sediment and that, if removed, would require treatment prior to disposal. As such, the SQOs specified under the ROD did not establish the criteria for the removal action. Sediment, that remained following the Area 5106 Removal Action, which exceeded SQOs but did not require treatment, was to be addressed in accordance with the ROD as part of the Waterway remedial action.

2.3.1 BACKGROUND DATA

As required under the AOC, OCC prepared an Area 5106 Background Data Report that presented a compilation of all existing chemical, biological and physical data for

Area 5106. The Draft Area 5106 Background Data Report was submitted to USEPA on November 26, 1997. The report was approved by USEPA without comments on September 10, 1999.

2.3.2 AREA 5106 SEDIMENT CHARACTERIZATION

Area 5106 Sediment was defined as sediments which, if placed in a disposal site with dredged Hylebos sediment without treatment, could cause the disposal site to fail relevant marine WQC at the regulatory point of compliance. Conversely, contaminated sediment acceptable for placement in the disposal site was considered boundary sediment. This characterization effort was limited to characterizing the horizontal and vertical extent of the Area 5106 Sediments as defined above. Until recently, no investigations were conducted to determine the vertical and lateral extent of contamination within the boundary sediments.

An investigation was performed to characterize the source, nature, and extent of the chemicals in and near Area 5106. Initially, the investigation focused on historical operations and waste management practices at the Facility. Based on the available information, it was determined that the chlorinated organic chemicals present within and in the vicinity of Area 5106 resulted from a chlorinated solvents process which produced TCE and PCE from 1947 to 1973. Area 5106 and surrounding areas received waste effluent from solvent production processes via direct discharge to the Waterway in 1947, supernatant/overflow from settling ponds (1949-52 and 1972-73), and supernatant/overflow from disposal barges (1952-72).

Once the probable source of chemistry was determined the boundaries of the Area 5106 Sediment were established based upon an extensive program of sediment and pore water sampling, analysis, and evaluation. In accordance with the AOC, OCC prepared a SAP, a QAPP and a HASP, all of which were approved by USEPA on February 13, 1998. An amendment to the SAP was approved by USEPA on February 27, 1998.

Consistent with the above definition of Area 5106 Sediment, the methodology utilized to determine the boundary of Area 5106 Sediment was based on the criteria for disposal of dredged sediments into a nearshore confined disposal facility (CDF). Discharges from a CDF are regulated under the Clean Water Act (CWA) and must not result in exceedance of marine WQC at the point of discharge into the receiving water (i.e., in seeps that discharge through the CDF berm). Acceptability of dredged sediment for placement in a CDF was determined using a combination of laboratory tests (column leach tests [CLTs])

and groundwater flow and contaminant transport modeling. The CLTs simulate the salt washout effects and chemical mobility of the dredged sediments once placed in a CDF influenced by upland groundwater. The groundwater flow and transport model simulates the various attenuation processes (such as tidal dispersion, biodegradation, and sorption) which occur within the CDF and predicts the chemical concentrations at the point of compliance. Comparison of the predicted water quality with relevant marine WQC determines whether the sediment represented by the CLT is acceptable for placement within the CDF without treatment.

In accordance with the approved SAP, the boundaries of the Area 5106 Sediment were determined utilizing the following methodology:

i) three (3) potential horizontal boundaries were estimated based on the concentrations of PCE, TCE, ethylbenzene, and hexachlorobutadiene (HCBD) in porewater extracted from sediment samples;
ii) one (1) potential vertical boundary was estimated based on the concentrations of PCE, TCE, ethylbenzene, and HCBD in leachate obtained from native sand sediments utilizing the Synthetic Precipitation Leaching Procedure (SPLP) (porewater could not be extracted from the native sand sediments);
iii) CLTs were performed on composite samples collected from each of the four (4) estimated boundaries. Each CLT was representative of the sediment just outside the estimated boundary; and
iv) leachate concentrations from the CLTs were utilized in the groundwater flow and contaminant transport model to predict the long-term quality of the water that may ultimately discharge from the disposal site to the adjacent surface waters.

OCC began implementation of the above methodology on February 17, 1998.

OCC submitted the Interim Summary of Preliminary Analytical Data to USEPA on March 27, 1998. A meeting was held on April 1, 1998 with USEPA, Ecology, and USACE to review and discuss the preliminary data. The preliminary data report was updated with additional porewater and SPLP analysis and submitted to USEPA on April 27, 1998.

OCC met with USEPA and Ecology on May 13, 1998 to review the Interim Summary of Preliminary Analytical Data and discuss proposed locations for the boundary confirmation samples. On June 12, 1998, USEPA approved the proposed locations for the boundary confirmation samples and the CLT procedures. Parameters analyzed for

the CLTs were finalized based on the results of the analyses of the boundary sediment confirmation samples. The CLTs were initiated in July 1998. Summaries of the preliminary analytical data from the CLTs were submitted to USEPA on August 12, 1998 and October 26, 1998. The CLTs were completed in December 1998.

OCC submitted the Draft Area 5106 Sediment Characterization Report to USEPA on November 20, 1998. The related Draft CLT Evaluation Report was submitted to USEPA on March 5, 1999. The final CLT Evaluation Report and the final Area 5106 Sediment Characterization Report were approved by USEPA on April 7, 1999 and April 27, 1999, respectively.

The disposal site analysis predicted that seepage concentrations from the CDF would be significantly below the relevant marine WQC and would present no long-term water quality concerns for the boundary sediment represented by all four CLTs. Therefore, the boundary sediments represented by all four CLTs were determined to be acceptable for placement within the CDF without treatment, thereby confirming the boundary of the Area 5106 Sediment. Based upon the confirmed horizontal and vertical boundaries, Area 5106 Sediment include an estimated in-situ volume of 22,300 cubic yards and covered approximately 2.15 acres (see Figure 1.3 for the limits of Area 5106 Sediment).

In addition to the boundary confirmation, the chemical and physical characteristics of the Area 5106 Sediment were determined through sampling, analysis, and testing of Area 5106 Sediment:

i) stratigraphy within the Area 5106 Study Area generally consisted of fill, recent fine grained sediment, visual 5106-like material, and native sandy sediment. The visual 5106-like material included both Area 5106 Sediment and material that had the same physical properties but not the chemical properties;

ii) surface sediment concentrations exceeded SQOs but were significantly lower than subsurface sediment concentrations; and

iii) primary organic chemicals present in the Area 5106 Sediment were PCE, TCE, dichloroethene (DCE), vinyl chloride (VC), hexachlorobenzene (HCB), and HCBD.

2.3.3 PRELIMINARY TREATMENT TECHNOLOGY EVALUATION

Following delineation of the Area 5106 Sediment, potentially applicable removal action technologies for its containment, removal, treatment, and disposal were identified. The

technologies were initially screened based on implementability for the site conditions and sediment characteristics. Those technologies which were not technically feasible to implement or whose effectiveness would be less than another comparable technology were eliminated from further consideration. The retained technologies were evaluated based on effectiveness, implementability, and cost considerations. The strengths and limitations of each retained technology were evaluated in order to facilitate the combination of technologies into removal action alternatives.

Preliminary removal action alternatives were developed from the retained technologies in order to evaluate how the technologies must interact to achieve a successful removal response. Twelve preliminary removal action alternatives were identified and assessed based on relative effectiveness, implementability, and costs. In conjunction with the alternative assessment, preliminary technology modeling and testing were performed to evaluate the potential of a technology to meet the removal action objectives.

The Draft Preliminary Treatment Technology Evaluation (PTTE) Report was submitted to USEPA on September 22, 1998. The draft report was subsequently revised as follows:

- January 18, 1999 – OCC submitted a redline version of the PTTE Report based on USEPA comments.
- April 14, 1999 – OCC submitted a revised redline of the PTTE Report.

The final PTTE Report was approved by USEPA on June 2, 1999.

In conjunction with the alternative assessment, preliminary technology modeling and testing were performed and presented in the PTTE Report. These included:

i) Preliminary WASP Modeling to evaluate the potential of natural recovery, the long-term effectiveness of a sand/gravel cap and the water quality effects of dredging the Area 5106 Sediment;
ii) Pilot scale tests of the Hazelton Soil Washing Technology;
iii) Bench scale Slurry Aeration Tests; and
iv) Bench scale Dewatering Tests.

Based on the preliminary technology evaluation, the alternative assessments, and the preliminary modeling/testing, the most promising containment, removal, treatment, and disposal technologies were identified for additional study and evaluation. The additional technology evaluations included:

i) Bench Scale Treatability Study (See Section 2.3.4) – Bench scale treatability tests were performed in the laboratory to assess the effectiveness of the Slurry Aeration treatment process;

ii) Dredging Controls (See Section 2.3.5) – Potential engineering controls to limit impacts to water quality during dredging were evaluated;

iii) Water Quality Test (See Section 2.3.6) – A limited dredging test was performed in the Hylebos to measure the water quality resulting from dredging operation and to collect material for the treatability study; and

iv) Disposal Site Analysis (See Section 2.3.7) – Additional disposal site modeling was performed to determine the practicable level of treatment required for the disposal of treated Area 5106 Sediment in a CDF to be constructed at the Port of Tacoma Slip 1.

2.3.4 BENCH SCALE TREATABILITY STUDY

OCC submitted a Draft Work Plan for the Bench Scale Treatability Study to USEPA on June 7, 1999. The Work Plan was revised based on USEPA comments and submitted to USEPA as final on July 21, 1999.

Sediment samples for the treatability study were collected on September 2-3, 1999, and the treatability study was initiated on September 13, 1999. Results of the treatability study were presented in the Draft Bench Scale Treatability Study Report submitted to USEPA on November 29, 1999. The report was revised to reflect USEPA comments and submitted to USEPA as final on December 30, 1999.

The treatability tests were performed to assess the effectiveness of slurry aeration to remove VOCs and SVOCs from Area 5106 Sediment and to determine whether chemical oxidation could enhance the effectiveness of the treatment. Based upon the results of the pilot/bench scale studies and on knowledge of the technologies, slurry aeration was selected as the treatment technology for the EE/CA removal action alternative evaluation.

2.3.5 EVALUATION OF DREDGING CONTROLS

OCC submitted the Draft Evaluation of Dredging Controls Report to USEPA on April 7, 1999. The report was revised to reflect USEPA comments and submitted to USEPA as final on January 13, 2000.

The report presented an evaluation of potential engineering controls to limit the extent of exceedances of marine WQC during dredging of Area 5106 Sediment to within the 300-foot mixing zone specified by USEPA. Each of the control measures were evaluated with respect to effectiveness, implementability, schedule and costs. The Evaluation of Dredging Controls report concluded that production rate reduction and timing of dredging were the only practicable engineering controls which could be implemented in the event that significant water quality exceedances occurred outside the mixing zone on a regular basis during dredging of Area 5106 Sediment.

2.3.6 EVALUATION OF WATER QUALITY - DREDGING IMPACTS

As part of the PTTE Report, OCC performed preliminary modeling to assess the water quality impacts that might be expected during the dredging of the Area 5106 Sediment. Subsequently, under the direction of USEPA, the United States Army Corps of Engineers Waterways Experiment Station (WES) performed additional screening level modeling to predict the water quality impacts from dredging. WES utilized the DREDGE model to estimate the mixing zones required to meet relevant WQC.

Based on the results of the WES modeling, USEPA determined that:

i) the acute marine WQC would serve as the performance criteria for the established mixing zone; and
ii) an approximately 300 foot extent estimates the necessary mixing zone.

In order to evaluate the water quality impacts of dredging, OCC performed water quality monitoring during the collection of Area 5106 Sediment for the Bench Scale Treatability Study. OCC submitted a plan for the water quality test to USEPA on June 7, 1999. The plan was revised based on USEPA comments and submitted to USEPA as final on July 8, 1999. The results of the water quality monitoring are presented in the Water Quality Test Report submitted to USEPA on November 29, 1999.

2.3.7 DISPOSAL SITE ANALYSIS

OCC performed groundwater flow and transport modeling of the Slip 1 CDF in order to assess the potential water quality impacts of placing the Area 5106 boundary sediments in the Slip 1 CDF. The disposal site analysis predicted that seepage concentrations from

the Slip 1 CDF would be significantly below the relevant marine WQC and would present no long-term water quality concerns. Consequently, the Area 5106 boundary sediments were determined to be acceptable for placement within the Slip 1 CDF without treatment. The groundwater flow and transport modeling was presented in the CLT Evaluation Report.

The results of the modeling and subsequent sensitivity analyses were also utilized to determine the practicable treatment criteria for the disposal of treated Area 5106 Sediment in the Slip 1 CDF.

2.3.8 ENGINEERING EVALUATION / COST ANALYSIS

As required under the AOC, OCC prepared and submitted a Draft EE/CA Report for the Area 5106 Removal Action to USEPA on December 30, 1999. The draft report was subsequently revised as follows:

- April 24, 2000 – OCC submitted a redline version of the Draft EE/CA Report based on USEPA comments.
- May 22, 2000 – OCC submitted a revised redline version of the Draft EE/CA Report based on additional USEPA comments.

The EE/CA Report was subsequently finalized and submitted to USEPA on July 11, 2000. USEPA placed the EE/CA Report for public comment in July 2000.

Based on the technology evaluations, the following removal action alternatives were developed for detailed evaluation and analysis in the EE/CA:

i) Alternative A – No Action (Natural Recovery):
   - no removal action would be performed,
   - long-term annual inspection, sampling, and analysis would be performed to monitor the rate of natural recovery;

ii) Alternative B – Containment:
   - containment would be achieved utilizing an armored sand cap.
   - institutional controls would be implemented to restrict future dredging and ship anchoring in the vicinity of the cap,
   - long-term inspection and monitoring would be performed to ensure the caps continued effectiveness;

iii) Alternative C – Removal/Treatment/Disposal:

- Area 5106 Sediment would be removed utilizing a combination of TOYO pump and mechanical dredging,
- the removed sediment would be treated using the Slurry Aeration treatment process,
- the treated sediment would be transported to the Slip 1 CDF for disposal; and

iv) Alternative D – Combined Containment and Removal:

- the portion of Area 5106 Sediment located on Pioneer property would be capped including the Area 5106 Sediment located under Pioneer Dock No. 1, and
- the portion of Area 5106 Sediment from the face of the docks into the Waterway would be removed, treated, and disposed as described in Alternative C.

Each of the alternatives was evaluated against short-term and long-term aspects of the broad CERCLA criteria: effectiveness, implementability, and costs. The EE/CA Report selected Alternative C as the recommended removal action to meet the stated remedial objectives.

Following the public comment period, an Action Memorandum was issued by USEPA on June 20, 2001 to document USEPA approval of the non-time critical Area 5106 Removal Action. The Action Memorandum was approved on July 6, 2001.

2.3.9 BIOLOGICAL ASSESSMENT

OCC prepared a Biological Assessment (BA) Addendum to evaluate the potential effects of the proposed Area 5106 Removal Action on federally listed threatened and endangered species. The BA Addendum was submitted to USEPA on June 25, 2002 as an addendum to the BA prepared by USEPA for the entire CB/NT Superfund Site. The BA Addendum was subsequently revised and submitted to USEPA on July 21, 2002.

USEPA subsequently received the United States Fish and Wild Life Services final Biological Opinion required under Section 7 of the Endangered Species Act for the Area 5106 Removal Action on October 4, 2002. On December 12, 2002, USEPA received the National Marine Fisheries Service's (NMFS) Biological Opinion and MSA Essential Fish Habitat Consultation for the Area 5106 Removal Action.

2.3.10 DESIGN OF REMOVAL ACTION

Following USEPA approval of the EE/CA, OCC performed the complete detailed design of the removal action including calculations, modeling, construction specifications, drawings, equipment specifications, compliance and monitoring plans, operation and maintenance plans, health and safety plans, etc. To document the design, OCC prepared a Draft 95% Design Report for the Area 5106 Removal Action and submitted it to USEPA on July 6, 2001. USEPA provided OCC informal comments on August 22, 2001 which were utilized to revise the 95% Design Report. Specifically, USEPA requested more detail concerning the dredging and dewatering plans and equipment. In order to provide the most accurate descriptions, OCC expedited the contracting process and obtained competitive bids from qualified dredging and dewatering contractors. OCC selected the preferred dredging/dewatering contractors and then worked with them to develop the detailed dredging and dewatering plans that had been requested in USEPA's informal comments dated August 22, 2001. OCC incorporated these detailed dredging and dewatering plans into the revised Draft 95% Design Report that was submitted to USEPA on April 12, 2002. The Design Report was subsequently revised as follows:

- July 18, 2002 – OCC submitted a Draft (Redline) 100% Design Report based upon USEPA comments.

The 100% Design Report was finalized and submitted to USEPA on December 13, 2002. The approved 100% Design Report provided the basis for implementing the Area 5106 Removal Action.

