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December 20, 1995

Federal Express Mail
No. 5505550352

Peter C. Wright, Esq.
Monsanto Company
800 North Lindbergh Boulevard
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RE: Rhône-Poulenc Inc., Seattle - RCRA Corrective Action

Dear Mr. Wright:

Please find enclosed a draft of the Round 3 Technical Memorandum prepared by CH_2M Hill.

Please call if you have any questions. We plan to meet to discuss this draft during the second or third week of January.

Very truly yours,

George S. Goodridge

George S. Goodridge
Senior Environmental Attorney

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Enc.
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MEMORANDUM CH2M HILL

DEC 1995 RECEIVED RP LEGAL DEPT

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FROM: Liz Luecker/CH2M HILL-SEA

DATE: December 15, 1995

SUBJECT: RP Seattle, WA facility Round 3 Technical Memorandum

PROJECT: 106063.A8.ZZ

Hopefully you received my fax last week letting you know of the schedule for the Round 3 Technical Memorandum review. We apologize for the inconvenience of having to review this over the holidays. Review comments should be returned to Edwin by 1/3/96.

Please let Edwin (609-452-5064) or me (206-453-5005 x5585) know if it would be useful to have Doug Holsten (CH2M HILL hydrogeologist) and I come to the east coast on 1/9 (at the latest) to discuss and resolve your comments on the Memorandum. We need to send the draft Memorandum to EPA 10 and Ecology on 1/17. If we don't hear from you, we will assume that we can resolve the comments over the telephone.

A few notes about this draft document:

1) This draft is comb bound with clear plastic covers. The EPA draft will be similar to the other documents we have produced and will be distributed in three-ring binders.

2) No color copies have been included in this draft. Figures 2-2, 4-2, and 4-3 will be reproduced in color for the EPA draft.

Edwin will be forwarding a copy of the draft Memorandum to the new RP community relations person.

If you have any questions, please call me. Thanks for your assistance.

DRAFT

Round 3 Data and Sewer Sediment Technical Memorandum

RCRA Facility Investigation
Rhône-Poulenc Inc.'s Marginal Way Facility,
Tukwila, Washington

12/15/95

Executive Summary

This Technical Memorandum (Memorandum) presents the results of Round 3 of the RCRA Facility Investigation (RFI) conducted at Rhône-Poulenc's Marginal Way Facility (the Facility) in Tukwila, Washington. RFI Round 3 activities included groundwater and seep sampling, which was conducted during March and April 1995 in accordance with the approved RFI Workplan (December 1993) and various addenda to the Workplan. The objectives of the Round 3 sampling were as follows:

- Obtain groundwater data to (1) confirm the results of Rounds 1 and 2 of the RFI, (2) speciate chromium, (3) continue assessing the toluene plume, and (4) determine total metals concentrations in samples obtained using micropurging well sampling techniques.

- Complete the seep assessment portion of the RFI.

In addition to the Round 3 activities, sewer sediment sampling and sewer cleaning were conducted at the Facility from May through October 1995, as described in this Memorandum. The objectives of this sampling were to characterize sediments in sewers that may have discharged offsite and to ascertain whether sewers needed cleaning prior to reopening the outfall 7 discharge to the Duwamish Waterway.

Summary of Findings

Groundwater samples were taken from 35 of the 38 Facility monitoring wells. The resulting groundwater data verified the continuing existence of the toluene plume centered near well H11. The extent of the plume remained unchanged from Rounds 1 and 2 of the RFI; toluene concentrations at the center of the plume remain high (670,000 µg/l in well H11). Toluene concentrations appear to have decreased in the lower portion of the Upper Aquifer; in two of the three wells sampled from this area of the aquifer, no toluene was detected.

The Round 3 groundwater samples were obtained using micropurging and low-disturbance sampling techniques. The samples were analyzed for a range of parameters including benzene, toluene, ethylbenzene, and xylenes (BTEX), inorganic compounds (including hexavalent chromium), volatile and semivolatile organic compounds, and conventional parameters. The parameters for each well were selected to confirm previous single data points. The Round 3 data were generally consistent with the data from Rounds 1 and 2, although the total metals concentrations were, on average, approximately 60 percent lower than those detected previously. Groundwater data were compared to the same action levels considered previously in the RFI, which were the most stringent federal and state groundwater and surface water standards.

Seven seeps were sampled at the Facility during a minus-1 to minus-2 foot tide. The seeps were located along either the southern portion of the Duwamish Waterway (seeps 1 through 4) or Slip No. 6 (seeps 5, 6, and 7). Most of these seeps are not visible except during an extremely low tide. All the seep samples were analyzed for inorganic compounds (including hexavalent chromium), conventional parameters, volatile and semivolatile organic compounds, formaldehyde, and guaiacol/resin acids; one seep was sampled for 40 CFR 264 Appendix IX parameters. The seep action levels were the most stringent of a range of federal and state surface water standards.

As part of the seep sampling, two surface water samples were collected from the Duwamish Waterway: one sample was upgradient of the seeps, and the other was downgradient. The samples were analyzed for hexavalent chromium.

Sewer sediment samples were taken from former outfall lines and from other sewers at the Facility. Seven samples and one duplicate were taken from what were believed to be outfall lines; one of these, sample 02-SWO, was later determined not to be from a storm sewer outfall line but from a process line. Thirteen samples and one duplicate were taken from other sewer locations. The sewer sediment samples were analyzed for total organic carbon, inorganics, volatile and semivolatile compounds, polychlorinated biphenyls (PCBs), BTEX, and grain size. The action levels for sewer sediments were the state Sediment Management Standards (SMS) Cleanup Screening Levels/Minimum Cleanup Levels (CSL/MCUL).

Sewer sediment sample 02-SWO had a concentration of 526 mg/kg of the PCB Arochlor 1254; therefore, additional samples were taken from elsewhere along the same line. These samples also contained high concentrations of Arochlor 1254 (1.3 percent in one sample).