2.3.11 UNILATERAL ADMINISTRATIVE ORDER

During the design of the Area 5106 Removal Action, USEPA issued a Unilateral Administrative Order (UAO) on March 25, 2002 directing OCC to conduct the Area 5106 Removal Action as described in the approved EE/CA and the USEPA Action Memorandum. OCC submitted a Notice to Comply with the UAO on April 24, 2002.

2.3.12 IMPLEMENTATION OF REMOVAL ACTION

In order to meet the schedule required by the UAO, OCC expedited the construction of the sediment treatment plant based on the 95% Design Report and applicable USEPA

comments. Construction contracts were awarded to qualified civil, mechanical and electrical contractors. The treatment plant was mechanically complete on September 23, 2002. Equipment and system checkouts were performed with seawater and completed on October 4, 2002.

Dredging, treatment, and dewatering of Area 5106 Sediment began on October 15, 2002 and continued until February 28, 2003. The treated, dewatered sediment was stockpiled at the treatment site until the construction of the Slip 1 CDF was completed. Placement of the treated sediment into the Slip 1 CDF began on January 23, 2003 and continued until March 28, 2003. Both the dredging and placement activities were extended beyond the planned February 15, 2003 completion date with the approval of USEPA and the resource agencies. In total, over 36,000 cubic yards of Area 5106 Sediment and underlying native sediments were removed from the Waterway and treated prior to disposal in the Slip 1 CDF under USEPA oversight. The removal action was documented by weekly and monthly progress reports prepared by OCC and submitted to USEPA as required by the UAO.

The entire Area 5106 dredging area was dredged to or below the design dredging elevations defined by the Area 5106 Sediment characterization pre-confirmatory sampling and analysis. All Area 5106 Sediment was therefore removed and treated prior to disposal into the Slip 1 CDF. Confirmation sampling, however, indicates that there is chlorinated organic contamination within the underlying native sediments. OCC presented a summary of the dredging compliance data in the Preliminary Completion Report for Area 5106 Dredging submitted to USEPA on March 10, 2003. The results are summarized in Section 3.2.2 of this SOW.

In a letter to OCC dated March 25, 2003, USEPA acknowledged the work completed and directed OCC to perform additional response actions pursuant to Sections X and XII of the UAO. In response, OCC submitted a Draft Post-Treatment Work Plan for Area 5106 Removal Action to USEPA on April 23, 2004. The Work Plan was revised based on USEPA comments and approved by USEPA on August 1, 2003. The approved Post-Treatment Work Plan included activities required to:

i) characterize the sediment remaining within the aerial limits of the Area 5106 dredging;
ii) prepare an alternatives analysis report which will evaluate dredging or capping options based on the characterization and other pertinent factors;

iii) recommend the appropriate alternatives and how those alternatives would be incorporated into the Segment 5 cleanup and/or the Embankment Area Removal Action.

The Work Plan focused upon the relatively flat-bottom portion of Area 5106, where additional information was needed to make informed decisions about the Segment 5 Hylebos Waterway dredge cuts within and around Area 5106. USEPA agreed that the additional data needed to adequately characterize sediment contamination within the steeply sloping portion of Area 5106 could be deferred and later incorporated into a Work Plan which would address both the steeply sloping portion of Area 5106 and the adjoining portion of the Embankment Area.

Subsequent to the approval of the Post-Treatment Work Plan, OCC and USEPA agreed to combine and integrate the Site's remedial activities/projects into a single AOC. Consequently, only the characterization activities within the relatively flat portion of the Area 5106 were performed. The remaining tasks included in the Post-Treatment Work Plan have been incorporated into this SOW.

2.3.13 POST-TREATMENT CHARACTERIZATION

OCC implemented the post-treatment characterization in accordance with the SAP and QAPP included as Appendices A and B of the Post-Treatment Work Plan. Field activities were initiated on July 21, 2003.

OCC submitted a Draft Post-Treatment Characterization Report to USEPA on September 8, 2003. The data and evaluations presented in this draft report will be incorporated in the Draft Characterization Report that OCC will prepare under Task A6 of this SOW.

3.0 SUMMARY OF CURRENT SITE CONDITIONS

3.1 SITE CONSTITUENTS OF CONCERN

Constituents of Concern (COC) have been established for the Site based upon historical site processes, investigations and characterizations. Tables 3.1 through 3.4 present the COCs for each of the major site media / areas including:

i) Upland Groundwater (Table 3.1),

ii) Embankment Area / Subtidal Groundwater (Table 3.2),

iii) Surface Water (Table 3.3); and

iv) Sediment / Porewater (Table 3.4).

Additional COC's may be added to these tables based on the results of the field investigations performed under this SOW. Performance of the selected groundwater and sediment remedies will be monitored and evaluated based on the cleanup levels and criteria for these COCs shown in Table 4.1 or based on a "remediation level" according to MTCA as approved by USEPA and Ecology for a specific remedy.

3.2 GROUNDWATER REMEDIATION

The limits of the groundwater COC plumes (both chlorinated organic chemicals and elevated pH) at 25, 50, and feet below the groundwater surface, as estimated in November 2004, are shown on Figures 3.1 through 3.3. Composite groundwater plume depictions, which encompass all of the sampled horizons at the Site, are shown on Figure 1.2.

The existing groundwater remediation system includes 23 groundwater extraction wells, 22 groundwater injection wells, and a groundwater treatment facility. The groundwater remediation system has been operating since 1996. The system was designed to remove chemical mass and provide hydraulic containment of the Upland Groundwater COCs. The locations of the components of the groundwater remediation system are shown on Figure 1.2. Recently, however, questions concerning the effectiveness of portions of the groundwater remediation system have arisen as a result of additional data collection and system review activities including the following:

- The effectiveness of the F-Branch injection wells to provide a continuous hydraulic barrier to the flow of the Upland Groundwater COC plume has been reduced, possibly as a result of precipitates from elevated pH groundwater in and around the F-Branch injection wells.
- Ground water samples taken near Pier 25 in July of 2004, in a subtidal discharge area down gradient from the injection system, found PCE, TCE, vinyl chloride and arsenic in excess of applicable regulatory criteria. This indicates a potential discontinuity in the hydraulic barrier provided by the E-branch injection wells pending further evaluation.
- Post-dredging sampling of the native sediments within the limits of the Area 5106 dredging along the lower portion of the embankment and subsequent core samples indicate that elevated chlorinated organic concentrations remain within native sediment of unknown depth and breadth. This area of impacted native sediment is located waterward of the injection system. As such, there is a concern that these impacted sediments may leach PCE, TCE, vinyl chloride and other constituents of concern into the Waterway in concentrations that exceed applicable regulatory criteria for surface water and/or can be expected to cause sediment contamination above one or more SQOs.
- The northern limit of the Upland Groundwater COC plume at the 100 foot depth has not been fully delineated.
- A Remedial System Evaluation (RSE), conducted for USEPA by Geotrans (Geotrans 2003), was initiated under the USEPA RCRA program and a site characterization report was prepared for Ecology by Tetra Tech EM Inc (Tetra Tech 2003). Both documents concluded that there were problems concerning the effectiveness of the current injection system and suggested modifications to the monitoring locations and methods utilized to evaluate its effectiveness.
- The RSE Report included recommendations for evaluation, and modification as necessary, of all the components of the existing groundwater remediation system.
- PCE was detected in seep samples collected during a minus 2 foot tide by Ecology {MS-1 (200 μg/L) and Ecology–1 (205 μg/L)} that were located along the Pioneer facility bank adjacent to and south of Dock 2, respectively; south of the limits of the current groundwater remediation system.
- Vinyl chloride was detected at 8800 μg/L in a groundwater sample obtained during an investigation of subtidal discharges by USEPA and Ecology from a piezometer installed in Waterway sediments in the shipping channel beyond the current boundary of Area 5106.
- Elevated (8.5+) pH has been found in shallow ground water in the southern half of the site near the Waterway, and in subtidal seeps sampled at very low tides.

Groundwater samples from beneath the Waterway at about –40 feet MLLW, collected near the southern end of Dock 2 in July of 2004, had pH levels above 11.

- Preliminary results of groundwater sampling on the Mariana and 721 Alexander properties have identified a PCE plume at the boundary between these properties.

In order to collect the data necessary to address these questions, this SOW provides for supplemental field investigations and site characterization. The resultant data will be utilized in the evaluation of existing groundwater remedial system followed by an alternative evaluation to select a groundwater remedy or remedy modifications that will prevent the discharge of contaminated groundwater to the Waterway and that is compatible with the sediment remedies.

3.3 SEDIMENT REMEDIATION

3.3.1 EMBANKMENT SEDIMENTS

USEPA approved the EE/CA for the Embankment Area Removal Action in September 2001. The EE/CA recommended a 3-foot thick permeable sand/gravel cap to meet the removal action objectives.

The cap proposed in the EE/CA was to be designed to cover the impacted sediments and provide sufficient tidal dispersion within the cap to reduce leachate concentrations of dissolved metals to below marine WQC. Based on investigation of the embankment, the chlorinated organic contamination was thought to be limited to the portion of the embankment that would be dredged under the Area 5106 Removal Action. The anthropogenic materials characterized as Area 5106 Sediment were, in fact, removed during the Area 5106 Sediment dredging. However, the data resulting from the post-dredging sampling revealed that the native sediment beneath the Area 5106 Sediment contain elevated concentrations of PCE, TCE, HCB, and HCBD. Further, dredging to remove these impacted native sediments could not be performed due to embankment slope stability concerns and the related stability of Pioneer Dock No. 1.

The concentration levels of the chlorinated organic contamination in the native sediments indicated that the permeable cap design presented in the EE/CA may not physically and chemically isolate the impacted native sediments in this area of the embankment. As such, an alternative remedy may be required.

Subsequent to USEPA approval of the EE/CA, additional information also raised concerns about the effectiveness of the proposed permeable cap in other portions of the embankment. Specifically,

- PCE was detected in seeps MS-1 (200 µg/L) and Ecology–1 (205 µg/L) sampled by Ecology.
- Elevated pH groundwater may be discharging to the Waterway, based on the results of Phase I of the Rapid pH Assessment, and more recent ground water sampling that found high pH groundwater at the toe of the subtidal slope near Dock 2.
- USEPA and Ecology believe that there may be preferential pathways for groundwater discharge to the Waterway.

Based upon the above information, this SOW provides for supplemental field investigations to further characterize the embankment and groundwater discharging through it to the Waterway. An alternative evaluation will be performed as part of this SOW to select a remedy for sediments, including those in the embankment, that meets the remedial objectives and is compatible with the groundwater remedy.

3.3.2 AREA 5106 NATIVE SEDIMENT

The anthropogenic materials characterized as Area 5106 Sediment were removed during the Area 5106 removal action. However, the data resulting from the post-dredge sampling revealed that the native sediments beneath the Area 5106 Sediment contain elevated concentrations of PCE, TCE, HCB and HCBD. Further dredging to remove the impacted sediments could not be performed due to embankment slope stability concerns and the related stability of Pioneer Dock No. 1.

Existing conditions within and around Area 5106 are summarized as follows:

- Surface sediment samples from 49 locations, each representing about 2500 square feet, were analyzed for PCE, TCE, HCB, HCBD, and DCE. Based on the post-dredging analytical data, 21 grids have achieved the USEPA Sediment Removal Compliance Criteria. Another 22 grids were above the USEPA Sediment Removal Compliance Criteria but below the Slip 1 Disposal Criteria. Six grids, five of which are located on the steeply sloped portion of Area 5106, have chemical concentrations exceeding the Slip 1 Disposal Criteria.
- Six of the 49 sediment samples exceeded the EE/CA Slip 1 disposal criteria for PCE of 64,000 µg/kg. The three highest PCE concentrations (6,100,000 µg/kg = 0.61

percent; 2,200,000 µg/kg = 0.22 percent; and 2,100,000µg/kg =0.21 percent) were from sediment samples on the dredged subtidal slope. Another three samples met the PCE EE/CA criteria but not the Removal Action performance standard for PCE of 28,600 µg/kg. The remaining 40 samples contained PCE at concentrations which met the performance standard for the Removal Action yet were significantly higher than the PCE SQO of 57 µg/kg.

- Chemical concentrations in the sediment within the flat portion of Area exceed relevant SQOs at depths ranging from five feet to greater than fifteen feet below the post-dredging mudline.
- The average concentrations of TCE, PCE, HCBD and HCB in sediment remaining within the flat portion of Area 5106 are well below the Slip 1 Disposal Criteria.
- The landward and waterward extent of the most contaminated source material remaining at the site has not been determined. See Figures 3.4 and 3.5 for cross sections that show sediment PCE concentrations through Area 5106.

The post-dredging characterization data from the flat portion of Area 5106 will be integrated with the data obtained from an investigation of the steeply sloped portion of Area 5106 to fully characterize the remaining contaminated native sediments within and around Area 5106. An alternative evaluation will be performed as part of this SOW to select a remedy for contaminated sediments, including those within Area 5106, that meets the remedial objectives and is compatible with the groundwater remedy.

4.0 REMEDIAL OBJECTIVES AND PERFORMANCE STANDARDS

Upon completion of remaining soil, sediment, and ground water investigations, remedial alternatives will be evaluated with respect to the nine criteria found in the NCP and the MTCA Criteria for selection of cleanup actions in WAC 173-340-360 of the MTCA regulations to determine which alternatives merit further detailed evaluation. Remedial alternatives must also achieve; 1) overall protection of human health and the environment and 2) compliance with applicable or relevant and appropriate requirements (ARARs). The ARARs and remedial objectives for the Site are described in the following sections.

4.1 GROUNDWATER REMEDIAL OBJECTIVES

The remedial objectives of the Groundwater Remediation at the Site are as follows:

i) prevent releases of impacted Site groundwater to the Hylebos Waterway;
ii) contain impacted Site groundwater to prevent migration to non-impacted areas;
iii) collect and treat impacted Site groundwater to reduce overall Site contamination; and
iv) remediate/contain the shallow elevated pH groundwater at the Site to prevent its migration to the groundwater collection system or the Hylebos Waterway .

With respect to the above, impacted Site groundwater means groundwater which contains concentrations of groundwater Constituents of Concern (COCs) that exceed the site-specific groundwater cleanup levels. Groundwater cleanup standards for the Site are discussed in Section 4.4.2. Groundwater cleanup levels are shown in Table 4.1 of this SOW. Excavation of highly contaminated soil or sediment that serves as a significant source of contaminated ground water will be included as an alternative for evaluation.

4.2 SEDIMENT REMEDIAL OBJECTIVES

The remedial objectives of the Sediment Remediation at the Site are as follows:

i) prevent marine ecological receptors from contacting sediments and debris that have contaminant concentrations exceeding relevant sediment cleanup levels;
ii) prevent migration of hazardous substances, pollutants, or contaminants from the sediments at concentrations in excess of relevant sediment cleanup levels;

iii) prevent migration of groundwater to the Hylebos Waterway at concentrations that will recontaminate sediment above relevant sediment cleanup levels;

iv) prevent human receptors from contacting impacted sediment and debris;

v) control bioaccumulation exposures to human receptors associated with sediment releases at the site; and

vi) prevent migration of hazardous substances, pollutants, or contaminants from the sediments at concentrations that will contaminate surface water above relevant surface water cleanup levels.

Sediment cleanup standards for the Site are discussed in Section 4.4.3. Sediment cleanup levels are shown in Table 4.1 of this SOW.

4.3 SURFACE WATER REMEDIAL OBJECTIVES

The remedial objectives of surface water remediation at the Site are as follows:

i) prevent marine ecological receptors from contacting surface waters that have contaminant concentrations that exceed surface water cleanup levels;

ii) prevent migration of hazardous substances, pollutants or contaminants to the surface waters at concentrations that exceed surface water cleanup levels; and

iii) control bioaccumulation exposures to human receptors associated with releases to surface water from the Site.

Surface water cleanup standards for the Site are discussed in Section 4.4.4. Surface water cleanup levels are shown in Table 4.1 of this SOW.

4.4 PERFORMANCE STANDARDS

"Performance Standards" are defined as the cleanup standards, standards of control, and other substantive requirements, criteria or limitations, including SQOs, groundwater quality and/or containment provisions to prevent sediment contamination, state groundwater and surface water quality criteria, construction and post-construction standards, and habitat standards, set forth in the ROD, the 1997 ESD, and the August 2000 ESD; state water quality standards in WAC 173-201A; MTCA WAC 173-340, this SOW; and approved plans, deliverables, or reports required by the SOW.

OCC will adhere to the following performance standards for the design of the selected remedies for the Groundwater and Sediment Remediations. These performance standards are consistent with the remedial objectives and are necessary to ensure that the remedies are protective of human health and the environment.