Conclusions

The Round 3 and sewer sediment sampling results were evaluated to identify conditions at the Marginal Way Facility that may pose risks to human health and/or the environment. The major conclusions were as follows:

- **Groundwater.** In general, the same constituents were detected in groundwater at concentrations above their action levels that were detected in Rounds 1 and 2. Five constituents were detected in Round 3 that either were not detected or were not detected above action levels in Rounds 1 or 2. Cadmium, selenium, thallium, and nitrite were detected above their respective action levels; phenanthrene, which does not have an action level, was also detected. These five compounds will be addressed in the Risk Assessment/Media Cleanup Standards (MCS) evaluation that will assess the need for remedial actions at the Facility. Beryllium and silver, previously identified above their action levels, were not detected above action levels in Round 3 and will be removed from the list of the constituents to be addressed in

the Risk Assessment/MCS evaluation. No hexavalent chromium was detected in any groundwater sample.

- **Seeps.** Arsenic, cadmium, copper, lead, mercury, nickel, zinc, and bis(2-ethylhexyl)phthalate were the only constituents detected in seeps above their respective action levels. Barium, cobalt, and vanadium, which do not have action levels, were also detected. All these compounds will be addressed in the Risk Assessment/MCS evaluation. No hexavalent chromium or guaiacol/resin acids were detected in any seep sample. In addition, no hexavalent chromium was detected in surface water samples collected in the Duwamish Waterway adjacent to the Facility.

  Evaluation of the seep data indicated that three seeps have constituent concentrations that may cause exceedances of the CSL/MCUL for sediments. These seeps and the constituents are: seep 2 (cadmium, copper, chromium, zinc), seep 5 (mercury), and seep 7 (bis[2-ethylhexyl]phthalate).

- **Sewer Sediments.** All the sewer sediment samples exceeded at least one CSL/MCUL. Because of this, sediments were removed from all the accessible sewers by high-pressure cleaning of the sewers.

Recommendations for Future Actions

The following recommendations for future actions are presented:

- Additional localized sampling is recommended for three of the seeps where detected constituents may be causing CSL/MCUL exceedances in the sediments, and for four of the outfall discharge points where sediments affected by Facility discharges may still lie within the upper 10 centimeters of sediments. The upper 10 centimeters of sediments constitute the biologically active zone described in the SMS. The additional samples would be analyzed for those constituents that could cause potential CSL/MCUL exceedances or for those constituents that exceed the CSL/MCUL in the storm sewer outfall sediments. As previously agreed with the Washington State Department of Ecology, additional sediment sampling is not required in the Duwamish Waterway or Slip No. 6 where sewer sediments did not exceed the CSL/MCUL. Duwamish Waterway intertidal sediments were sampled on a random grid pattern during Round 1 of the RFI, and no contaminants above the CSL/MCUL were detected. Therefore, no significant contamination is expected.

- Based on all the RFI data collected through Round 3, a Risk Assessment/MCS evaluation is warranted to address the following groundwater constituents whose detected concentrations exceeded action levels: arsenic, cadmium, chromium, copper, lead, mercury, nickel, selenium, thallium, vanadium, and zinc (metals); 4,4'-DDD, endosulfan I, and endosulfan sulfate (pesticides); benzo(a)pyrene, chrysene,

bis(2-chloroethyl)ether, pentachlorophenol, 2-methylphenol, 4-methylphenol, and bis(2-ethylhexyl)phthalate (semivolatile organic compounds); toluene, benzene, methylene chloride, 1,1-dichloroethane, acetone, and formaldehyde (volatile organic compounds); and nitrite (a conventional parameter). Groundwater constituents without action levels that will be addressed in the evaluation are cobalt, dibenzofuran, 2-methylnaphthalene, and phenanthrene.

- A Risk Assessment/MCS evaluation is also warranted to address the following seep constituents whose detected concentrations exceeded action levels: arsenic, cadmium, copper, lead, mercury, nickel, zinc, and bis(2-ethylhexyl)phthalate. Seep constituents without surface water action levels that will be addressed in the evaluation are barium and vanadium.

- As previously stated in the RFI Report, the Risk Assessment/MCS evaluation will also address the following detected soil constituents that do not have action levels: cobalt, 2-methylnaphthalene, benzo(g,h,i)perylene, isopropyl alcohol (2-propanol), and phenanthrene. (Note: This list remains unchanged from that presented in the RFI Report, as no new soil data were collected in Round 3.)

- The need for a Corrective Measures Study (CMS) will be determined by the results of the Risk Assessment/MCS evaluation. If needed, the CMS will evaluate corrective measures applicable to contaminants exceeding the Media Cleanup Standards developed in the Risk Assessment/MCS evaluation. At this time, it appears that a CMS may be warranted for the toluene groundwater plume. Any CMS evaluation addressing groundwater remediation may also consider the need to remediate Unsaturated Zone soils in order to better ensure the effectiveness and permanence of any groundwater remediation.

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Section 1
Introduction

1.1 Statement of Purpose

On May 6, 1993, Rhone-Poulenc Inc. (RPI) and U.S. Environmental Protection Agency Region 10 (U.S. EPA) entered into an Administrative Order on Consent (the Consent Order). The Consent Order, No. 1091-11-20-3008(h), specifies the Resource Conservation and Recovery Act (RCRA) corrective action requirements for RPI's Marginal Way Facility in Tukwila, Washington (the Facility). One of the corrective action requirements is completion of a RCRA Facility Investigation (RFI). The final RFI Report was submitted to U.S. EPA on June 19, 1995, pursuant to Section VI.B of the Consent Order. This Round 3 Data and Sewer Sediment Technical Memorandum (Memorandum) constitutes an addendum to the RFI Report and presents additional environmental data collected at the Facility.

The general objectives of the RFI are to:

Round 3 of the RFI was conducted to refine and further support the conclusions presented in the RFI Report. The objectives of Round 3 were to:

- Obtain additional groundwater data to provide (1) a second, confirmatory set of groundwater samples from monitoring wells installed during Round 2 of the RFI; (2) speciation of chromium present in groundwater samples; (3) continued assessment of the nature and extent of the toluene plume; and (4) analysis of total metals concentrations in groundwater samples obtained after micropurging.

- Complete the seep assessment portion of the RFI.

In addition to the Round 3 activities, sewer sediments were sampled. The objectives of this sampling were to:

- Characterize sewer sediments that may have discharged to the King County Storm Drain, to the Duwamish Waterway, or to Slip No. 6.

- Characterize the sediments in other sewers at the Facility to determine whether the sewers needed cleaning. Some of these sewers were going to be cross-connected and used for future stormwater collection.

The activities completed during Rounds 1 and 2 of the RFI are described in the RFI Report. Activities completed since Round 2 and described in this Memorandum include the following:

- Groundwater sampling of 35 of the 38 Facility monitoring wells and analysis of the samples collected (wells DM-1B, DM-2B, and DM-6 were not sampled)

- Sampling and analysis of seven seeps from the shorelines of the Duwamish Waterway and Slip No. 6

- Surface water sampling in the Duwamish Waterway upgradient and down-gradient from the Facility, and analysis of the samples for chromium speciation

- Sampling and analysis of sediments present in Facility sewer systems that may have historically discharged to the King County Storm Drain, to the Duwamish Waterway, or to Slip No. 6

- Sampling and analysis of sediments present in other Facility sewer systems to determine whether the sewers required cleaning prior to use as part of the storm sewer system

The results and conclusions presented in this Memorandum will be incorporated into the Risk Assessment/Media Cleanup Standards (MCS) evaluation, which will be used during the Corrective Measures Study to assess potential remedial actions needed at the Facility.

1.2 Action Levels

The action levels for each environmental medium were presented in the RFI Report or were developed during subsequent discussions with U.S. EPA and the Washington State Department of Ecology (Ecology). These action levels, as approved by U.S. EPA and Ecology, are as follows:

- For groundwater, the action levels are those presented in the RFI Report. These action levels are the most stringent of the state and federal groundwater and surface water standards, since Upper Aquifer groundwater at the Facility appears to discharge to surface water (the Duwamish Waterway). During the initial evaluation of the Round 3 data, groundwater data from certain near-shore monitoring wells were compared to groundwater standards because data from downgradient seeps were available for comparison to surface water standards. The approach to evaluation of the data is discussed in Section 4.

- For seeps, the action levels are the most stringent of the following surface water standards (note that these are the same surface water standards that the groundwater data were compared to):

- Federal Aquatic Health Criteria–Freshwater Acute Criterion Maximum Concentrations (40 CFR 131.36[b][1])

- Federal Aquatic Health Criteria–Freshwater Chronic Criterion Continuous Concentrations (40 CFR 131.36[b][1])

- State Aquatic Health Criteria–Freshwater Acute Criterion Maximum Concentrations (WAC 173-201A-040[3])

- State Aquatic Health Criteria–Freshwater Chronic Criterion Continuous Concentrations (WAC 173-201A-040[3])

- Federal Aquatic Health Criteria–Marine Water Acute Criterion Maximum Concentrations (40 CFR 131.36[b][1])

- Federal Aquatic Health Criteria–Marine Water Chronic Criterion Continuous Concentrations (40 CFR 131.36[b][1])

- State Aquatic Health Criteria–Marine Water Acute Criterion Maximum Concentrations (WAC 173-201A-040[3])

- State Aquatic Health Criteria–Marine Water Chronic Criterion Continuous Concentrations (WAC 173-201A-040[3])

- Federal Human Health Criteria for Consumption of Organisms Only (40 CFR 131.36[b][1])

- State Model Toxics Control Act (MTCA) Method C Cleanup Levels for Surface Water (WAC 173-340)

- For sewer sediments, the action levels are the Washington State Marine Sediment Management Standards (WAC 173-204). Although these standards are not directly applicable, exceedances of action levels in sediments present in sewer lines could indicate potential exceedances in sediments discharged via sewer outfalls to the Duwamish Waterway or to Slip No. 6.

In this Memorandum, detected constituents are compared with the action levels cited above. In cases when one or more of these action levels are exceeded, these constituents will be further addressed in the Risk Assessment/MCS evaluation. Such an approach is consistent with current U.S. EPA guidance as presented in the final RCRA Corrective Action Plan (Directive 9902.3-2A, May 31, 1994).

1.3 Organization of This Memorandum

The organization of this Memorandum parallels the organization of the RFI Report. Following Section 1, the contents are as follows:

- **Section 2, Summary of Additional Fieldwork**, summarizes the methods and procedures used to conduct the additional fieldwork at the Facility.

- **Section 3, Field and Laboratory Quality Assurance/Quality Control**, presents the quality assurance/quality control (QA/QC) methodology and results.

- **Section 4, RFI Round 3 and Sewer Sediment Analytical Results and Findings,** contains the analytical results and related findings of the RFI Round 3 and sewer sediment sampling and analysis.

- **Section 5, Sewer Cleaning**, describes the rationale, methodology, and waste disposal practices for the cleaning of sewers at the Facility, which has also taken place since Round 2 of the RFI.

- **Section 6, Conclusions and Recommendations,** presents the conclusions of the Round 3 and sewer sediment findings and additional recommendations for future actions, with emphasis on findings that require modifications to the conclusions and recommendations presented in the RFI Report.

- **Section 7, References,** lists the references and sources used in preparing this Memorandum.

Tables and figures referenced in the text follow Section 7. Appendices A through F, which provide additional technical information, follow the tables and figures.