4.4.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The design of the remedial actions performed under this SOW will comply with the substantive requirement of the following ARARs:

i) Clean Water Act (CWA), 33 United States Code (USC) 1251 et seq;

ii) Section 402 of the CWA (33 USC 1342) and 40 CFR Parts 122 and 125;

iii) CWA Section 401, 404 and 404(b)(1) Guidelines (40 CFR Part 125, 230);

iv) Endangered Species Act (ESA);

v) Rivers and Harbors Act (33 CFR Parts 320, 322);

vi) Resource Conservation and Recovery Act (RCRA); 42 U.S.C. 6901 et seq.;

vii) Washington Hazardous Waste Management Act (Chapter 70.105 RCW; Chapter 173-303 WAC);

viii) Puyallup Tribe of Indians Settlement Act of 1989 (PL 101-41, 103 Stat. 83);

ix) Washington Solid Waste Management Act (Chapter 0.95 RCW) and Solid Waste Regulations (WAC 173-304);

x) Water Pollution Control Act (Chapter 90.48 RCW);

xi) Coastal Zone Management Act (16 USC 1451 et seq.); Washington Shoreline Management Act (Chapter 90.58 RCW; Chapter 173-14 WAC); City of Tacoma Shoreline Ordinance (Chapter 13.10);

xii) Washington Model Toxics Control Act Cleanup Regulation (Chapter 173-340 WAC); and

xiii) Water Quality Standards for Surface Waters of the State of Washington (Chapter 173-201A WAC).

No local, state, or federal permits will be required or obtained for on-site response actions performed under this SOW however, the substantive conditions of such permits shall be met.

4.4.2 GROUNDWATER CLEANUP STANDARDS

Groundwater cleanup standards for the Site, consisting of groundwater cleanup levels and the location (point of compliance) where the cleanup levels must be met, have been established following the procedures described in the MTCA regulations.

Groundwater Cleanup Levels

The use of Site groundwater is restricted to "non-potable" uses through restrictive covenants currently in effect for the Site. Since groundwater at the Site is considered as non-potable (while the covenants are in place) and discharges to the Hylebos or Blair Waterways, the groundwater cleanup standards for the Site are based on the surface water cleanup standards for the site described below in section 4.4.4. The site-specific groundwater cleanup levels are presented in Table 4.1. Note that, for arsenic, the groundwater cleanup level of 5 μg/L is based on the presumed natural background level for this constituent in groundwater for the state of Washington in accordance with the MTCA regulations in WAC 173-340-730, the numerical value of which is shown in Table 720-1 of these regulations.

Groundwater Point of Compliance

Based upon site conditions, the nature and extent of the impacted groundwater and current technological limitations, it is anticipated that it will not be practicable to meet the groundwater cleanup levels throughout the site in a reasonable time frame. As such, a conditional point of compliance for groundwater cleanup levels will be established based on a demonstration (based on the results of the alternatives analyses performed under this SOW) that the selected methods of groundwater remediation will be implemented to the maximum extent practicable. As required under MTCA, the conditional groundwater point of compliance, to be approved by Ecology and USEPA, will be located as close to the source or sources of groundwater contamination as possible.

4.4.3 SEDIMENT CLEANUP STANDARDS

Sediment cleanup standards for the Site, consisting of sediment cleanup levels and the location (point of compliance) where the cleanup levels must be met, have been

established by the CB/NT ROD following procedures consistent with the MTCA regulations.

Sediment Cleanup Levels

MTCA addresses sediment cleanup levels by reference to the Washington State Sediment Management Standards (SMS) (WAC 173-204). Under the SMS, the primary endpoint for sediment quality evaluations is protection of the environment, specifically the benthic community, from adverse effects associated with the Site COCs. Sediment Quality Objectives (SQOs) for the Site were developed by USEPA for the entire CB/NT site and incorporated into the ROD. In the event that sediments are found with high levels of constituents that were not considered when the ROD was developed in 1989, Ecology and USEPA will determine site-specific concentration limits for these constituents consistent with the methodologies provided by the NCP and WAC 173-204..

Ecology has previously concluded that the implementation of bioassays and interpretive endpoints used in the USEPA risk assessment to develop SQOs was based on a framework similar to that developed in the SMS. Accordingly, Ecology previously concluded that the SQOs provide protective levels for acute and chronic toxicity of biota in sediments at the Site using a risk-based approach similar to the risk-based approach provided by SMS.

Consequently, site-specific sediment cleanup levels are based on SQOs, where SQOs exist. If an SQO does not exist for a particular COC, the sediment cleanup level is based on the Sediment Quality Standard (SQS) promulgated under SMS for that constituent, if one exists. Site-specific sediment cleanup levels are presented on Table 4.1.

Sediment Point of Compliance

The point of compliance for achieving the sediment cleanup levels will generally be 0 to 10 cm below the sediment surface. Ecology and USEPA have generally applied the 0 to 10 cm biologically active zone interval within the Waterway based on available information on the distribution of abundance and biomass of biota in Commencement Bay sediments. Radioisotope dating evaluations performed by USEPA and Ecology as part of the remedial investigation feasibility study for the overall CB/NT Site revealed that the biologically active zone within the Hylebos Waterway does not generally extend deeper than 10 cm below the sediment surface. Where habitat is favorable to burrowing organisms, such as burrowing shrimp, the point of compliance should be modified to ensure protectiveness of cleanup remedies with respect to these organisms.

4.4.4 SURFACE WATER CLEANUP STANDARDS

Surface water cleanup standards for the Site, consisting of surface water cleanup levels and the location (point of compliance) where these cleanup levels must be met, have been established based on the surface water cleanup standards in the MTCA regulations, WAC 173-340-730, and with the state water quality standards in WAC 173-201A.

Surface Water Cleanup Levels

Surface water cleanup levels for the Site have been developed based on water quality criteria protective of aquatic organisms or risk to human health. Site-specific surface water cleanup levels are presented in Table 4.1. Note that, for arsenic, the cleanup level has been established based on the National Toxic Rule human health criterion in surface water, as adjusted to the current practical quantitation limit of 1 μg/L for chemical analysis for this constituent. Depending on the selected remedy, this value will be further adjusted upward to 5 μg/L if compliance monitoring is located in discharging groundwater rather than in surface water.

Point of Compliance

As discussed in Section 4.4.3, the biologically active zone in sediment is considered to extend from the sediment surface to a depth of 10 cm, or possibly deeper if the habitat is favorable for burrowing benthic organisms. The point of compliance for achieving surface water cleanup levels is the point of release of pore water into the Waterway, generally defined as the base of the biologically active zone. Therefore, surface water cleanup levels are applicable to a depth of 10 cm below the sediment surface unless the biologically active zone is deeper.

4.4.5 SEDIMENT PROTECTION CRITERIA

The chemical concentrations of groundwater/porewater at the sediment point of compliance can not exceed concentrations that may re-contaminate the sediments following remediation. Groundwater/porewater with chemical concentrations above the established porewater criteria shown in Table 4.1 will require treatment and/or containment. Table 4.1 uses published adsorption-based Koc values. These values might be replaced in the future by site specific desorption Koc values or adsorption Koc

values depending on the specific application of these values to the evaluation of alternative remedies and/or compliance monitoring

Contaminated sediment greater than 10 cm below the sediment surface will be considered a potential source of contamination, and preference given to removal where feasible. Where removal is infeasible, long-term physical and chemical isolation from the biologically active zone will be required.

4.4.6 OTHER PERFORMANCE STANDARDS

i) Groundwater Monitoring – The integrity and effectiveness of the groundwater remedial actions will be maintained through requirements for construction, long-term compliance monitoring, inspections and maintenance.

ii) Groundwater Treatment – Treated groundwater discharged from the groundwater treatment facility shall meet the water quality specified in the operating permit.

iii) pH Source Control – Measures for pH source control shall reduce high pH groundwater to below 8.5 in a manner to maintain the pH of the groundwater greater than 7.0.

iv) Capping Design – Capping design and construction will follow the USEPA guidance document "Guidance for In-Situ Sub-aqueous Capping of Contaminated Sediments" (September 1998, Reference EPA 905-B6-004). Caps will be constructed to address adverse impacts through four (4) primary functions.

   a) Physical isolation of sediment that exceed SQOs from the ecological receptors;

   b) Complete confinement and stabilization of contaminated sediments, preventing re-suspension and transport to other locations within the Waterway;

   c) Reduction of chemicals transported through the groundwater pathway to levels that will not cause surface sediments in the "biologically active zone" to exceed SQOs, and will not cause surface water in the "biologically active zone" to exceed surface water standards.

   d) Provide a cap surface that promotes colonization by aquatic organisms, unless it is demonstrated not to be practicable.

v) Cap Monitoring – The integrity and effectiveness of capping impacted sediments will be maintained through requirements for construction, long-term compliance monitoring and maintenance.

vi) Construction Water Quality – In-water remedial activities, including dredging and capping, will be subject to construction quality assurance and monitoring to ensure that applicable surface water standards protective of aquatic organisms are not exceeded beyond a designated surface water mixing zone. The mixing zone utilized during in-water activities will require a water quality certification from USEPA. OCC will submit water quality monitoring plans, as part of the Construction Quality Assurance Plans (CQAPs) required under this SOW.

vii) Natural Recovery Areas – Sediment areas designated for natural recovery shall achieve the remedial objectives within a ten (10) year time frame. Natural recovery monitoring will be performed until the remedial objectives have been achieved. Additional response actions for active remediation may be required if monitoring indicates that natural recovery does not occur by year ten.

viii) Conservation Measures and Mitigation – OCC will take all appropriate measures during remedial design, construction, and site maintenance to avoid and minimize adverse impacts to the aquatic environment resulting from implementation of the remedial action. As set forth in the CB/NT Biological Assessment (BA) prepared by USEPA, a range of conservation measures are required by USEPA to ensure that critical habitat for listed species is protected by the remedial action. Conservation measures for work in the Mouth of Hylebos Waterway Problem Area include:

a) Design of capping actions to avoid conversion of aquatic habitat to upland in the Mouth of Hylebos Waterway Problem Area, or inclusion of compensatory mitigation measures if conversion is unavoidable;

b) Design of dredging and capping actions to avoid conversion of intertidal habitat to subtidal habitat in the Mouth of Hylebos Waterway Problem Area, or inclusion of compensatory mitigation measures if conversion is unavoidable;

c) Timing restriction for in-water work to avoid fish-critical activity periods, such that no in-water work will occur during designated fish windows.

d) Substantive compliance with water quality standards as specified in a water quality certification to be issued by USEPA;

e) Addition of select substrates (fish mix) as part of capping to assist in providing suitable habitat for prey items of juvenile salmonids; and

f) Incorporation of specific measures (e.g., Best Management Practices) into the design, to reduce the potential for construction-related impacts to listed species or their habitats. Specific design measures will be reviewed and approved by USEPA.

Additional conservation measures beyond those identified by USEPA in the CB/NT BA (July 2000) may be identified by USEPA in consultation with the National Marine Fisheries Service and the U.S. Fish and Wildlife Service and shall be incorporated into the final design documents under this SOW.

Section 404 of the Clean Water Act requires compensatory mitigation for unavoidable loss of wetlands and aquatic habitat. To the extent that conversion of aquatic habitat to upland, or intertidal habitat to subtidal habitat is unavoidable within the Mouth of Hylebos Waterway Problem Area, and that compensatory mitigation is determined to be necessary, OCC shall submit compensatory mitigation plans to offset unavoidable losses to aquatic habitat. Compensatory mitigation shall contribute toward the recovery of ESA-listed species, consistent with the conservation measures in the BA and the August 2000 ESD performance standards for mitigation.

5.0 TASK A – SITE CHARACTERIZATION

The purpose of site characterization studies is to perform remaining investigations and evaluations needed to adequately characterize the contamination of soil, sediment and groundwater underlying the Site, evaluate the environmental risks posed, and allow development and evaluation of remedial design alternatives to address those risks. The scope of the work for the site characterization activities are based upon the following objectives:

i) determine the three-dimensional extent of VOC and pH contamination in ground water onshore and beneath Hylebos Waterway;

ii) determine the depth of hydraulic capture required to prevent contaminated groundwater from discharging into the Hylebos Waterway;

iii) determine the three-dimensional extent of source material onshore and beneath the Hylebos Waterway; and

iv) quantify the hydrogeological parameters that will allow the flux of potential contaminants into the Waterway to be determined, and provide data needed to refine the conceptual hydrogeological model for the Site.

Specific tasks to address the objectives are provided below.

5.1 TASK A1 – INTRODUCTION

The tasks presented in this SOW are based upon information currently known to OCC, USEPA and Ecology. These tasks may be modified or new tasks added to this SOW if deemed necessary based on the results of the field investigations performed under this SOW.

5.2 TASK A2 – ASSEMBLE EXISTING DATA

OCC will assemble and review existing hydrogeologic and chemical data that could be utilized to further evaluate the Site conditions and the existing groundwater remediation systems. This will include data from the reports listed in Table 2.2 as well as any other relevant and pertinent data.

5.3 TASK A3 – PERFORM SUPPLEMENTAL FIELD INVESTIGATIONS

OCC will perform the following supplemental investigations to further characterize the nature and extent of the groundwater and soil contamination at the Site.

i) Further Delineation of pH Plume: The plume of elevated pH groundwater will be further delineated through sampling of groundwater from discrete intervals in borings advanced within the upland portion of the Embankment Area. The data resulting from this sampling will be used to develop pH source control measures within the shallow groundwater elevated pH plume so that elevated pH groundwater does not reach the groundwater collection systems or the Waterway;

ii) Further Delineation of the Northern Extent of the Groundwater COC Plume: The Upland Groundwater COC plume will be further delineated through sampling of groundwater from discrete intervals in borings advanced outside the northern limit of the plume as currently defined. The delineation of the Upland Groundwater COC plume will be used in the evaluation of the existing groundwater remediation system;

iii) Delineation of Groundwater COC Plume Adjacent to Dock 2: The Embankment Area Groundwater COC plume adjacent to Dock 2 will be further delineated through the installation and sampling of monitoring wells installed between existing well locations 16 and 17 and the identification and sampling of bank seeps in the same area.. The existing wells at locations 16 and 17 will also be sampled. The data resulting from the analyses of these groundwater and seep samples will be used to evaluate groundwater alternatives;

iv) Evaluate the Effectiveness of the Existing E-Branch Injection Wells: Monitoring wells will be installed, hydraulically monitored and chemically sampled to determine whether the existing E-Branch injection wells maintain an effective hydraulic barrier to the flow of the Upland Groundwater COC plume to the Waterway;

v) Further Evaluate the Effectiveness of the Existing F-Branch Injection Wells: Additional monitoring wells will be installed, hydraulically monitored, and chemically sampled to further evaluate whether the existing F-Branch injection wells maintain an effective hydraulic barrier to the flow of the Upland Groundwater COC plume to the Waterway;

vi) Analyze Groundwater Samples for Appendix IX Analytes: Existing groundwater monitoring wells located within the upland portion of the Embankment Area will be sampled and the samples will be analyzed for the USEPA Appendix IX

parameter list. The data from the Appendix IX analyses will be used to assist in the design of the embankment cap long-term monitoring program;

vii) Further Characterization of COC Presence in Soil and Fill Within WMU H: The presence of Embankment Area COCs in soil and anthropogenic fill above the water table and in soils within the shallow saturated zone within former WMU H will be defined through the sampling and analysis of these materials. The data generated will be used with existing data to evaluate the potential for continuing contribution of Embankment Area COCs to groundwater from this unit as well as to evaluate groundwater remedial alternatives;

viii) Further Characterization of COC Presence in Soil and Fill Within WMU C: The presence of Embankment Area COCs in soil and anthropogenic fill above the water table and in soils within the shallow saturated zone within former WMU C will be defined through the sampling and analysis of these materials. The data generated will be used with existing data to evaluate the potential for continuing contribution of Embankment Area COCs to groundwater from this unit as well as to evaluate groundwater remedial alternatives;

ix) Characterization of Chemical Presence in Soil and Fill Within WMU A: The characterization of the extent of volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) in shallow soils within the surrounding former WMU A will be accomplished through the sampling and analysis of shallow soils. The investigation of WMU A was initially approved by Ecology in June 2001 with subsequent confirmation of that approval in the letter from L. Wilhelm (Ecology) to M. Wassmann (GSH) dated December 16, 2002;

x) Further Characterization of COC Presence in Soil and Fill Within the N Landfill: The presence of Embankment Area COCs in soil and anthropogenic fill above the water table and in soils within the shallow saturated zone within N Landfill will be defined through the sampling and analysis of these materials. The data generated will be used with existing data to evaluate the potential for continuing contribution of Embankment Area COCs to groundwater from this unit as well as to evaluate groundwater remedial alternatives;

xi) Area 5106 Slope Investigation: Nine (9) borings will be installed within and adjacent to Area 5106. Sediment samples collected from each boring will be analyzed and the resultant data will be used to further characterize residual chemical presence in the area investigated. Additional boreholes/sampling may be needed to define the extent of contamination beneath and in the vicinity of Pier 25 if samples from boreholes PT10 and /or PT11 contain elevated chemical concentrations. Based upon recent information, additional borings will be

needed to determine the extent of contamination both landward and waterward of the Area 5106 footprint.

xii) 709/721 Alexander Investigation: The PCE plume on the 709/721 Alexander properties will be investigated as described in the USEPA and Ecology approved "Work Plan, 709/721 Alexander Investigation".

xiii) Characterization for Chlorinated Dioxins (CDD), Furans (CDF) and Polychlorinated Biphenyl (PCB) Congeners: Sampling and analysis will be performed at selected locations to determine the levels of CDD, CDF, and PCB congeners .