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Section 2
Summary of Additional Fieldwork

A phased approach was used to conduct the RFI at the Marginal Way Facility. The field sampling and laboratory analysis presented in the RFI Report were conducted in two rounds between January and September 1994. The third round of groundwater and seep sampling and analysis was conducted in March and April 1995. Additional field sampling and analysis were conducted between May and October 1995.

This section summarizes the methods and procedures used to conduct the RFI Round 3 and sewer sediment field sampling and laboratory analysis. The following sampling and analysis are described in this Memorandum:

- Round 3 groundwater sampling was conducted in accordance with the addendum to the RFI Workplan (RPI, July 1994) and took place in March 1995.

- Seep and surface water sampling was conducted in accordance with the RFI Workplan (RPI, December 1993) and a memorandum dated April 12, 1995 (see Appendix A). The sampling took place from April 18 to April 20, 1995.

- Sewer sediment sampling was conducted in accordance with the Sewer System Sediment Sampling Plan (see Appendix A). Sewer sediment sampling was not addressed in the RFI Workplan. The sampling took place in May 1995, with follow-up sampling in July.

During the course of the Round 3 work, some of the methods and procedures presented in the RFI Workplan and subsequent addenda were modified. In general, the modifications were needed to address the differences between the conditions assumed or anticipated in the

planning stages and the actual field conditions encountered during sampling activities. The Round 3 modifications are documented in Appendix B.

The technical approach to the Round 3 and sewer sediment field activities and analyses are described in the following sections:

- 2.1–Overall Technical Approach
- 2.2–Round 3 Groundwater Sampling and Analysis
- 2.3–Seep Sampling and Analysis
- 2.4–Sewer Sediment Sampling and Analysis

The additional data obtained from the groundwater, seep, and sewer sediment samples were entered into the RFI project database. Appendix C contains a printout from this database listing detected constituents.

2.1 Overall Technical Approach

The overall technical approach to the groundwater and seep field sampling and analysis considered past Facility operations and the specific objectives for each environmental medium. This approach is described in detail in the RFI Workplan and summarized in the RFI Report. As discussed in the RFI Report, the Facility was divided into 11 investigation areas for Rounds 1 and 2. An additional investigation area, Area A12 (the Slip No. 6 intertidal zone), was added for Round 3 to include seep samples from the shoreline of Slip No. 6. Figure 2-1 shows the 12 investigation areas at the Facility.

The constituents of interest for the groundwater and seep sampling and analysis were those specified in the RFI Workplan, as modified by discussions with U.S. EPA and Ecology.

Two technical approaches were followed for the sewer sediment sampling, depending on the type of sewer system (storm sewer outfall or other sewer) and the specific sewer line sampled. Because the sewers had never been cleaned, the sediments remaining in them would be representative of what may have discharged offsite. Therefore, the approach to the outfall sampling consisted of sampling the sediments as closely as possible to the storm sewer outfall (i.e., the end-of-pipe discharge point to the Duwamish Waterway [Area A11] or Slip No. 6 [Area A12]) or to the King County Storm Drain discharge point. For the other sewers, a sample was taken from the downstream end of each discrete drainage area to determine whether the line needed cleaning. Because sediments may have discharged offsite to intertidal and subtidal sediments, the constituents of interest for the sewer sediment sampling and analysis were those constituents listed in the Sediment Management Standards (WAC 173-204) that were previously detected in onsite soil during the RFI or were site-specific constituents of interest (e.g., toluene).

2.2 Round 3 Groundwater Sampling and Analysis

The overall objectives of the RFI groundwater sampling and analysis are presented in Section 2.4 of the RFI Report. The field methods for the Round 3 groundwater investigation were selected to meet the following objectives:

- Conduct a second confirmatory round of sampling and analysis for the eight new monitoring wells installed during Round 2 of the RFI (wells MW-13 through MW-20).

- Provide ongoing monitoring of the Upper Aquifer toluene plume to identify significant changes that may be occurring in the extent (horizontal and vertical) and magnitude of contamination.

- Provide ongoing monitoring of near-shore monitoring wells on the south and west sides of the toluene plume to detect potential discharge of toluene to the Duwamish Waterway or to Slip No. 6.

- Speciate chromium (i.e., trivalent or hexavalent) in wells for which the available chromium data exceeded the most stringent water quality criteria.

- Verify the presence of isolated and/or unanticipated organic and inorganic constituents detected during previous RFI or pre-RFI sampling events (e.g., a trace concentration of toluene detected in well DM-2B and a high concentration of acetone detected at well H11 during Round 1 of the RFI).

Groundwater sampling was conducted by Terra Nova Associates on March 29 through 31, 1995. The field methods and procedures are summarized below (Appendix D contains Terra Nova's report describing the field methods and procedures). Samples were obtained from 35 of the 38 Facility monitoring wells, 33 completed in the Upper Aquifer and two in the Lower Aquifer. Wells DM-1B, DM-2B, and DM-6 were not sampled. The locations of the monitoring wells sampled during Round 3 are shown in Figure 2-2. Table 2-1 shows the analyses performed for each well, and Table 2-2 lists the analytical methods for the Round 3 groundwater samples.

Sampling was conducted using methods and procedures outlined in the following documents:

- RCRA Ground-Water Monitoring: Draft Technical Guidance Document (U.S. EPA, 1992)

- Terra Nova Associates Field Sampling Procedures Manual

609-452-5259
John Hershfeller
Chicago
Marine Shale
Kinbur

- RFI Workplan (RPI, December 1993)
- Ground Water Sampling for Metals Analysis (U.S. EPA, 1989)

Well purging was performed with a submersible pump, a bladder pump, or a diaphragm pump. Purge rates were between 0.25 liter and 0.45 liter per minute. The following field parameters were recorded during purging: temperature, pH, specific conductance, dissolved oxygen, and oxidation/reduction potential. Table 2-3 shows the field parameter measurements. Purging was terminated and sampling initiated after two successive readings of field parameters were within 10 percent of each other.

Samples were collected either with laboratory-cleaned dedicated Teflon bailers or with a field-decontaminated bladder pump. When sampling was conducted with the bladder pump, flow was reduced to approximately 0.1 liter per minute. Samples were delivered to the laboratory via Federal Express and following chain-of-custody procedures.

2.3 Seep Sampling and Analysis

Seeps along the Facility shoreline were sampled to assess the quality of groundwater discharging to the adjacent waterways and to evaluate possible cross-media contamination from groundwater to surface water and sediments. These objectives were met by obtaining samples of water from seven seeps located along the intertidal zone of the Duwamish Waterway and Slip No. 6 (Figure 2-2).

On the basis of the observations made on August 18, 1994, seep sampling was scheduled to take place during the week of April 17, 1995, when minus tides were expected to provide maximum exposure of the intertidal zone. During this sampling period, tides estimated at minus 1 foot to minus 2 feet occurred. Because of the extreme low tides, more seeps were observed along the Facility shoreline than during any previous reconnaissance.

CH2M HILL staff sampled seven seeps (Figure 2-2): three were located along the shoreline of Slip No. 6 (seeps 5, 6, and 7), and four were located along the southernmost portion of the Duwamish Waterway (seeps 1, 2, 3, and 4). Detailed information on the seep identification, description, and sampling methods is provided in Appendix E. One of the four seeps discharging into the Duwamish Waterway had a dark brown tint (seep 2); a duplicate sample was collected from this seep. The seep analyses were expanded from those in the RFI Workplan to include analysis for guaiacol and resin acids, as requested by Ecology.

Sampling was expanded to include surface water both up- and downriver from the Facility (samples 01-SW and 02-SW, respectively). Figure 2-2 shows the sampling locations. The surface water samples were analyzed only for hexavalent chromium using EPA Method 7197. Table 2-4 shows the analyses performed for each seep and surface water sample, and Table 2-5 lists the analytical methods for the seep samples.

Sampling was conducted using the methods and procedures outlined in the RFI Workplan and the seep sampling memorandum dated April 12, 1995 (see Appendix A). As sampling was completed at each location, field parameters were measured from samples collected from the seven seeps and the two surface water sites. The parameters measured were salinity, dissolved oxygen, electrical conductance, temperature, and pH. Table 2-6 shows the field parameter measurements. The field report is provided in Appendix E.

2.4 Sewer Sediment Sampling and Analysis

Sewer sediments were sampled to (1) characterize residual sediments in the sewers, (2) evaluate whether sewer sediments in historical outfall lines may have discharged offsite and potentially affected sediment quality in adjacent waterways, and (3) assess whether other sewers needed to be cleaned before being cross-connected to the storm sewer and used for future stormwater collection. These objectives were met by analyzing the sewer sediment samples and comparing the results to the Sediment Management Standards (WAC 173-204)

chemical criteria. Sewer lines containing sediments with constituent concentrations exceeding the Minimum Cleanup Levels were cleaned.

Sediment sampling in the Facility sewer systems was not addressed in the RFI Workplan. A draft Sewer System Sediment Sampling Plan was prepared and submitted for review to Ecology (U.S. EPA deferred to Ecology) on May 22, 1995. Ecology's Sediment Management Unit reviewed the sampling plan and provided comments on May 22, 1995. The revised plan, incorporating Ecology's comments, is included in Appendix A.

CH2M HILL staff conducted sewer sediment sampling on May 24, May 25, and July 6, 1995. A steel scoop attached to a fiberglass pole was used to collect samples from residual sediments that had accumulated in the bottom of catch basins, manholes, and pipes. The field methods and procedures are described in detail in Appendix F.

In the Sewer System Sediment Sampling Plan, seven sampling locations were proposed for the historical storm sewer outfalls and the discharge to the King County Storm Drain. An additional 15 samples were proposed for the other sewer lines. Table 2-7 lists the proposed sampling locations, the rationale for the proposed locations, and the actual sampling points. Samples were not taken from the sanitary sewer. Of the proposed sampling locations, two of the other sewer sampling locations and a designated alternate sampling location did not contain enough sediment to sample; but all seven outfall lines had enough sediment to sample. Twenty samples were ultimately collected in addition to two duplicate samples. Figures 2-3 and 2-4 show the actual sampling points for the outfall lines and the other sewer lines, respectively.

The lines leading to outfalls 2 and 3 could not be found close to the outfalls. Two test pits were excavated along the expected location of each line, based on historical drawings. The test pits were extended either to below the anticipated depth of the line or until obstructions were encountered. The locations of these test pits are shown in Figure 2-3; the subsurface conditions encountered in each test pit are described in Appendix F. When no line of the

expected material and diameter was found, the sampling point was moved upgradient until such a line was found. At that point, the pipe was broken and a sample was collected.

Numerical sample results of PCB analyses were received at the end of June 1995. One sample, 02-SWO, contained 526 mg/kg of the PCB Arochlor 1254. Because of this high concentration, RPI attempted to isolate the line containing the high-concentration PCBs from the rest of outfall 2 (Figure 2-3) prior to cleaning the outfall. However, this action was unnecessary since this line did not discharge to Outfall 2 but to a process sewer manhole. On July 6, two additional sediment samples were taken from lines upgradient of the original sampling location (Figure 2-5). No sample was taken from the third line that entered the line originally sampled because the line turned vertically upward adjacent to the trench and contained little sediment.

The sewer sediment samples were analyzed for those constituents listed in the Sediment Management Standards (WAC 173-204) that were previously detected onsite or were site-specific constituents of interest (e.g., toluene). Table 2-8 shows the analyses performed on each sample, and Table 2-9 lists the analytical methods used.