With the exception of the 709/721 Alexander Investigation and the characterization for CDD, CDF and PCB congeners, the scope of the above investigations was detailed and presented in SAP and a QAPP prepared by OCC and approved by USEPA/Ecology on May 28, 2004 with stipulations. The field investigations were implemented according to the agency approved SAP and QAPP.

5.4 TASK A4 – SUBTIDAL DISCHARGE INVESTIGATION

USEPA and Ecology conducted a preliminary investigation of subtidal discharges to the Hylebos Waterway in two phases. Phase 1 consisted of field testing equipment and procedures and was conducted on April 21 and 22, 2004. Phase 2, conducted June 29 - July 2, 2004, July 20 and July 21, 2004 and August 10 and 11, 2004 consisted of diver reconnaissance, installation and sampling of piezometers, measurement of relative hydraulic heads between groundwater and surface water, the deployment and retrieval of passive diffusion samplers and the installation and retrieval of seepage meters. The field procedures, data evaluation, and the resulting USEPA and Ecology conclusions and recommended actions are provided in the report prepared by USEPA and Ecology titled "Preliminary Investigation and Assessment of Techniques for Characterizing Groundwater Discharge to the Hylebos Waterway", dated October 11, 2004.

OCC will prepare a Draft SAP and Draft QAPP to implement the Subtidal Discharge Investigation (SDI) based upon the recommended actions provided in the above agency report. OCC will finalize the SAP and QAPP for the SDI based upon USEPA/Ecology comments, along with any subsequent discussions with USEPA/Ecology if necessary for the purposes of clarifying agency comments.

Upon USEPA/Ecology approval of the SAP and QAPP, OCC will implement the SDI according to the approved SAP and QAPP. Results from the SDI will be presented to USEPA/Ecology as an interim data report, and incorporated into the Characterization Report prepared under Task A6 of this SOW.

5.5 TASK A5 – ADDITIONAL SITE INVESTIGATIONS

Additional upland investigation activities will be required, in coordination with the SDI (see Task A4), to determine the flux of potential contaminants into the Waterway and refine the conceptual hydrogeological model for the Site.

Determining the flux of contamination into the Waterway is necessary to evaluate the effectiveness and design parameters of potential sediment remedies such as capping, hydraulic containment or natural attenuation. By measuring upward hydraulic gradient, porosity, permeability, and flow velocities, the mass transport of contamination into the Hylebos Waterway can be estimated. Hydraulic gradient data will be developed in Task A4. The information on hydraulic gradients will be used in conjunction with porosity and permeability data to estimate the contaminant flux into the Waterway. Permeability data will be collected using techniques that utilize push probe drilling equipment. Soil samples will be collected from upland borings to measure vertical permeability, grain size, organic carbon, and porosity.

On behalf of Ecology, Tetra Tech EM Inc. (Tetra Tech) recently conducted an independent review and analysis of the hydrogeologic data collected at the Site (Tetra Tech, 2003). As a result of this review, Tetra Tech developed a characterization of the shallow aquifer beneath the Site. This conceptual hydrogeologic model suggests that two significant groundwater flow regimes are present beneath the site. The shallow groundwater flow extending to 100 feet bgs is recharged from local precipitation and discharges into the Hylebos Waterway. Deep groundwater flow below 100 feet bgs moves in the opposite direction toward the Blair Waterway and may be recharged from upland areas located northeast of the Site. Additional data is needed to confirm that the deep groundwater flow is directed toward the Blair Waterway and if so, to determine the transition depth between the shallow and deep groundwater flow systems in upland areas. These additional data need to be combined with similar data collected in the subtidal portion of the site. The transition between shallow and deep groundwater flow systems, if it exists, is anticipated to occur at depths between -60 and -100 feet MLLW. Additional site investigations will include:

i) installation of additional monitoring wells at existing well nests screened between 50 and 100-foot intervals. Data from the new onshore wells and offshore (see Task A4) locations will be used to identify the transition zone between the shallow to deep groundwater flow systems across the Site; and

ii) collection of additional information such as geochemical data to assist in the interpretation of the flow systems.

OCC will prepare a Draft SAP and Draft QAPP to implement the additional Site investigation activities. OCC will finalize the SAP and QAPP based upon USEPA/Ecology comments, along with any subsequent discussions with USEPA/Ecology if necessary for the purposes of clarifying agency comments. To avoid possible redundancy and promote the integration of similar tasks, a combined SAP and QAPP for Tasks A4 and A5 will be developed.

Upon USEPA/Ecology approval of the SAP and QAPP, OCC will implement the investigations according to the approved SAP and QAPP. Results from the investigations will be presented to USEPA/Ecology as an interim data report, and incorporated into the Characterization Report prepared under Task A6 of this SOW.

5.6 TASK A6– PREPARE CHARACTERIZATION REPORT

Upon completion of the Supplemental Field Investigations performed under Tasks A3, A4, and A5, OCC will prepare a Draft Characterization Report for USEPA/Ecology review. The Draft Characterization Report will include:

i) summaries of relevant existing analytical and physical data, including but not limited to Borehole 5106 and any other investigation borings that extend beyond the current Area 5106 dredge depth;

ii) summaries of supplemental investigations performed under Tasks A3, A4, and A5 including field activities and analytical results;

iii) maps and cross sections which illustrate the three dimensional extent of elevated chlorinated organic concentrations within the upper and lower portion of the embankment, including adjoining parts of the Waterway bottom to the east, upland areas to the west and the location of the waste management units;

iv) maps and cross sections which illustrate the subtidal discharge locations and relevant chemical data; and

v) recommendations and conclusions.

OCC will finalize the Characterization Report based on USEPA/Ecology comments on the Draft Characterization Report, along with subsequent discussions with USEPA/Ecology (for the purpose of clarifying agency comments).

6.0 TASK B – pH SOURCE CONTROL

6.1 TASK B1 – FINALIZE RAPID pH ASSESSMENT REPORT

Upon completion of the Supplemental pH Investigation performed under Task A3 of this SOW, OCC will prepare a revised Draft Rapid pH Assessment Report. The Draft Rapid pH Assessment Report will include all data collected during the two (2) phases of the Rapid pH Assessment program and will be submitted to USEPA/Ecology for review.

OCC will finalize the Rapid pH Assessment Report based on USEPA/Ecology comments on the revised Draft Rapid pH Assessment Report, along with subsequent discussions with USEPA/Ecology (for the purpose of clarifying agency comments).

The data presented in the Rapid pH Assessment Report will be utilized by OCC in the design of the pH source control performed under Tasks B5 and B6 of this SOW.

6.2 TASK B2 – TREATABILITY STUDY

OCC will implement a bench-scale treatability study to evaluate the effectiveness of carbon dioxide (CO_2) injection as the primary pH source control measure. Based on successful implementation at other sites, OCC intends to use CO_2 injection for pH source control unless the treatability study determines that it can not be effectively implemented at the Site. If the results of the treatability study suggest that CO_2 injection will be marginally effective or costly, OCC will extend the treatability study to include acid injection, treated water injection or other reagents.

The effectiveness of injecting CO_2 or other reagents will be determined by comparing the results of the treatability study to the following criteria:

i) Does the reagent reduce high pH groundwater to below 8.5?
ii) Does the resultant treatment alter the hydraulic properties of the soil matrix?
iii) Is the reaction easily controlled to prevent "over-treatment" of the groundwater to a pH below 6.0?
iv) Is the treatment expected to have a reasonable zone of influence surrounding each injection point?

Upon completion of the treatability study, OCC will prepare a Draft Treatability Study Report. The Draft Treatability Study Report will include the following:

i) description of the test equipment and procedures;

ii) description of the test results;

iii) conclusions concerning the treatability test results;

iv) brief discussion of potential alternatives for pH source control; and

v) selection of pH source control measures with justification.

OCC will finalize the Treatability Study Report based on USEPA/Ecology comments on the Draft Treatability Study Report, along with subsequent discussions with USEPA/Ecology (for the purpose of clarifying agency comments).

6.3 TASK B3 – PREPARE WORK PLAN FOR PH PILOT STUDY

Upon USEPA/Ecology approval of the Treatability Study Report and this SOW, OCC will prepare a Draft Work Plan for pH Pilot Study for USEPA/Ecology review. The scope, methodologies and procedures for the pH Pilot Study will be developed to achieve the following objectives:

i) determine the overall feasibility of utilizing $FeSO_4$ injection as an in-situ treatment for pH source control considering treatment effectiveness, implementability and costs;

ii) determine the most cost-effective implementation methodologies, equipment, QA/QC monitoring procedures, etc.;

iii) establish empirical relationships for various parameters that will be utilized in the design and implementation of the pH source control; and

iv) evaluate the impacts of $FeSO_4$ injection on soil permeability, conductivity and groundwater flow.

OCC will finalize the Work Plan for pH Pilot Study based on USEPA/Ecology comments on the Draft Work Plan, along with subsequent discussions with USEPA/Ecology (for the purpose of clarifying the agency comments).

6.4 TASK B4 – IMPLEMENT PH PILOT STUDY

Upon USEPA/Ecology approval of the Work Plan for pH Pilot Study, OCC will implement the pH Pilot Study as outlined in the approved Work Plan. Upon completion of the pilot study, OCC will submit a pH Pilot Study Report to USEPA/Ecology documenting the results of the pilot study. The results of the pilot study will be the basis for the design of the pH source control measures performed under Tasks B5 and B6 of this SOW.

6.5 TASK B5 – PREPARE PRELIMINARY DESIGN REPORT FOR pH SOURCE CONTROL

The scope of the pH source control that will be implemented at the Site, will be determined by, and compatible with, the groundwater and sediment remedies selected under Task C2 and D2 of this SOW and approved by USEPA/Ecology. Therefore, OCC will begin the design of the pH source control upon USEPA/Ecology approval of the pH Pilot Study Report and the completion of Task C2 and D2 of this SOW. To document the design, OCC will prepare a Preliminary Design Report for pH Source Control for USEPA/Ecology review. The Preliminary Design Report for pH Source Control will include the following components:

i) description of the key elements of the pH source control that will be implemented;

ii) preliminary Process Flow Diagrams and Process and Instrumentation Diagrams (P&IDs);

iii) preliminary engineering calculations;

iv) implementation methodology;

v) preliminary construction drawings showing proposed injection and monitoring locations;

vi) detailed schedule for implementation of the pH control measures including those portions of pH source control to be implemented as interim measures;

vii) description of methods that will be used during implementation to confirm that the elevated pH is being reduced at a rate sufficient to achieve the schedule; and

viii) description of contingency measures that will be taken, if it is determined during implementation that the rate of pH reduction is not sufficient to achieve the schedule.

6.6 TASK B6 – PREPARE FINAL DESIGN REPORT FOR - pH SOURCE CONTROL

Upon receipt of USEPA/Ecology comments on the Preliminary Design Report for pH Source Control, OCC will continue with the final design of the pH source control that will be implemented. The final design will incorporate any USEPA/Ecology comments on the Preliminary Design Report, along with subsequent discussions with USEPA/Ecology. To document the final design, OCC will prepare a Draft Final Design Report for pH Source Control for USEPA/Ecology review. The Draft Final Design Report for pH Source Control will include the following components.

i) description of pH source control that will be implemented including those portions of pH source control to be implemented as interim measures;

ii) final Process Flow Diagrams and P&IDs;

iii) final construction drawings showing the proposed injection and monitoring locations;

iv) final engineering calculations;

v) implementation methodology including the proposed drilling/injection sequence, equipment descriptions, etc.;

vi) description of methods that will be used during implementation to confirm that the elevated pH is being reduced at a rate sufficient to achieve the schedule;

vii) description of contingency measures that will be taken, if it is determined during implementation that the rate of pH reduction is not sufficient to achieve the schedule;

viii) technical specifications;

ix) Construction Quality Assurance/Monitoring Plan;

x) Health and Safety Plan; and

xi) Quality Assurance Project Plan.

OCC will finalize the Final Design Report for pH Source Control based on USEPA/Ecology comments, along with subsequent discussions with USEPA/Ecology (for the purpose of clarifying agency comments). The USEPA/Ecology approved Final

Design Report will be the basis for the implementation of the pH source control required for the selected groundwater and sediment remedies.

6.7 TASK B7 – IMPLEMENT INTERIM PH SOURCE CONTROL MEASURES

Upon USEPA/Ecology approval of the Final Design Report for pH Source Control, OCC will implement, as interim measures, those portions of the pH source control scope (as presented in the Final Design Report) that require implementation prior to the implementation of the selected groundwater and sediment remedies. The scope of the interim pH source control measures will be determined by OCC, USEPA and Ecology . Specifically, the portion of the pH source control measures that USEPA and Ecology determine can be performed during and/or after implementation of the selected groundwater and sediment remedies will not be implemented as interim pH source control measures under this SOW.

OCC will meet all applicable substantive requirements of the State Injection Control Program, Chapter 173-218 WAC, prior to and during implementation of the interim pH source control measures. Requirements for long-term pH monitoring will be included in the Groundwater Monitoring Plan prepared under Task C of this SOW.

7.0 TASK C – GROUNDWATER REMEDIATION

7.1 TASK C1 – EVALUATE EXISTING CONTAINMENT / TREATMENT SYSTEMS

Upon completion of the investigations performed under Tasks A3, A4 and A5, OCC will evaluate the performance of the existing groundwater remediation systems to provide the required containment of impacted Site groundwater. The evaluation will include the existing extraction system, the existing injection system, and the existing treatment system.

The evaluation will be based on the available Site data and the data obtained from the investigations performed under Tasks A3, A4 and A5. The evaluation methodologies and results will be presented in the Evaluation Report for Groundwater Remedial Alternatives performed under Task C2 below.

7.2 TASK C2 – EVALUATE GROUNDWATER REMEDIAL ALTERNATIVES

The evaluation of the existing groundwater remediation systems performed under Task C1, will identify whether the existing groundwater remediation system achieves the stated groundwater remedial objectives.

Based on the currently available Site information, the following preliminary list of groundwater remedial alternatives will be evaluated under this Task. If deficiencies in the existing systems are identified during the evaluations, this list of preliminary remedial alternatives for groundwater remediation will be modified, as necessary, to address the specific system deficiencies.

- Groundwater collection drain tile under an impermeable cap over the entire embankment (see Section 8.2 for discussion of Sediment Remedial Alternatives) to collect contained groundwater for treatment.
- Groundwater collection drain tile under an impermeable cap over portions of the embankment (see Section 8.2 for discussion of Sediment Remedial Alternatives) to collect contained groundwater for treatment.
- Complete hydraulic containment using a network of extraction wells and/or drain tiles in the upland areas only.
- Complete hydraulic containment using shoreline injection wells (similar to the existing system) along the embankment, in combination with the aforementioned network of extraction wells and/or drain tiles in the upland areas.
- Groundwater extraction system (wells and/or drain tiles) combined with physical containment (i.e., slurry wall, sheet piling, etc.) along the shoreline (adjacent to or within the embankment area).
- Physical containment (i.e. slurry wall, sheet piling, etc.) along the shoreline combined with upland groundwater extraction (wells and/or drain tiles) and excavation of portions of the embankment on the waterside of the containment (see Section 8.2 for discussion of Sediment Remedial Alternatives).
- Excavation of portions of the embankment that are beyond the limits of the physical or hydraulic containment system (see Section 8.2 for discussion of Sediment Remedial Alternatives).
- Permeable Reactive Barrier (PRB) along the entire shoreline or in combination with a physical containment wall (i.e., funnel and gate) to effect passive treatment of groundwater before it reaches the Waterway.

- Chemical oxidation via the introduction of oxygen releasing compounds (ORC) or hydrogen releasing compounds (HRC) into the groundwater along the shoreline (or further upland) to react with and destroy organic chemicals.
- Air or ozone sparging system along the shoreline (or further upland) as a line of vertical sparge/extraction wells or horizontal perforated pipes, possibly combined with SVE system (see next bullet) if sparging causes significant loading of vapor phase VOCs into the vadose zone.
- Soil vapor extraction (SVE) system along the shoreline (or further upland) as a line of vertical extraction wells or horizontal perforated pipe for extraction of contaminants from the vadose zone.
- Localized excavation of soils and/or sediment which serve as a source for groundwater contamination.

A brief description of each remedial technology included in the above groundwater remedial alternatives is presented below.

i) Groundwater Collection Systems - Groundwater collection involves the removal of groundwater from the subsurface, with required treatment of the collected groundwater prior to discharge. This collection can be facilitated via vertical extraction wells and/or horizontal drain tiles, both involving well screens (or perforated pipe) to allow water (but not fines) into the well/pipe.

ii) Injection/Recirculation Wells - To assist the groundwater collection system(s), injection/recirculation wells may be installed whereby water (treated, pre-treated, or untreated) is injected into the subsurface. This injection of water can provide hydraulic containment by creating a groundwater mound to prevent continued migration of contaminated water (i.e., along the shoreline), or can be used to accelerate remediation by driving groundwater towards the groundwater collection system(s).

iii) Soil/Sediment Excavation - This technology involves direct removal of the pertinent material, and appropriate disposal.

iv) Permeable Reactive Barrier - The permeable reactive barrier (PRB) technology consists of a shallow trench excavated across the groundwater flow pathway and backfilled treatment media such as iron fillings. As groundwater flows through the PRB, passive treatment is effected but no groundwater is removed. For an iron filing PRB, the iron acts as the reactive substrate and the VOCs are converted into non-toxic natural by-products or immobile compounds. Other

treatment media (i.e., granular activated carbon) will act differently while performing the passive treatment. PRB technology may be used in combination with physical containment (i.e., funnel and gate), whereby PRB gates are constructed at select locations within the containment wall.

v) In-situ-Chemical Oxidation - This technology involves the introduction of either ORC or HRC into the groundwater in sufficient concentration to react with and destroy organic chemicals. For ORC, oxidizing agents such as Fenton's Reagent (H_2O_2 in a solution with sulfuric acid and ferrous iron), hydrogen peroxide, or potassium permanganate solutions are introduced into the groundwater.

vi) Air or Ozone Sparging - Air sparging is an in-situ technology whereby air is injected (sparged) into impacted groundwater to "strip" VOCs from the water. As the sparged air travels up through the water, mass transfer of VOCs from the liquid to the vapor phase occurs and the VOCs are carried into the vadose zone. Ozone sparging is similar to air sparging except ozonated air is sparged into the groundwater. As the mass transfer of VOCs occurs from the liquid to gas phase, the ozone in the air reacts with and breaks down the organic compounds.

vii) Soil Vapor Extraction - Soil vapor extraction (SVE) is an in-situ remedial technology whereby a vacuum is applied through wells near the source of elevated chemical concentrations in the soil. In this way, volatile constituents of the chemical mass "evaporate" and the vapors are drawn toward the extraction wells thus reducing the concentrations of VOCs adsorbed to soils in the unsaturated (vadose) zone. Extracted vapor is then treated as necessary (commonly with carbon adsorption) before being released to the atmosphere. SVE may be required in combination with air sparging if the VOC loading into the vadose zone is significant.

The preliminary list of groundwater remedial alternatives presented above is based on currently available site information. The list may be modified, as necessary, to address additional site data obtained during the investigations performed under Task A3 and A4. In addition, OCC will perform a preliminary evaluation of the preliminary alternatives to identify those alternatives that can be eliminated from further evaluation due to technical considerations including constructability. Cost will only be a consideration in eliminating an alternative where the incremental costs of an alternative being evaluated over that of a lower cost alternative exceed the incremental benefits achieved by that alternative over the lower cost alternative. OCC will submit a technical memorandum to USEPA/Ecology recommending the final list of groundwater remedial

alternatives that will be evaluated under Task C2. The technical memorandum will include a description of each retained alternative and the justification for eliminating each alternative that is not retained for further evaluation. Upon USEPA/Ecology approval of the revised list of alternatives, OCC will evaluate each retained alternative according to applicable criteria in the MTCA cleanup regulations including criteria specified in WAC 173-340-360 and criteria specified in the National Contingency Plan (NCP).

OCC will prepare a Draft Evaluation Report for Groundwater Remedial Alternatives for USEPA/Ecology approval. The Draft Evaluation Report for Groundwater Remedial Alternatives will include the following:

i) a detailed presentation of the evaluations of the existing groundwater remediation systems performed under Task C1;

ii) summary of the deficiencies, if any, identified during the evaluation of the existing groundwater remediation systems;

iii) descriptions of the selected and approved groundwater remedial alternatives;

iv) a detailed discussion and evaluation of each remedial alternative;

v) selection and justification of a remedial alternative(s) for implementation including a description of how the selected remedial alternatives will be integrated with the selected sediment remedial alternative(s).

vi) an evaluation of the capacity of the components of the groundwater treatment plant; and

vii) an evaluation of the capability of the groundwater treatment plant to process the estimated combined hydraulic and chemical loadings from the recommended groundwater and sediment remedial alternatives, and, if applicable, an evaluation of the modifications to the groundwater treatment plant that are required to process the increased hydraulic and/or chemical loading.

OCC will revise the Evaluation Report for Groundwater Remedial Alternatives based on USEPA/Ecology comments on the Draft Evaluation Report, along with subsequent discussions with USEPA/Ecology (for the purposes of clarifying agency comments).

Concurrently with the submittal of the revised Evaluation Report for Groundwater Remedial Alternatives, OCC will submit to Ecology a checklist assessing the environmental impacts of the recommended alternative according to the requirements in the current State Environmental Policy Act (SEPA) regulations, Chapter 197-11 WAC.

7.3 TASK C3 – ISSUE EVALUATION REPORT FOR PUBLIC COMMENT

Following USEPA/Ecology concurrence with the revised Evaluation Report, USEPA/Ecology will issue the revised Evaluation Report for public comment. A forty-five (45) day public comment period is anticipated. Following the public comment period, USEPA/Ecology will prepare responses to the public comments received. OCC will finalize the Evaluation Report for Groundwater Remedial as directed by USEPA/Ecology as the result of agency consideration of comments received during the public comment period.

7.4 TASK C4 – PREPARE 30% DESIGN REPORT FOR GROUNDWATER REMEDIATION

If directed to do so by USEPA/Ecology, in order to expedite the schedule, OCC will begin the design of the remedial alternative(s) selected under Task C2 while the public comment period for the Evaluation Report is underway. To document the design, OCC will initially prepare a 30% Design Report for Groundwater Remediation for USEPA/Ecology review. The 30% Design Report for Groundwater Remediation will include the following components:

i) descriptions of the key design elements of the selected groundwater remedial alternative(s);

ii) preliminary Process Flow Diagrams and P&IDs, if appropriate;

iii) preliminary engineering calculations;

iv) construction/implementation methodology;

v) preliminary/conceptual construction drawings showing key elements of the selected remedial alternative(s);

vi) a Draft Work Plan for Groundwater Pilot Testing the 30% Design to determine/confirm critical design parameter (e.g. well spacing, extraction/injection rates, etc) for the selected remedial alternatives(s) unless USEPA and Ecology make a determination after consultations with OCC that sufficient information exists in lieu of conducting pilot testing of the selected remedial alternative(s); and

vii) if appropriate, results of groundwater flow modeling performed under Task E3 to determine critical design parameters (e.g. well spacing, extraction/inject rates, etc.) for the selected remedial alternative(s).

7.5 TASK C5 – IMPLEMENTGROUNDWATER PILOT TESTING

If pilot testing is required, OCC will finalize the Work Plan for Groundwater Pilot Testing based on USEPA/Ecology comments on the Draft Work Plan and the 30% Design Report, along with subsequent discussions with USEPA/Ecology (for the purposes of clarifying agency comments).

Upon USEPA/Ecology approval of the Work Plan for Groundwater Pilot Testing, OCC will implement the pilot testing as outlined in the approved Work Plan. Upon completion of the pilot testing, OCC will submit a Groundwater Pilot Testing Report to USEPA/Ecology documenting the results of the pilot testing. Based on the results of the pilot testing, the Groundwater Pilot Testing Report will propose, for USEPA and Ecology approval, any needed design modifications to the selected remedial alternative(s) described in the 30% Design Report.

7.6 TASK C6 – PREPARE 90% DESIGN REPORT FOR GROUNDWATER REMEDIATION

To document the continued design efforts, OCC will prepare a Draft 90% Design Report for Groundwater Remediation for USEPA/Ecology review. The 90% design will incorporate any agency comments on the 30% Design Report along with any agency-approved modifications to the 30% design of the selected remedial alternatives resulting from the recommendations in the Groundwater Pilot Testing Report. The Draft 90% Design Report for Groundwater Remediation will include the following components:

i) descriptions of key design elements of the selected groundwater remedial alternative(s);

ii) final Process Flow Diagrams and P&IDs, if appropriate;

iii) final engineering calculations;

iv)

iv) where appropriate, results of the groundwater flow modeling performed in Task E3;

v) construction/implementation methodology;

vi) final construction drawings;

vii) technical specifications;

viii) Construction Quality Assurance Plan;

ix) Health and Safety Plan;

x) Groundwater Operations and Maintenance Plan – The existing Groundwater Operation and Maintenance Plan (GOMP) for the groundwater remediation systems will be revised to reflect the requirements of the remediation systems after completion of the remedial actions implemented under this SOW;

xi) Long-term Groundwater Monitoring Plan – A Draft Groundwater Monitoring Plan, (GMP) consistent with the requirements for compliance monitoring in the MTCA cleanup regulations WAC 173-340-410, will be prepared that will present the requirements for groundwater monitoring at the Site to assure the long-term effectiveness of the groundwater remediation. Following implementation of the groundwater remedial actions and finalization of the GMP based on comments on the draft GMP received from USEPA/Ecology that will be included with the agency comments on the 90% Design Report for Groundwater Remediation, the GMP will replace the existing CAMP. OCC will work closely with Ecology to develop a GMP that provides a cost-effective program in which the monitoring data clearly represent the performance of the groundwater remediation system;

xii) Quality Assurance Project Plan; and

xiii)Draft Engineering Report for Groundwater Treatment Plant Modifications (if required) – see Task C7 of this SOW.

OCC will finalize the 90% Design Report based on USEPA/Ecology comments on the Draft 90% Design Report, along with subsequent discussions with USEPA/Ecology (for the purpose of clarifying agency comments).

7.7 TASK C7 – PREPARE DRAFT 90% ENGINEERING REPORT FOR GROUNDWATER TREATMENT PLANT MODIFICATIONS

The actual evaluation of the groundwater treatment plant will be performed under Task C1 and reported under Task C2. If modifications to the groundwater treatment plant are required as part of the selected Groundwater remedy, OCC will prepare a separate Draft 90% Engineering Report for Treatment Plant Modifications. The Draft 90% Engineering Report will be prepared in accordance with applicable requirements in Chapter 173-240 WAC and the guidance entitled "Submissions of Plan and Reports for Construction of Wastewater Treatment Facilities." The Draft 90% Engineering Report for Groundwater Treatment Plant Modifications will describe the proposed modifications and will be submitted to USEPA/ Ecology for review as an appendix to the Draft 90% Design Report prepared and under Task C6 of this SOW.

OCC will finalize the 90% Engineering Report based on USEPA/Ecology comments on the Draft 90% Engineering Report, along with subsequent discussions with Ecology (for the purpose of clarifying agency comments).

8.0 TASK D – SEDIMENT REMEDIATION

8.1 TASK D1 – DRAIN TILE / EMBANKMENT CAP SYSTEM MODELING

One of the remedial alternatives that will be evaluated under Task D2 of this SOW, consists of a drain tile collection system constructed as part of the cap for the Embankment Area. The drain tile/embankment cap system as currently conceptualized is presented on Figure 6.1. The drain tile/embankment cap system would extend from some distance beyond the northern Pioneer property line to the southern boundary of the Mariana property. The single liner shown in Figure 6.1 is for illustrative purposes only and does not reflect the possibility that one or more additional liners may be required.

The drain tile will flow to collection sumps located along the length of the embankment. Pumps will be installed in each sump to pump collected groundwater to the existing groundwater treatment plant.

Conceptually, the system as proposed would meet the remedial objectives of both the Groundwater Remediation and the Embankment Area Removal Action. Preliminary

groundwater flow modeling (CRA, October 2003) indicates that the drain tile/embankment cap system is a possible remedial alternative.

OCC will evaluate the effectiveness of the drain tile/embankment cap system conceptualized on Figure 6.1 to meet the Site's remedial objectives. The effectiveness of the system will be evaluated based upon a two-dimensional groundwater flow model representative of the Site hydrogeological conditions. The groundwater flow model will be developed using the finite-difference groundwater flow model MODFLOW-SURFACT99. Hydraulic containment will be evaluated by particle tracking simulations using the particle-tracking model MODPATH that works in conjunction with MODFLOW. Due to the impermeable liner and anticipated groundwater flow velocities within the underlying drainage layer, contaminant transport modeling is not expected to be required. However, should the groundwater flow velocities within the drainage layer not be as high as expected, some contaminant transport modeling may be required on the final modeling runs.

Hydraulic properties of the existing hydrogeologic system used in the model will be based on the available Site and regional data. Hydraulic properties of the embankment cap will be assigned consistent with the materials of construction presented on Figure 6.1. Note that if this alternative is selected the materials of construction, thickness and their related hydraulic properties will be revised as necessary to optimize the hydraulic performance of the drain tile/embankment cap system and to ensure its constructability and performance over its design life. A final modeling run will then be performed consistent with the materials selected and used in the actual construction of the cap.

OCC and USEPA/Ecology have been working on developing a Modeling Plan for the proposed groundwater flow modeling. USEPA/Ecology approved the Draft Modeling Plan on May 5, 2004. OCC finalized the Modeling Plan and submitted it to USEPA/Ecology on May 11, 2004.

OCC will perform the groundwater flow modeling as outlined in the USEPA/Ecology approved Modeling Plan. To document the modeling, OCC will prepare a Modeling Report for USEPA/Ecology review. The Modeling Report will include:

i) a presentation of all model construction details, input parameters and the basis for these input parameters;

ii) a presentation of the simulation results in graphical and tabular format as appropriate;

iii) a compact disk containing the modeling input/output files;

iv) a summary of the modeling results; and

v) conclusion(s) as to the effectiveness of the drain tile/embankment cap system to contain site groundwater.

8.2 TASK D2 – EVALUATE SEDIMENT REMEDIAL ALTERNATIVES

Based on the currently available Site information, the following preliminary list of sediment remedial alternatives will be evaluated under this task.

- Localized excavation of the embankment soil, debris and/or sediment, likely in combination with physical or hydraulic containment (see Section 7.2 for discussion of Groundwater Remedial Alternatives).
- Permeable cap over the embankment and Area 5106 impacted sediments, with amendments, if necessary, to absorb organics and allow tidal dispersion of inorganics.
- Semi-permeable cap constructed over impacted sediments, with amendments, if necessary, to absorb organics.
- Impermeable cap constructed over the embankment (selected portions or the entire area) to prevent groundwater migration to the Waterway.
- Impermeable cap constructed over the embankment (similar to above), with a drain tile installed to collect groundwater for treatment. For this alternative, the impermeable cap will prevent groundwater migration to the Waterway (directing it to the drain tile), but the cap must also prevent incoming flow from the Waterway resulting from the fluctuating tidal conditions.

The preliminary list of sediment remedial alternatives presented above is based on currently available site information. The list may be modified, as necessary, to address additional site data obtained during the investigations performed under Tasks A3, A4 and A5. In addition, OCC will perform preliminary evaluations of the preliminary alternatives to identify those alternatives that can be eliminated from further evaluation due to technical considerations including constructability. Cost will only be a consideration in eliminating an alternative where the incremental costs of an alternative being evaluated over that of a lower cost alternative exceed the incremental benefits achieved by that alternative over the lower cost alternative. OCC will submit a technical memorandum to USEPA/Ecology recommending the final list of sediment remedial alternatives that will be evaluated under Task D2. The technical memorandum will

include a description of each retained alternative and the justification for eliminating each alternative that is not retained for further evaluation. Upon USEPA/Ecology approval of the revised list of alternatives, OCC will evaluate each retained alternative according to applicable criteria in the MTCA cleanup regulations including criteria specified in WAC 173-340-360 and criteria specified in the NCP.

OCC will prepare a Draft Evaluation Report for Sediment Remedial Alternatives for USEPA/Ecology approval. The Draft Evaluation Report for Sediment Remedial Alternatives will include the following:

i) description of the selected and approved sediment remedial alternatives;

ii) a detailed discussion and evaluation of each remedial alternative; and

iii) selection and justification of a remedial alternative(s) for implementation including a description of how the selected remedial alternative(s) will be integrated with the selected groundwater remedial alternative(s).

OCC will revise the Evaluation Report for Sediment Remedial Alternatives based on USEPA/Ecology comments on the Draft Evaluation Report, along with subsequent discussions with USEPA/Ecology (for the purpose of clarifying agency comments).

Concurrently with the submittal of the revised Evaluation Report for Sediment Remedial Alternatives, OCC will submit to Ecology a checklist assessing the environmental impacts of the recommended alternatives according to the requirements in the current State Environmental Policy Act (SEPA) regulations, Chapter 197-11 WAC.

8.3 TASK D3 – ISSUE EVALUATION REPORT FOR PUBLIC COMMENT

Following USEPA/Ecology concurrence with the revised Evaluation Report, USEPA/Ecology will issue the revised Evaluation Report for public comment. A forty-five (45) day public comment period is anticipated. Following the public comment period, USEPA/Ecology will prepare responses to the public comments received. OCC will finalize the Evaluation Report for Sediment Remedial Alternatives as directed by USEPA/Ecology as a result of agency consideration of comments received during the public comment period.