The data indicated that constituent concentrations in the sewer sediments exceeded the Sediment Management Standards Minimum Cleanup Levels. Because of this, the accessible sewers were cleaned and sections of sewer that were not going to be used for stormwater collection were blocked off. Stormwater through the newly joined storm system was then tested prior to opening the outfall to the Duwamish Waterway. These activities occurred between July and October 1995 and are described in Section 5 of this Memorandum.

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Section 3
Field and Laboratory Quality Assurance/Quality Control

The RFI QA/QC procedures were established to provide data of known quality, to facilitate evaluation and understanding of ongoing data collection efforts, and to help develop more accurate relationships and comparisons with previous studies conducted at the Facility (Dames & Moore, 1986; Landau Associates, 1991). The Round 3 groundwater and seep data were collected and validated in accordance with the QA/QC procedures presented in the RFI Workplan (RPI, December 1993). The sewer sediment data, while collected in accordance with the RFI Workplan field QC procedures, were not validated, as discussed in Section 3.2.2.

3.1 Field QA/QC

The field QA/QC procedures implemented for the Round 3 groundwater, seep, and sewer sediment sampling are described in the following sections.

3.1.1 Groundwater Sampling QA/QC

QA/QC procedures were implemented during the Round 3 sampling of groundwater monitoring wells in order to evaluate the following:

- Variation and precision of overall methodology
- Contamination possibly introduced by sampling equipment or sample collection methods
- Contamination of samples by ambient conditions

Three types of samples were collected as part of the field QA/QC program for the Round 3 groundwater sampling: field duplicates, equipment rinsate blanks, and trip blanks. All Round 3 groundwater samples, including the QA/QC samples, were obtained by Terra Nova Associates. Terra Nova's report (Appendix D of this Memorandum) indicates that field QA/QC samples were obtained in accordance with the RFI Workplan, with the exceptions listed in Appendix B.

Variation and precision in the overall methodology were evaluated by field duplicate analysis. Table 3-1 presents the field duplicate results; the reported results are average values of the duplicate samples. In cases where one sample contained a detection and the duplicate sample was a nondetection (or vice versa), one half of the detection limit was substituted for the nondetection to calculate the average sample result. Relative percent deviations (RPDs) for the duplicate results, also listed in Table 3-1, give an overall indication of the variability of the data, particularly where constituents were detected in both a sample and a duplicate.

With the exception of four analytes, the RPD values met the QA objectives for precision as defined in Table 3-2. The analytes with RPDs that exceeded these QA objectives were methane (31.4%), aluminum (35.4%), boron (63.7%), and zinc (31.2% and 141.2%).

Contamination introduced by sampling equipment or sample collection methods was evaluated by collection and analysis of equipment blanks. Three equipment blanks were collected. The results of the equipment blank analyses are presented in Appendix C. For samples that show detected constituents corresponding to the blanks, the sample results have been qualified according to U.S. EPA guidelines. The equipment blank results are consistent with the contamination levels generally encountered in these studies and do not interfere with the interpretation of the results or the final conclusions.

Constituents found in the equipment blanks included metals, conventionals, methylene chloride, carbon disulfide, 2-butanone (methyl ethyl ketone), and chloroform. The metals detected in the equipment blanks were also detected in the laboratory blanks; low levels of

metals and conventionals are naturally found in water used for rinsing equipment. Carbon disulfide and methylene chloride were detected in one of the field blanks (FB-02) and also in one of the laboratory method blanks associated with the field blank. Carbon disulfide, which was not detected in samples or blanks during Round 1 or Round 2, was detected in Round 3 in wells H10 (900 µg/l) and H11 (1 µg/l). These wells were sampled on the day the field blank was obtained. Samples from H10 and H11 were also associated with the laboratory method blank contaminated with carbon disulfide. The samples from H10 and H11 were both dilution samples (5,000x and 25x respectively); these are the lowest dilutions available with acceptable QA/QC. Since carbon disulfide was not detected in Round 1 or Round 2, the presence of this compound in the groundwater is suspect. With the high dilution ratios, one likely source of carbon disulfide is the dilution water. Based on the high dilution ratios, the fact that carbon disulfide was present in the associated method blank, and the fact that it was not detected in Round 1 or Round 2, its presence in H10 and H11 should be considered as a laboratory artifact and not as representative of actual groundwater conditions. Likewise, the relatively high concentrations of methylene chloride found in samples from H10 and H11 (8,300J and 15J) are also laboratory artifacts and are not representative of actual groundwater conditions.

The other contaminants found in the equipment blanks, 2-butanone and chloroform, were not detected in samples or blanks during Round 1 or Round 2, and were not detected in any Round 3 samples.

Contamination of groundwater samples by ambient conditions was evaluated by analyzing trip blanks for volatiles. Detections in trip blanks help establish sources of contamination; contamination of trip blanks by compounds not detected in laboratory blanks is an indication of contamination introduced during transport by diffusion across samples or from ambient air. Two trip blanks were collected during Round 3 groundwater sampling. No target compounds were detected in the two trip blanks.

3.1.2 Seep Sampling QA/QC

QA/QC samples were collected during seep sampling to evaluate the following:

- Variation and precision of overall methodology
- Contamination possibly introduced by sampling equipment or sample collection methods
- Contamination of samples by ambient conditions

Three types of samples were collected as part of the seep sampling QA/QC program: field duplicates, an equipment rinsate blank, and a trip blank. The QA/QC samples were collected according to the procedures specified in Section 5.5 of the RFI Workplan.

Variation and precision in the overall methodology were evaluated by field duplicate analysis. Table 3-3 presents the seep sample field duplicate results; the reported results are average values of the duplicate samples. RPD values for the duplicate results are also listed in Table 3-3.

With the exception of one analyte, the RPD values met the QA objectives for precision as defined in Table 3-4. The analyte with an RPD that exceeded these QA objectives was bis(2-ethylhexyl)phthalate (86.5%).

Contamination introduced by sampling equipment or sample collection methods was evaluated by collection and analysis of one equipment blank. Methylene chloride was the only constituent detected in the equipment blank; methylene chloride is a common solvent in field and laboratory operations. The results of the equipment blank analysis are presented in Appendix C. For samples that show detected constituents corresponding to the blank, the sample results have been qualified following U.S. EPA guidelines. The equipment blank

results are consistent with the contamination levels generally encountered in these studies and do not interfere with the interpretation of the results or the final conclusions.

Contamination of seep samples by ambient conditions was evaluated by collecting one trip blank and analyzing it for volatiles. No volatile organic compound was detected in the trip blank.

3.1.3 Sewer Sediment Sampling QA/QC

QA/QC samples were collected during sewer sediment sampling to evaluate the following:

- Variation and precision of overall methodology
- Contamination possibly introduced by sampling equipment or sample collection methods
- Contamination of samples by ambient conditions

Two types of samples were collected as part of the sewer sediment sampling QA/QC program: field duplicates and an equipment rinsate blank. The QA/QC samples were collected according to the procedures specified in Section 5.5 of the RFI Workplan.

Variation and precision in the overall methodology were evaluated by field duplicate analysis. Table 3-5 presents the sewer sediment sample field duplicate results; the reported results are average values of the duplicate samples. RPD values for the duplicate results are also listed in Table 3-5.

In one set of the duplicate samples (014-SEW and 838-SEW), the RPDs were within the QA objectives for precision with the exception of eight analytes (see Table 3-5). For the second set of the duplicate samples (07-SWO and 08-SWO), the QA objectives for precision as defined in Table 3-6 were exceeded for most of the analytes. This is likely because

these samples are highly complex and variable in nature, and is not a reflection of the laboratory performance.

Contamination introduced by sampling equipment or sample collection methods was evaluated by collection and analysis of one equipment blank. Methylene chloride was the only constituent detected in the equipment blank. Methylene chloride is a common solvent found in field and laboratory operations. The results of the equipment blank analysis are presented in Appendix C. For samples that show detected constituents corresponding to the blank, the sample results have been qualified following U.S. EPA guidelines. The equipment blank results are consistent with the contamination levels generally encountered in these studies and do not interfere with the interpretation of the results or the final conclusions.

3.2 Laboratory QA/QC and Data Validation

The laboratory QA/QC and data validation procedures implemented for the RFI Round 3 groundwater, seep, and sewer sediment samples are discussed in Sections 3.2.1 and 3.2.2. Section 3.2.3 presents an assessment of the validated data.

3.2.1 Analytical Methodology and Laboratory QA/QC

Groundwater, seep, and sewer sediment samples conducted during the Round 3 sampling were analyzed using the analytical methodologies detailed in the RFI Workplan (Section 6 and Appendix G), with some exceptions. These exceptions and the pertinent portions of the methodologies are summarized below and in Table 3-2 for groundwater analyses, Table 3-4 for seep analyses, and Table 3-6 for sewer sediment analyses.

Groundwater and seep samples were analyzed following the U.S. EPA *Test Methods for Evaluating Solid Waste* (1992, methodology SW-846) for comparability to other RCRA studies. To obtain data of known quality, QA/QC protocols at a level equivalent to the U.S.

EPA Contract Laboratory Program (CLP) were implemented for the analyses of volatiles, semivolatiles, and metals. For parameters not covered under the CLP (e.g., water quality parameters), QC specifications were established at a comparable level.

The seep samples were also analyzed for chromium speciation (hexavalent chromium) and guaiacol, vanillin, and resin acids (compounds or breakdown products of compounds previously used by RPI); the groundwater samples were also analyzed for chromium speciation. Hexavalent chromium analyses were performed following EPA Methods 7197 and 218.4 for groundwater samples and Method 7197 for seep samples. Guaiacol, vanillin, and resin acids were analyzed according to the National Council of the Paper Industry for Air and Stream Improvement Technical Bulletin Method 85.01M, a method commonly used by the pulp and paper industry. The QC specifications were implemented at a level comparable to the other non-CLP parameters.

Sewer sediment samples were analyzed following the Puget Sound Estuary Program (PSEP) protocols or standard U.S. EPA methodology, as noted in Table 3-6. CLP protocols and CLP QC requirements were specified where applicable. The target analytes specified for volatiles analysis were benzene, toluene, ethylbenzene, and xylene, rather than the full target analyte list as specified in the CLP. For parameters not covered under the CLP, QC specifications were established at a comparable level.

Project target detection limit specifications are presented in Tables 3-2, 3-4, and 3-6, and follow RCRA guidelines. U.S. EPA SW-846-specified practical quantitation limits (PQLs) were met where applicable. For parameters where no PQLs are defined, appropriate project-specific target detection limits were identified in the laboratory statement of work. SW-846 also specifies establishing laboratory-specific method detection limits (MDLs) per 40 CFR Part 163, Appendix B; the laboratories have established MDLs following this procedure. The laboratory MDLs for this project are below their respective PQLs. The proposed action levels, such as maximum contaminant levels (MCLs) for groundwater and surface water quality standards for seep samples, were met for most parameters. The

exceptions were those cases where PQLs were above the proposed action levels and when dilution was necessary because of matrix interference or high sample concentration.

Round 3 analyses were carried out by six laboratories: PACE/Mid Pacific Laboratory (the majority of the groundwater sample parameters), PACE/Southern California (general chemistry parameters for six groundwater samples), PACE/New Orleans (the majority of the seep sample parameters), PACE/Minneapolis (formaldehyde), Columbia Analytical Services (guaiacol, vanillin, and resin acids), and Maxwell S-Cubed (hexavalent chromium and sewer sediment samples).