8.4 TASK D4 – PREPARE 30% DESIGN REPORT FOR SEDIMENT REMEDIATION

If directed to do so by USEPA / Ecology, in order to expedite the schedule, OCC will begin the design of the remedial alternative(s) selected under Task D2 while the public comment period for the Evaluation Report is underway. To document the design, OCC will initially prepare a 30% Design Report for Sediment Remediation for USEPA/Ecology review. The 30% Design Report Sediment Remediation will include the following components:

i) Descriptions of the key design elements of the selected sediment remedial alternative(s);

ii) Preliminary Process Flow Diagrams and P&IDs, if appropriate;

iii) Preliminary Engineering Calculations;

iv) Construction/Implementation Methodology;

v) Groundwater Flow Modeling, if appropriate; and

vi) Preliminary/conceptual construction drawings showing key elements of the selected remedial alternative(s).

8.5 TASK D5 - PREPARE 90% DESIGN REPORT FOR SEDIMENT REMEDIATION

Upon USEPA/Ecology approval of the Evaluation Report for Sediment Remedial Alternatives (Task D3) and receipt of USEPA/Ecology comments on the 30% Design Report (Task D4), OCC will continue with the design for the Sediment Remediation. To document the continued design efforts, OCC will prepare a Draft 90% Design Report for Sediment Remediation for USEPA/Ecology review. The 90% design will incorporate any agency comments on the 30% Design Report.

The Draft 90% Design Report for Sediment Remediation will include the following components:

i) Descriptions of key design elements of the selected sediment remedial alternatives(s);

ii) Final Process Flow Diagrams and P&IDs, if appropriate;

iii) Final Engineering Calculations;

iv) Groundwater Flow Modeling, if appropriate;

v) Construction/Implementation Methodology;

vi) Slope Stability Assessment (if a capping alternative is selected) – An assessment of slope stability will be presented in the report. The stability of the designed cap will be analyzed utilizing standard geotechnical methodologies for slope stability. The analysis will be limited to static gravity conditions. Seismic analysis will not be included in the design of the caps. Long-term inspection and monitoring will ensure the integrity of the caps. Areas of the caps damaged by seismic activity will be repaired.

vii) Erosion Control Analysis (if a capping alternative is selected) – An Erosion Control Analysis will be presented in the report. The cap designs will include an analysis of the dynamic forces within the Waterway and their impact on the long-term stability of the caps. These dynamic forces include wind-generated wave action, vessel-induced wake heights, and propeller wash effects on bottom currents. Erosion control measures (e.g., riprap) will be designed to withstand these dynamic forces.

viii) Material Selection and Availability (if a capping alternative is selected) – A general discussion of the materials that will be utilized in the cap system will be presented in the report. The selection of each material utilized in the system will be based on specific criteria required by the groundwater flow modeling, hydraulic engineering calculations, the slope stability assessment and the erosion control analysis. Further, materials will be selected from locally available materials which meet these criteria.

ix) Final Construction Drawings

x) Technical Specifications

xi) Construction Quality Assurance Plan – A Construction Quality Assurance/Monitoring Plan (CQAP) will be prepared to present the inspections and testing required during the construction of the cap systems. In addition, the CQAP will present the water quality monitoring which will be performed during construction operations to assure that relevant marine WQC are not exceeded beyond the limits of the established mixing zone.

xii) Health and Safety Plan

xiii) Community Air Monitoring/Emergency Response Plan

xiv) Long-Term Compliance Monitoring Plan - A Long-Term Compliance Monitoring Plan will be prepared which presents the requirements for monitoring to assure the long-term effectiveness of the sediment remediation. The CMP will be prepared consistent with the requirements for compliance monitoring in the

MTCA cleanup regulations WAC 173-340-410 and applicable regulations in CERCLA.

xv) Long-Term Operations and Maintenance Plan – A long-term Operation and Maintenance Plan (OMP) will be prepared which presents the requirements for operation and maintenance to assure the long-term effectiveness of the sediment remediation. Maintenance of a capping alternative will be performed on an as-needed basis based on inspections and surveys.

xvi) Quality Assurance Project Plan

OCC will finalize the 90% Design Report based on USEPA/Ecology comments on the Draft 90% Design Report, along with subsequent discussions with USEPA/Ecology (for the purpose of clarifying agency comments).

9.0 TASK E – 3D GROUNDWATER FLOW MODELING

OCC will develop a three-dimensional (3D) groundwater flow model for the Site. The primary purpose of the 3D model is to serve as a simulation tool for evaluating potential groundwater and sediment remedial alternatives and assist in the design of selected remedies. It is expected that the 3D groundwater flow model will be improved, if warranted, as more data becomes available that demonstrate hydrogeologic conditions differ from those used for the 3D model development. The model may also be useful in identifying areas where future additional data could help reduce uncertainty in the model predictions, if necessary and appropriate. The 3D groundwater flow model will be calibrated assuming steady-state groundwater flow conditions under the average tide elevation.

9.1 TASK E1 - DEVELOP MODELING PLAN

OCC will prepare a Draft Modeling Plan for the development of the 3D groundwater flow model for USEPA/Ecology review. The 3-D Modeling Plan will include:

i) the objectives and purpose of modeling;

ii) criteria for the evaluation and selection of an appropriate groundwater modeling program;

iii) a summary of the current status of the conceptual hydrogeological model developed for the Site;

iv) a description of the model domain, hydrogeologic properties, boundary conditions and other applicable model inputs;

v) procedures and objectives used for calibrating the model;

vi) a list of proposed simulations to evaluate those groundwater and sediment remedial alternatives anticipated to be retained for final evaluation in Tasks C2 and D2, respectively; and

vii) a schedule for conducting the modeling tasks.

OCC will finalize the Modeling Plan based on USEPA/Ecology comments on the Draft Modeling Plan, along with subsequent discussions with USEPA/Ecology.

9.2 TASK E2 - 3D MODEL CONSTRUCTION AND CALIBRATION

Utilizing the hydraulic monitoring data collected during Tasks A4 and A5 of this SOW, OCC will construct and calibrate the 3-D groundwater flow model as outlined in the USEPA/Ecology approved Modeling Plan. To document the model construction and calibration, OCC will prepare a Draft Model Calibration Report for USEPA/Ecology review. The Draft Model Calibration Report will include:

i) a summary of the finalized conceptual hydrogeological model developed for the Site;

ii) a description of the groundwater flow modeling program selected for developing the 3D model;

iii) a presentation of all model construction details, input parameters and the basis for these input parameters;

iv) a presentation of the model calibration results in graphical and tabular format as appropriate, including a model calibration sensitivity analysis;

v) a compact disk containing electronic versions of the input/output files for the calibrated model; and

vi) a summary of the modeling calibration results.

OCC will finalize the Model Calibration Report based on USEPA/Ecology comments on the Draft Model Calibration Report, along with subsequent discussions with USEPA/Ecology. The final calibrated groundwater flow model will be applied in the evaluation of the potential groundwater and sediment remedial alternatives under Task E3 (described below) of this SOW.

9.3 TASK E3 - MODELING OF REMEDIAL ALTERNATIVES

OCC will apply the USEPA/Ecology approved final calibrated groundwater flow model to evaluate potential groundwater and sediment remedial alternatives, and to assist in the design of selected remedies. To document the application of the calibrated model to evaluate the remedial alternatives, OCC will prepare a Draft Model Application Report for USEPA/Ecology review. The Draft Model Application Report will include:

i) a description of each remedial alternative evaluated in terms of the location and magnitude of stresses to the shallow aquifer (i.e., pumping/injection wells and

rates) and hydraulic property specifications (i.e., for capping and barrier alternatives);

ii) a description of the methodology applied to evaluate each remedial alternative (i.e., particle tracking and solute transport methods);

iii) a presentation of the simulation results for each alternative in graphical and tabular format as appropriate;

iv) a compact disk containing electronic versions of the input/output files for the remedial alternative simulations; and

v) conclusions on the effectiveness on the remedial alternatives being evaluated and/or information on design parameters of selected alternatives as appropriate.

OCC will finalize the Model Application Report based on USEPA/Ecology comments on the Draft Model Application Report, along with subsequent discussions with USEPA/Ecology.

10.0 SCHEDULE

Table 10.1 presents a Milestone Schedule for the submittal of deliverables required under this SOW. In the event that OCC's ability to meet these milestones is impacted by unforeseen circumstances or project scope revisions, OCC will immediately notify USEPA and Ecology so that the issue can be resolved with minimal impact on the overall project schedule. The Milestone Schedule is based on the understanding that no local, state, or federal permits will be required for onsite response actions conducted pursuant to the AOC.

A detailed up-to-date project schedule will be provided with each monthly report to the Agencies. OCC will continue to regularly update the schedule, as needed, so that both OCC and the agencies are working from the same understanding of the more detailed project schedule as it changes.

11.0 ELECTRONIC DATA SUBMITTAL

OCC will submit results of field measurements and laboratory analyses of samples to be compiled and used in the Characterization Report in electronic form. This data will be provided to Ecology for entering into Ecology's Environmental Information Management System (EIM). This data will also be provided to EPA in a format usable to EPA and EPA's consultants for the purpose of assessing data relationships and data gaps at the site.

11.1 ELECTRONIC DATA SUBMITTAL TO ECOLOGY

OCC will submit results of field measurements and laboratory analyses of samples to Ecology's EIM System using the EIM Import Module which is described and accessed on Ecology's web site.

11.2 ELECTRONIC DATA SUBMITTAL TO EPA

OCC will provide results of field measurements, laboratory analyses of samples, and other data relevant to accomplishing the tasks in this SOW, such as CAD files of base maps and other graphic presentations of data, in a usable format to facilitate EPA and Ecology reviews of data submittals. Historic information already stored in an electronic format will be provided to EPA and/or its contractor(s) upon request. A brief description of newly acquired data will be included in each monthly report. Newly acquired data will be transmitted within one month of its acquisition (or validation if needed) unless a longer holding time is agreed upon.

TABLE 2.1

HISTORICAL INVESTIGATIONS
GROUNDWATER AND SEDIMENT REMEDIATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Investigation Area	*Year Performed*	*Purpose of Investigation*
Former OCC Tacoma Plant	1979	In December of 1979, Occidental Chemical Corporation (OCC) (Walker Wells, Inc.) completed a Phase I groundwater investigation. The study results were presented in the report entitled *"Groundwater Investigation, Tacoma Washington Plant Site, Phase I"*, (December 1979, Walker Wells, Inc.). The purpose of the investigation was to evaluate the groundwater pollution potential from liquid and solid industrial waste materials contained on Plant property.
	1980	In August 1980, OCC (Hart Crowser & Associates, Inc.) completed the Phase II groundwater study for the Plant. The study results were presented in the report entitled *"Geology and Hydrologic Data for the Phase II Groundwater Study for the Hooker Chemical Plant, Tacoma, Washington"*, (August 1980, by Hart Crowser & Associates, Inc.) The purpose of the study was to obtain baseline data pertinent to the geology, hydrology, and geochemical conditions in the vicinity of the plant property. Study results were presented to Ecology and EPA in the August 1980 report by Walker Wells, Inc.
	1980	In August 1980, OCC (Walker Wells, Inc.) completed the Phase II investigation describing groundwater conditions at the Plant. The study results were presented in the report entitled *"Groundwater Conditions in the Vicinity of the Tacoma, Washington Plant, Phase II"*. The purpose of the investigation was to obtain a further appraisal of the geohydrologic and geochemical conditions as they might relate to the potential for groundwater pollution and migration from existing process and waste sources on plant property.
	1980	In October 1980, OCC (Hart Crowser & Associates, Inc.) completed the definition of organic concentrations in the unsaturated soils. The study results were presented in the report entitled *"Phase III Definition of Chlorinated Organic Concentration Within the Unsaturated Zone for The Hooker Chemicals and Plastics Corp. Plant, Tacoma, Washington"*, (October 1980, Hart Crowser & Associates Inc.) These study results were presented to Ecology and EPA in the December 1980 report by Walker Wells, Inc.
	1980	In December 1980, OCC (Walker Wells, Inc.) presented a report describing the groundwater quality at the Plant including a proposal for a remedial program. The report was entitled *"Groundwater Quality and Corrective Action Concerns at the Tacoma, Washington Plant"*, (December 1980, Walker Wells, Inc.) The purpose of the report was to re-evaluate earlier findings regarding groundwater quality and to evaluate appropriate corrective actions.
	1984	In February 1984, OCC (Conestoga-Rovers & Associates Limited (CRA)) presented a report evaluating water quality monitoring data for the Hylebos Waterway. The report was entitled *"Tacoma Plant Site - Evaluation of Monitoring Data"*, (February 1984, CRA). The report was in response to the request by Ecology that a review of chlorinated organic discharges to the Hylebos Waterway via the groundwater flow regimes be undertaken. Furthermore, Ecology requested that further studies or remedial actions, if appropriate, be defined.

TABLE 2.1

HISTORICAL INVESTIGATIONS
GROUNDWATER AND SEDIMENT REMEDIATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Investigation Area	*Year Performed*	*Purpose of Investigation*
	1985	In 1985, OCC conducted an investigation of groundwater migration pathways to the Waterway in accordance with their "*Application for the RCRA Part B Permit*".
	1989	In 1989, OCC conducted an investigation of the groundwater underlying the Plant and embankment seeps for the "*RCRA Facility Investigation I - Volumes 1 to 6*".
	1989	In April 1989, OCC (CRA) developed the "*Pre-Corrective Action Monitoring Program Quarterly Field Activities Report/Analytical Data*". The purpose of this report was to analyze the results of the pre-corrective action field activities, and the analytical data they generated.
	1990 through 1995	Various pumping tests were conducted to test the efficiency of the wells located on the Site.
	1993	In 1993, OCC collected soil samples for their analysis of the chemical migration rate on the Site. The results from this soil collection session are available in the report "*Estimation of Chemical Migration Rate*", *Occidental Chemical Corporation, Tacoma Plant Site.*
	1995	In January 1995, OCC, under the supervision of the United States Environmental Protection Agency (USEPA), conducted an investigation into the presence and identification of NAPL at the Site.
	1995	In August 1995, OCC (CRA) developed an "*Interim Data Report*", a "*Collection Trench Pilot Test*", and an "*Extraction System Pilot Testing Program*".
	1997	In October 1997, OCC conducted a NAPL screening program for internal information. This program was designed and constructed to further characterize the NAPL observed at the Property and to technically review alternate and/or innovative technologies for groundwater remediation.
	1997 through present	In accordance with the Corrective Action Monitoring Plan agreed upon by OCC, USEPA, the State of Washington, and OCC, quarterly monitoring reports consisting of any combination of hydraulic, chemical, and pH data are submitted quarterly. In addition, annual reports evaluating the performance of the existing groundwater remediation system and the progress toward cleanup were prepared and submitted.
Mariana Property	1989	In 1989, Ecology & Environment, Inc. performed a file review and inspection for the PRI Site. Soil and groundwater samples were collected and analyzed for volatile organic compounds, lead, oil, and grease.

TABLE 2.1

HISTORICAL INVESTIGATIONS
GROUNDWATER AND SEDIMENT REMEDIATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Investigation Area	*Year Performed*	*Purpose of Investigation*
	1992	In 1992, Ecology's Urban Bay Action Team inspected the PRI Site and collected soil and groundwater seep samples from the bank fill materials along the Hylebos Waterway.
	1994	In 1994, PRI Northwest, Inc. conducted an investigation of the backfill and soils in the embankment area of the Plant in order to characterize the PRI berm area.
	1995	In November and December 1995, OCC (CRA) and Hart Crowser & Associates, Inc. conducted separate investigations into the source of the contamination on the Mariana property. The investigations resulted in the generation of the *"PRI Source Identification Program Report"* (CRA, February 1996).
Embankment Area	1994	In 1994, the Hylebos Cleanup Committee conducted an investigation of the embankment area of the Plant in order to characterize the subtidal and intertidal sediments of the Hylebos Waterway.
	1996	In March 1996, OCC conducted an investigation to define chemical presence in the Embankment Area materials.
	1998	In January 1996, OCC conducted an investigation under the 1997 AOC, to characterize the source, nature and extent of the chemicals within the Embankment Area. The study results were presented in the *"Embankment Area Characterization Report"* (January 1999, CRA)
	1998	In October 1998, OCC implemented supplemental characterization activities to obtain supplemental leachate data for the embankment. The study results were presented in the *"Supplement A to the Embankment Area Characterization Report"*, (July 1999, CRA)
	2003	In January 2003, OCC completed an investigation to assess the pH of the groundwater within the Embankment Area. The results are presented in the *"Draft Rapid pH Assessment Report"*, (February 2003, CRA).
Area 5106	1994	In 1994, the Hylebos Cleanup Committee conducted a Hylebos Waterway Pre-Remedial Design (PRD) Study that included the collection and analysis of sediment samples from the Waterway. One sample was collected from a location identified as Station 5106.

TABLE 2.1

HISTORICAL INVESTIGATIONS
GROUNDWATER AND SEDIMENT REMEDIATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Investigation Area	*Year Performed*	*Purpose of Investigation*
	1998	In February 1998, OCC implemented an investigation to characterize the source, nature, and extent of the chemicals in and near Area 5106. The results of the investigation were presented in the *"Area 5106 Sediment Characterization Report,"* (April 1999, CRA) and the *"Column Leach Test Evaluation Report"* (April 1999, CRA)
	2003	In April 2003, OCC initiated an investigation to characterize the sediments within the relatively flat portion of Area 5106 following the completion of the dredging and treatment of Area 5106 Sediment. The study results were presented in the *"Draft Post Treatment Characterization Report"*, (September 2003, CRA)
Seep Discharges into Waterway		
	2001	In May 2001, Ecology staff conducted field measurements and identified highly elevated pH in discharges from seeps during a low tide event in the vicinity of Dock 2 and the Mariana and Navy properties. Documentation of the site visit during which these measurements were otained are in Ecology files for the Occidental Chemical corrective action site.
	2001	In June 2001, Ecology staff conducted field measurements of elevated pH and identified PCE and TCE above MTCA cleanup levels in samples obtained from seep discharges adjacent to Docks 1 and 2 and the Mariana property during a low tide event. Analytical results are documented in Ecology files for the Occidental Chemical corrective action site.
Hylebos Waterway		
	2004	In April and July 2004, Ecology and USEPA investigated field procedures and did a preliminary characterization of the subtidal groundwater discharge to the Hylebos Waterway. Results of this investigation are presented in the report titled *"Preliminary Investigation and Assessment of Techniques for Characterizing Ground Water Discharge to the Hylebos Waterway"* (October 2004, Ecology and USEPA)

TABLE 3.1

UPLAND GROUNDWATER CONSTITUENTS OF CONCERN [1]
GROUNDWATER AND SEDIMENT REMEDIATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Volatiles

1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethene
Benzene [2]
Carbon Tetrachloride
Chloroform (Trichloromethane)
Ethylbenzene
Methylene chloride
Tetrachloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Trichloroethene
Vinyl Chloride

Notes:

(1) Additional COCs may be added based on the results of the investigations performed under this SOW.

(2) 709/721 Alexander portion of Site only.

TABLE 3.2

EMBANKMENT AREA/ SUBTIDAL GROUNDWATER CONSTITUENTS OF CONCERN [1]
GROUNDWATER AND SEDIMENT REMEDIATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Volatiles

1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethene
Benzene [2]
Carbon tetrachloride
Chloroform (Trichloromethane)
Ethylbenzene
Methylene chloride
Tetrachloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Trichloroethene
Vinyl chloride

Semi-Volatiles

Hexachlorobutadiene
Hexachlorobenzene
Pentachlorophenol

Pesticides, PCB [3]

Total PCBs

Metals

Arsenic
Chromium, total
Copper
Lead
Mercury
Nickel
Thallium
Zinc

Notes:

(1) Additional COCs may be added based on the results of the investigations performed under this SOW.

(2) 709/721 Alexander portion of Site only.

(3) Dioxin-Furan (2,3,7,8 tcdd) may be added as a COC if detected above cleanup level in the dioxin characterization samples.

TABLE 3.3

SURFACE WATER CONSTITUENTS OF CONCERN [1]
GROUNDWATER AND SEDIMENT REMEDIATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Volatiles	
	1,1,2,2-Tetrachloroethane
	1,1,2-Trichloroethane
	1,1-Dichloroethene
	Benzene [2]
	Carbon tetrachloride
	Chloroform (Trichloromethane)
	Ethylbenzene
	Methylene chloride
	Tetrachloroethene
	cis-1,2-Dichloroethene
	trans-1,2-Dichloroethene
	Trichloroethene
	Vinyl chloride
Semi-Volatiles	
	Hexachlorobenzene
	Pentachlorophenol
Pesticides, PCB [3]	
	Total PCBs
Metals	Arsenic
	Chromium, total
	Copper
	Lead
	Mercury
	Nickel
	Thallium
	Zinc

Notes:

(1) Additional COCs may be added based on the results of the investigations performed under

(2) 709/721 Alexander portion of Site only.

(3) Dioxin-Furan (2,3,7,8 tcdd) may be added as a COC if detected above cleanup level in the dioxin characterization samples.

TABLE 3.4

SEDIMENT / POREWATER CONSTITUENTS OF CONCERN [1]
GROUNDWATER AND SEDIMENT REMEDIATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Volatiles

1,1,2,2-Tetrachloroethane
1,1,2-Trichloroethane
1,1-Dichloroethene
Benzene [2]
Carbon tetrachloride
Chloroform (Trichloromethane)
Ethylbenzene
Methylene chloride
Tetrachloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Trichloroethene
Vinyl chloride

Semi-Volatiles

1,2,4-Trichlorobenzene
bis(2-Ethylhexl) phthalate
Hexachlorobenzene
Hexachlorobutadiene
Pentachlorophenol

Pesticides, PCB(s)

4,4'-DDD
4,4'-DDE
4,4'-DDT
Aroclor 1248
Aroclor 1254
Aroclor 1260
Total PCBs
Dioxin-Furan (2,3,7,8 tcdd)

Metals

Antimony
Arsenic
Cadmium
Chromium, total [4]
Copper
Lead
Mercury
Nickel
Silver
Thallium [4]
Zinc

Notes:

(1) Additional COCs may be added based on the results of the investigations performed unc

(2) 709/721 Alexander portion of Site only.

(3) Dioxin - Furan (2,3,7,8 tcdd) may be deleted as a sediment/porewater COC if not detected in the dioxin characterization samples.

(4) Porewater COC only.

TABLE 2.2

HISTORICAL REPORTS
SEDIMENT AND GROUNDWATER REMEDIATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Remediation Area	*Report Title*	*Author, Date*
Groundwater	• RCRA Facility Investigation I – Volumes 1 to 6	CRA, March 1989
	• Corrective Action for Contaminated Groundwater	CRA, January 1990
	• PreCorrective Action Monitoring Program Quarterly Field Activities Report/Analytical Data	CRA, April 1989 through June 1993
	• Review of Groundwater Monitoring System	CRA, January 1990
	• Specific Capacity and Hydraulic Conductivity Assessments	CRA, May 1990 to present
	• Pumping Test Review	CRA, November 1990
	• Draft Modifications Groundwater Extraction System	CRA, June 1991
	• Draft Corrective Action Plan and Corrective Action Monitoring Plan	CRA, September 1992
	• Information Summary Report, A-120 Preliminary Pumping Test	CRA, October 1992
	• Information Summary Report, B-100 and C-70 Preliminary Pumping Tests	CRA, February 1993
	• Estimation of Chemical Migration Rate	CRA, February 1993
	• Information Summary Report, Preliminary Pumping Tests EW101-50, EW133-50, EW138-145	CRA, March 1993
	• Analysis of Preliminary Pumping Tests	CRA, July 1995
	• Interim Data Report, Collection Trench Pilot Test, Extraction System Pilot Testing Program	CRA, August 1995
	• Corrective Action Plan and Corrective Action Monitoring Program*	CRA, January 1996, Revised October 1998 & January 2002
	• CAMP Monitoring Event and System Performance Evaluation Reports	CRA, February 1996 to present
	• CAMP Annual Performance Evaluation Reports	CRA, December 1998 to present
	• PRI Source Identification Program Report	CRA, February 1996
	• Final Construction and System Startup Report	CRA, November 1996
	• Compilation of Soils and Related Data	CRA, January 1999
	• Site Characterization Report	TetraTech, June 2003

TABLE 2.2

HISTORICAL REPORTS
SEDIMENT AND GROUNDWATER REMEDIATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Remediation Area	*Report Title*	*Author, Date*
	• Summary of Previous Investigations	CRA, March 2004
	• Report of Remedial Systems Evaluation	GeoTrans, August 2004
Embankment Area	• Embankment Area Characterization Report	CRA, January 1999
	• Supplement A to the Embankment Area Characterization Report	CRA, July 1999
	• Engineering Evaluation / Cost Analysis Report, Embankment Area Removal Action	CRA, June 2001
	• 95% Design Report for Phase I - Pilot Cap Construction	CRA, December 2001
	• Draft 100% Design Report for Phase I - Pilot Cap Construction	CRA, September 2003
	• Draft Rapid pH Assessment Report	CRA, February 2003
Area 5106	• Area 5106 Background Data Report	CRA, November 1997
	• Area 5106 Sediment Characterization Report	CRA, April 1999
	• Column Leach Test Evaluation Report	CRA, April 1999
	• Preliminary Treatment Technology Evaluation Report	CRA, June 1999
	• Water Quality Test Report	CRA, November 1999
	• Bench Scale Treatability Study Report	CRA, December 1999
	• Evaluation of Dredging Controls Report	CRA, January 2000
	• Engineering Evaluation / Cost Analysis, Area 5106 Removal Action	CRA, July 2000
	• 95% Design Report	CRA, April 2002
	• Biological Assessment Addendum	Pacific, July 2002
	• 100% Design Report	CRA, December 2002
	• Weekly Progress Reports (22)	CRA, October 2002 to March 2003
	• Preliminary Completion Report, Area 5106 Dredging	CRA, March 2003
	• Draft Post-Treatment Characterization Report	CRA, July 2003
	Site Characterization Report	Tetra Tech EM Inc., June 2003
Hylebos Waterway	Preliminary Investigation and Assessment of Techniques for Characterizing Ground Water Discharge to the Hylebos Waterway	Ecology and USEPA, October, 2004

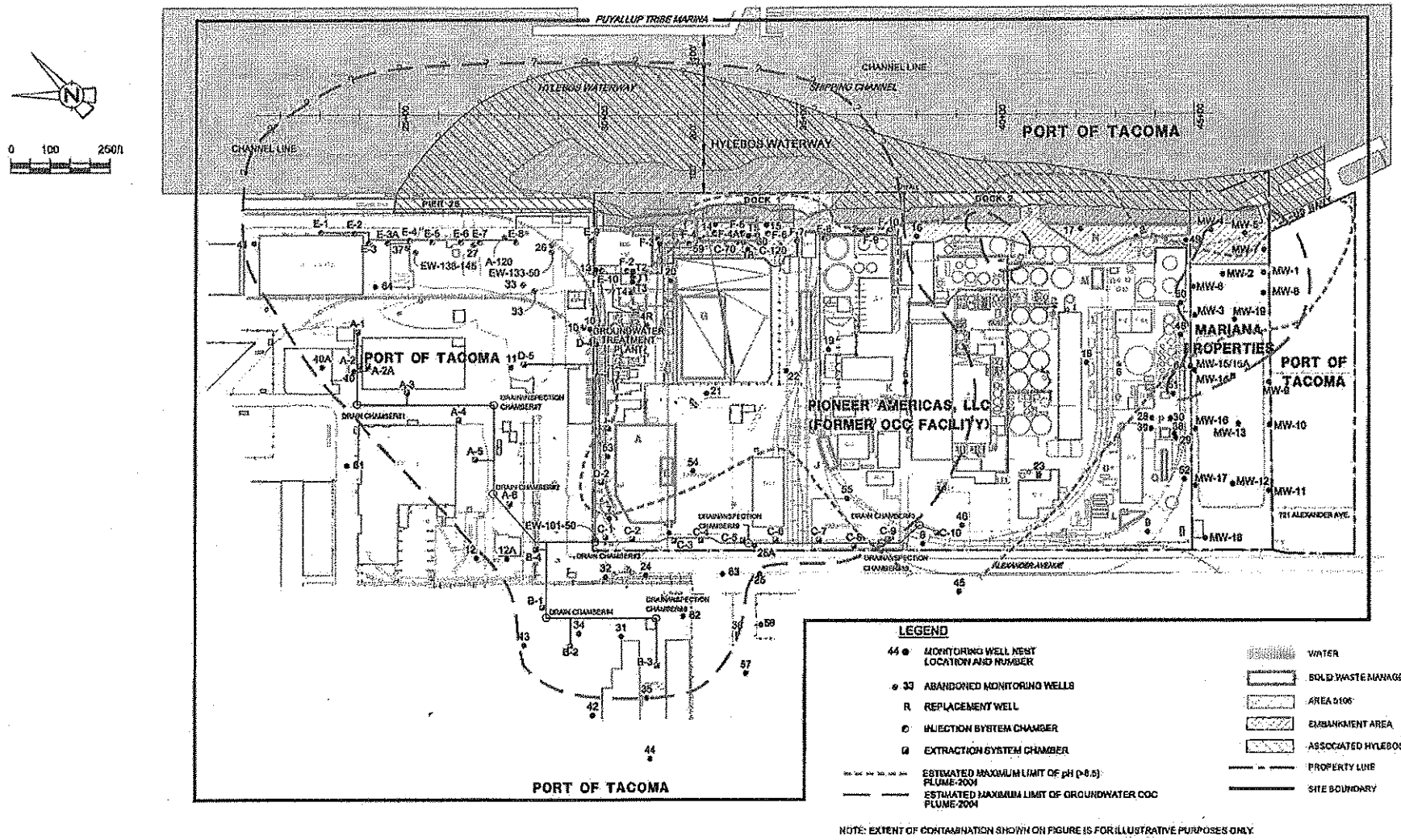
Notes:

TABLE 2.2

HISTORICAL REPORTS
SEDIMENT AND GROUNDWATER REMEDIATION
OCCIDENTAL CHEMICAL CORPORATION
TACOMA, WASHINGTON

Remediation Area	*Report Title*	*Author, Date*

* Renamed "Corrective Action Monitoring and Implementation Plan" in January 2002 revision.
CRA - Conestoga-Rovers & Associates
GeoTrans - GeoTrans, Inc.
Tetra Tech - Tetra Tech, Inc.
Pacific - Pacific International Engineering, PLLC and Anchor Environmental, LLC



Appendix B

OCCIDENTAL SITE PLAN
GROUNDWATER AND SEDIMENT REMEDIATION
Occidental Chemical Corporation, Tacoma, Washington

Formal Written Agreements

Informal Default
- Annual Check
- Oct + Lost

ENVIRONMENTAL PROTECTION AGENCY REGION 10
WASHINGTON STATE DEPARTMENT OF ECOLOGY
SUPERFUND MANAGEMENT IN WASHINGTON
February 23, 2000

Introduction and Purpose

This agreement[1] is intended to outline how EPA and Ecology will manage both private and federal Superfund sites in the State of Washington now and in the foreseeable future. It represents a continuing shift towards a more complete division of labor on the majority of NPL sites. This division of labor has been, and will continue to be a shared goal. Based on established program capability and capacity, it is understood that NPL sites can be adequately addressed by either EPA or Ecology as the lead agency.

The primary purpose of this agreement has been to restructure the EPA - Ecology regulatory relationship on NPL sites so the potential for conflicts among staff are minimized, agency resources are conserved, and environmental cleanups are pursued in a faster and more efficient way.

This document is intended solely as a managerial tool to be used by the EPA Superfund and Ecology Toxics Cleanup Program offices. Nothing in this document is intended to conflict with any provision or requirement of CERCLA or MTCA, the NCP, or applicable EPA rules, policy or guidance. It is the intention of both EPA and Ecology that the federal facilities fully adhere to applicable federal and state law. This document is intended to benefit only EPA and Ecology. It extends no benefits or rights to any party not a signatory to the agreement.

In support of this restructuring, EPA and Ecology have agreed that all NPL sites will be categorized as state or federal lead (with a few notable exceptions such as sites with joint Consent Decrees), and that a substantial majority of sites shall have only management involved on behalf of the support agency at 3 "touch points" **(milestone briefings)** in the cleanup process. A smaller number of sites which meet the criteria discussed herein will qualify for **enhanced involvement** status.

The scope of support agency involvement at **enhanced involvement** sites will be covered in a site-specific scope of work (SOW) as part of the support agency agreement. In the event

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1 This is an updated agreement. The managers of EPA Region 10's Environmental Cleanup Office, and the Washington Department of Ecology's Toxics Cleanup Program held a meeting on March 10, 1999. One of the topics discussed at the meeting was the status of implementing the "Ecology/EPA Agreement on Roles and Responsibilities at NPL Sites," which was signed by Ecology and EPA on October 14, 1994. Both agencies expressed their views that while in general the Agreement appears to be working well, we both were concerned that some parts of the agreement are not sufficiently detailed in areas that are now of greater importance to both of our programs. To address this mutual concern, Ecology and EPA agreed to update the 1994 agreement by providing further clarification of specific topics.

Superfund is reauthorized, it will not affect the division of labor as outlined here. It may, however, affect certain program and legal implementation requirements. These will be dealt with over time on a case by case basis.

II. Objectives

The approach described below is designed to achieve four primary objectives. First, the approach is designed to maximize the universe of sites for which there will be no support agency involvement other than **milestone briefings** (project managers will not be assigned by the support agency); second, it is expected to result in a more efficient use of EPA and Ecology resources at "**enhanced involvement**" sites by directing support agency resources to be complimentary rather than redundant activities; third, it sets forth a process that will help ensure that project completion by the lead agency is expected to be sufficient for concurrence and delisting by the support agency at minimal transaction cost; and fourth, it provides that Ecology and EPA will meet on an annual basis to discuss site-related planning and scheduling issues.

III. Planning and Scheduling

Each year on or about July 15, Ecology and EPA will have a face-to-face meeting to begin a discussion of site planning and scheduling issues. The goal of this discussion will be to reach agreement on milestone projections or "target" dates for the coming year, including those for Preliminary Assessments (PA's), RODs and CAPs, Construction Completions, deletions, five year reviews, and remedy changes or updates. The July meeting will focus on assessing the status of all sites with targets in the current EPA fiscal year, and identifying likely targets for the next fiscal year. Ecology and EPA will negotiate the agenda in advance of the meeting, and may agree to add other topics as appropriate.

On or about October 7, EPA and Ecology will meet again, or hold a conference call, to conclude the discussion. This meeting or call will clarify which targets were met during the just-concluded fiscal year, and which sites should be targeted for the coming year. EPA will use this information in its targeting negotiations with EPA headquarters, which typically occur in late October.

IV. Front End of Pipeline[2]

EPA and Ecology will conduct site assessment activities according to the EPA/Ecology Site

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2 This section does not apply to sites located on tribal land because of jurisdictional issues, nor to federal facilities because of the primacy issue.

Assessment Agreement, dated December 2, 1998 (Attachment 1). The agreement describes how the agencies will apportion site assessment work and provides guidelines for information sharing. During the site assessment process, the agencies commit to communicate frequently about those sites for which there is a mutual interest. If a site appears to be eligible for the National Priorities List (NPL), EPA will verbally notify Ecology, and the agencies will have an opportunity to meet to discuss potential management options for the site.

EPA and Ecology will discuss relevant site management factors, including identified threats to human health and the environment, fund-lead vs. PRP-lead, agency work load and resource capacities, potential timeliness of response, and other considerations. It is EPA and Ecology's intent to work toward and reach agreement on the appropriate site management approach. Once a site has been identified as potentially eligible for the NPL, Ecology may request a deferral of NPL listing to state Model Toxics Control Act (MTCA) authorities. EPA will use its guidance on deferral, including "Deferral of NPL Listing While States Oversee Response Actions," to evaluate Ecology's request and determine the suitability of the site for the deferral process.

Region 10 sites considered for NPL listing will be subject to the management review process according to Regional policy (see Attachment 2 - Policy for Site Prioritization in Region 10). Before listing a site on the NPL, EPA will follow its national policy on seeking state support for NPL listing by requesting governor concurrence. EPA will keep Ecology informed as to any communication with the Governor. If EPA does not receive governor concurrence, EPA will use its national policy on dispute resolution.

For sites that have been proposed on the NPL, Ecology may request lead agency status for the site. Because Ecology's cleanup authorities under MTCA are comparable to EPA's authorities under CERCLA, and because Ecology has a demonstrated record of appropriate cleanups under MTCA, EPA will defer to Ecology's request for lead agency status at new NPL sites. ("Automatic" state deferral may not apply to sites that are likely to be fund-lead.)

V. Site Management

Each NPL site in Washington (with few exceptions such as sites which have joint Consent Decrees) will either be the responsibility of EPA or Ecology (see Table 1). Once the lead agency is established, the support agency will be involved in **milestone briefings** or have **enhanced involvement,** as described below.

Milestone Briefings

For the large majority of NPL sites, support agency involvement will be limited only to milestone briefings. Support agency management or senior policy staff will participate in milestone briefings at three specific phases of the project and determine their willingness to provide written concurrence on the ROD and delisting materials based on briefing materials alone. These briefings shall be of sufficient detail so that both parties can meet their statutory obligations.

These milestone briefings include:

- Project Planning Briefing - The lead agency will present the conceptual site model and describe how the site will be managed, including investigation and enforcement. The support agency will provide input regarding technical, enforcement, community issues, and, in the case of federal facilities, resource implications. The lead agency will prepare the informational briefing package.

- Remedy Selection Briefing - A proposed plan briefing by the lead agency will be provided for the support agency to form a basis of concurrence on the proposed plan and record of decision (ROD) or cleanup action plan (CAP).

  Following the proposed plan and response to public comment, a second management briefing will be held for the ROD/CAP. The lead agency will prepare the briefing package.

- NPL Delisting - For all existing NPL sites, EPA will prepare all draft delisting packages. Ecology will assist in this effort.

  EPA shall notify and hold a briefing for Ecology on the proposed delisting package. The briefing and delisting package will be the basis for delisting concurrence by Ecology. For more on the delisting process, see Section X.

For more detailed information on the milestone briefings process, see the attachments to the November 16, 1994, Memorandum entitled, "Implementation Status of the Ecology/EPA Management Agreement for NPL Sites."

Enhanced Involvement

At a few sites, in addition to milestone briefings, certain factors may warrant additional coordination or assistance between EPA and Ecology. The assistance and coordination will be restricted to non-duplicative, value-added support tasks. These factors are:

- Fund-financed sites - Ecology has fiscal obligations at all fund-financed private sites. ROD concurrence by the State is especially important and a State Superfund Contract (SSC) is mandatory. The State is required to pay 10% of remedial action costs and assume 100% of operation and maintenance. While some fund-lead sites will have a support project manager assigned, it is agreed that others will not warrant this level of involvement. For more on SSCs, see Section VII.

- State and local stakeholder concerns - There are a limited number of sites in which politics or local concerns play a more important role in the cleanup process. This situation may warrant some additional level of involvement by the support agency.

- Special circumstances - Some sites may benefit from the unique support agency expertise (e.g., state involvement at marine sediment sites or EPA risk assessment), or agency resources may be insufficient to meet site demands. In these instances the lead agency shall request support agency involvement.

For **enhanced involvement** sites, scopes of work (SOWs) will be developed by EPA and Ecology on an annual basis identifying the role of the support agency. For Ecology, these SOWs will act as the basis for the multi-site grant application on private sites. For federal facilities, the SOW will document the technical oversight responsibilities of, and working relationship between, the two agencies.

VI. Remedy Selection

There are many parallels between MTCA and CERCLA. One difference however, is how low risk sites are managed. (For purposes of this section, low risk sites are sites which fall within the 10^{-4} to 10^{-6} risk range.) To ensure sites are managed in the same manner in the State, Ecology and EPA will give strong preference to 1 and 2, below.

1) When Ecology is the lead, institutional controls and other low cost remedial alternatives will be applied at low risk NPL sites. For federal facilities, Ecology will also consider deferring action until the federal facility is scheduled to go through base closure.

2) When EPA is the lead, EPA will push to include institutional controls or other low cost remedial alternatives for low risk sites, even if it would not ordinarily take this action under CERCLA.

In the event 1 and 2 are not possible, Ecology will be a signatory to the CERCLA ROD, thereby concurring that the remedy decision is consistent with CERCLA/NCP requirements, but state that the "No Action Cleanup Decision" does not meet state MTCA requirements.

VII. State Superfund Contracts (SSC): Planning for Transition to Ecology-Lead O&M

For fund-lead sites with a Record of Decision, Ecology and EPA will work together to produce a State Superfund Contract (SSC). The purpose of the SSC is to obtain assurances required by CERCLA regarding the State's remedial action (RA) cost share, potential property acquisition, and the conduct of operation and maintenance (O&M) of the remedy. During negotiation of the SSC, in addition to the CERCLA O&M assurance provided by the State, EPA and Ecology will collaborate on the development of an O&M agreement. The O&M agreement, which will be an attachment to the SSC, will be designed to clarify respective roles and expectations during specific periods of time, facilitate smooth O&M transitions, and help Ecology plan for upcoming financial burdens. The Plan will:

- identify State and EPA responsibilities for O&M related activities during the remedial design (RD), RA, post-RA, and O&M periods;
- further define, to the extent practicable, the administrative, financial, and technical parameters associated with typical O&M activities including inspection, sampling and analysis, routine maintenance, and reporting requirements;
- include conditions for State acceptance of O&M;
- describe the overall procedures and time frames for O&M transfer to the State.

The O&M agreement will be updated during the RD/RA phase of the project as more specific needs and information are developed.

VIII. EPA Statutory Obligations at Federal Facilities

Under Section 120 of CERCLA/SARA, EPA is currently required to: a) publish the RI/FS schedule within 6 months of NPL listing; b) enter into an interagency agreement with the federal facility for the conduct of the remedial action within 180 days of RI/FS completion; c) approve the remedial action; and d) exercise concurrence/approval responsibility in cases of federal property lease and/or transfer. Currently EPA is not permitted to delegate these obligations. EPA will continue to exercise these authorities/obligations regardless of which agency is in the lead oversight role. These circumstances may change under reauthorization.

IX. Procedures: Post-ROD and Post-CAP Remedy Changes

If a significant change to the remedy is under consideration by the lead agency after the ROD or CAP is final, the lead agency will inform the support agency of the possible change early in the evaluation and decision process. The support agency will then decide on its level of involvement. This involvement may be as limited as acknowledging this early notification, or may include a milestone briefing such as that required at remedy selection.

At federal facilities where Ecology is the lead agency, a somewhat different process must be followed because of EPA's statutory obligations to approve the remedial action. If significant changes to the selected remedy are under consideration by Ecology or the federal facility after the ROD has been signed, Ecology will inform EPA of the possible change early in the evaluation and decision process and will consult with EPA about the appropriate mechanism, under the National Contingency Plan (NCP), to document this change. If an Explanation of Significant Difference (ESD) or a Record of Decision (ROD) amendment is needed, then the procedures for remedy selection in this agreement will be followed, with the exception that an ESD will generally be signed by EPA's Environmental Cleanup Office Director, and may not require a milestone briefing.

At any EPA-lead site where an ESD or ROD amendment is prepared, Ecology will be offered the

NPL → w/ CAPs + No Five Year Review
-Alcoa
etc

NPL
Same time CERCLA Reg

opportunity to concur on the document.

X. Construction Completion

A site is considered eligible for "construction completion" once all physical construction required by the Cleanup Action Plan or Record of Decision is complete throughout the NPL site. The Preliminary Closeout Report (PCOR) is an EPA document that is prepared by the lead agency. The PCOR documents that physical construction throughout an NPL site has been completed. Even before the pre-final inspection is conducted, the site manager can start drafting portions of the Preliminary Closeout Report. The EPA state-lead coordinator will provide samples of PCORs to site managers to help facilitate the process and provide any necessary assistance. All draft PCORs will be reviewed by the Region and by EPA Headquarters. The construction completion milestone is achieved when the EPA Director of Environmental Cleanup signs the PCOR, a copy of the signed document is sent to EPA Headquarters, and EPA Headquarters concurs. If a site that meets the construction completion requirements also achieves all the cleanup standards stated in the CAP or ROD, then a Final Closeout Report (FCOR) should be prepared by the lead agency, following the same steps described for the PCOR.

XI. NPL Deletion

EPA and Ecology will work together to identify NPL sites that are ready for full or partial deletion, and a tracking schedule will be developed. Once the cleanup standards specified in the Cleanup Action Plan (CAP) or Record of Decision (ROD) have been met throughout the NPL site, and the cleanup is deemed protective of human and health and the environment, site completion has been achieved and the site deletion process can begin. Site deletion is possible once all the documents required by EPA guidance are completed. EPA requires a Final Closeout Report (FCOR) which ensures that (1) the documentation of activities and decision making at the site are complete, (2) the activities conducted and documented are verified, and (3) cleanup standards for site completion have been met. The FCOR will be completed by the lead agency. EPA will take the lead for all other deletion activities at all sites, including preparation of deletion packages and Federal Register Notices. Ecology will provide assistance as required. For Ecology-lead sites, this assistance will include providing copies of all necessary documents to EPA and reviewing the draft deletion package. If Ecology agrees that the site should be deleted, Ecology will provide EPA with a letter of concurrence for the proposed deletion.

XII. Five Year Reviews

While both CERCLA and MTCA have similar goals, they have different procedural requirements. CERCLA requires five year reviews for all Federal facility sites and most EPA-

lead sites. MTCA requires periodic reviews at sites cleaned up under MTCA that result in hazardous substances remaining at a site above Method A or B cleanup levels. Region 10 believes that CERCLA five-year reviews are not required for NPL sites cleaned up under non-CERCLA authorities such as MTCA. (EPA Headquarters is in the process of revising the five-year review guidance. If the revised guidance indicates that CERCLA five-year reviews are required for NPL sites cleaned up under non-CERCLA authorities, EPA and Ecology will deal with the issue at that time.)

EPA will provide copies of its current five year review guidance and samples of completed five year reviews to Ecology. EPA will also provide Ecology copies of the five year review guidance when it is updated. A draft is scheduled for Fall 1999, with the final guidance in Spring 2000.

At Ecology-lead federal facility sites, five year reviews need to be consistent with CERCLA and EPA's guidance. Copies of draft five year reviews will be provided to EPA for review to ensure consistency. If a five year review discloses the need for a change to a remedy, the procedures outlined above for remedy change will be followed. Copies of final five year reviews will be sent to EPA. EPA will then sign off on the reviews and make its statutorily required protectiveness determination.

Washington Department of Ecology

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Table 1 - EPA and Ecology Division of Labor[1]

Site	Lead	Support Agencies Role
American Crossarm	EPA	Milestone
ASARCO	EPA	Enhanced
Boomsnub/Airco	EPA	Enhanced
Bonneville Power Adm. Ross (USDOE)	EPA	Milestone
Commencement Bay	EPA	Milestone
CBSTC[2] - South Tacoma Field	EPA	Milestone
CBSTC - Well 12A	EPA	Milestone
FMC Yakama	EPA	Milestone
Frontier Hardchrome	EPA	Milestone
Harbor Island	EPA	Enhanced
Lakewood/Ponders	EPA	Milestone
Moses Lake/Skyline	EPA	Milestone
Northwest Transformer Mission Pole	EPA	Milestone
Northwest Transformer South Harkness	EPA	Milestone
Oeser	EPA	Milestone
Pacific Sound Resources	EPA	Milestone
Palermo Groundwater Contamination	EPA	Milestone
Queen City Farms	EPA	Milestone
Ruston North Tacoma	EPA	Enhanced
Silver Mountain Mine	EPA	Milestone
Spokane Junkyard	EPA	Milestone
Tacoma Tarpits	EPA	Milestone
Tulalip Landfill	EPA	Milestone
Vancouver Water Station #1	EPA	Milestone
Vancouver Water Station #4	EPA	Milestone
Wyckoff/Eagle Harbor - Wyckoff	EPA	Enhanced
Wyckoff/Eagle Harbor - East Harbor	EPA	Enhanced
Wyckoff/Eagle Harbor - West Harbor	EPA	Milestone
Yakima Plating	EPA	Milestone
Alcoa Vancouver Smelter	Ecology	Milestone
Centrailia Landfill	Ecology	Milestone
Colbert Landfill	Ecology	Milestone
Commencement Bay Sources	Ecology	Milestone
General Electric - Spokane	Ecology	Milestone
Greenacres Landfill	Ecology	Milestone

1 Hanford Sites are not included in this list.
2 Commencement Bay South Tacoma Channel

Table 1 continued - EPA and Ecology Division of Labor

Site	Lead	Support Agencies Role
Hidden Valley Landfill	Ecology	Milestone
Kaiser Aluminum Mead Works	Ecology	Milestone
Kent Highlands	Ecology	Milestone
Mica Landfill	Ecology	Milestone
Midway Landfill	Ecology	Milestone
North Market Street/ TOSCO	Ecology	Milestone
North Side Landfill	Ecology	Milestone
Paccar	Ecology	Milestone
Pasco Landfill	Ecology	Milestone
Western Processing	Joint	N/A
CBSTC - Tacoma Landfill	Joint	N/A
FEDERAL FACILITIES		
Fort Lewis Logistics Center	EPA	Milestone
Manchester Laboratory	EPA	Enhanced
Whidbey Island Ault Field	EPA	Milestone
Bangor	Ecology	Milestone
Fairchild	Ecology	Milestone
Hamilton Island	Ecology	Milestone
Jackson Park Housing Complex	Ecology	Milestone
Keyport Naval Undersea Warfare Station	Ecology	Milestone
McChord Air Force Base	Ecology	Milestone
Port Hadlock	Ecology	Milestone
Puget Sound Naval Shipyard (Bremerton) - OUA & OUNSC	Ecology	Milestone
Puget Sound Naval Shipyard (Bremerton) - OUB	Joint	N/A
Whidbey Seaplane Base	Ecology	Milestone
PROPOSED NPL SITE		
Midnight Mine	EPA	Milestone