3.2.2 Data Validation

For parameters covered by the CLP, data validation followed the U.S. EPA *National Functional Guidelines for Organic Data Review* (1991) and *Functional Guidelines for Evaluating Inorganic Analysis* (1988). For parameters not covered by the CLP, data were reviewed for calibrations, accuracy measurements, precision measurements, and blank sample measurements.

The analytical laboratory managed and tracked samples in sample delivery groups (SDGs); the samples in an SDG had common QC data, as they were run consecutively. When RPI received the analytical laboratory reports, separate data review reports were prepared for each individual SDG. Each report was prepared following procedures and subsection headings for the full CLP review as defined in the U.S. EPA Functional Guidelines. The reports include checks for proper methodology, the level of QC effort (the frequency of runs), conformance to U.S. EPA-defined quantitative control limits, and details of analytical protocol deviations, if any. For approximately 10 percent of the SDGs, the report included raw data checks. The level of validation for each SDG is noted in Table 3-7.

All the reports summarize the data that did not meet QA/QC requirements, if any, with the following minimum information:

- The affected sample numbers
- The affected parameters
- The specific quantitative deviation from the QC requirements
- The data validation flag, if any
- A description of the data validation flag, whether it was caused by laboratory error (designated as a "protocol" flag) or by matrix, analytical, or instrument limitations (designated as an "advisory" flag)

The data validation flags and their meanings are as follows:

- U–The concentration is less than the listed value (not detected).
- J–The estimated value is for qualitative use only.
- R–The data are restricted and may not be used for any purpose.
- UJ–The concentration is less than the estimated detection limit; the detection limit should be used qualitative and may bias the result to a false negative.

The data flags are presented in the database. Additional data-reporting qualifiers originating from the laboratory were received in the electronic data reports and hardcopy reports. These qualifiers are procedural in nature and may or may not address data quality. A list of these data reporting qualifiers and their meanings is included in Appendix D in this report, together with a complete set of detected chemicals.

Qualification of sample analyses for contamination observed in laboratory blank samples was detailed in the data validation reports. These samples were corrected for laboratory

contamination following U.S. EPA guidelines, and the qualifications have been incorporated into the data used in this report.

RPI decided not to validate the sewer sediment data. Unlike groundwater and seep samples, the sewer sediment samples were not environmental media samples, but were taken from sediments contained in plant sewers. Because of the constituent concentrations detected in the sewer sediments, the sewers have been cleaned out and the sediments disposed of through Chemical Waste Management, Inc.

3.2.3 Data Assessment

The validated data have met the project QA goals described in the QAPP in the RFI Workplan and in Tables 3-2, 3-4, and 3-6. The data are over 90 percent complete; that is, 90 percent of the data meet the target goals for precision, accuracy, and representativeness.

The overall quality objectives for accuracy and precision were met for groundwater and seep samples. Because of the highly complex and variable nature of the sewer sediment samples, the accuracy and precision objectives as defined in Table 3-6 were not met. The low recoveries of the matrix spike and matrix spike duplicates compounds in the volatiles, semivolatiles, and metals analyses indicate that there is a significant level of matrix interference and is not a reflection of the laboratory performance. Therefore, the data can be used according to their intended purpose.

With the current state of practice in this area, these data are of high quality and provide the detailed QC information needed to establish reproducibility and comparability. Target detection limits were met. Data validation reports, which summarize accuracy and precision values as defined in the QAPP, are included in the project files.

Section 4

RFI Round 3 and Sewer Sediment Analytical Results and Findings

This section presents the RFI Round 3 and sewer sediment analytical results and findings, with emphasis on the following:

- The analytical results from the samples collected
- Comparison of the analytical data with the action levels

The preliminary list of constituents to be addressed in the Risk Assessment/MCS evaluation was presented in Section 5 of the RFI Report. The Round 3 groundwater and seep data were compared to action levels to identify possible additional constituents to be included in the Risk Assessment/MCS evaluation. The outfall sewer sediment results were compared with the action levels to determine whether sewer cleaning was needed.

Before presenting the Round 3 groundwater and seep data, it is important to understand the data evaluation approach used. To simplify the analytical data presentation in this Memorandum, all the groundwater data are compared to both groundwater and surface water action levels, as was done in the RFI Report. The seep data are compared only to surface water action levels. Another groundwater data evaluation approach was suggested by Ecology: since seeps probably represent the worst-case potential groundwater discharge from the Facility to the Duwamish Waterway (because of the extreme low tide), Ecology proposed that RPI compare the data from the groundwater wells upgradient of the seeps to groundwater action levels only. The remaining wells with no downgradient seeps would be compared to both groundwater and surface water action levels. The groundwater data were evaluated using Ecology's approach. The Ecology approach and the RFI approach resulted in the same list of groundwater parameters exceeding action levels. The issue of ground-

water exceedances of surface water criteria (which do not allow for any attenuation or degradation) will be addressed further in the Risk Assessment/MCS evaluation.

The results and findings described in the remainder of Section 4 are presented in the following sequence:

- 4.1–Round 3 Groundwater Sampling Results
- 4.2–Seep Sampling Results
- 4.3–Sewer Sediment Sampling Results

A printout from the RFI project database listing constituents detected in all these sampling events is provided as Appendix C of this Memorandum.

4.1 Round 3 Groundwater Sampling Results

The Round 3 groundwater sampling encompassed 35 of the 38 Facility monitoring wells (Figure 2-2) and was conducted by Terra Nova Associates between March 29 and 31, 1995. (Wells DM-1B, DM-2B, and DM-6 were not sampled; Terra Nova's report is included as Appendix D.) The 35 wells were sampled using low-flow sampling techniques (micropurging, as discussed in Section 2). The analytical parameters for each well were selected to confirm the presence or further determine the concentrations of the groundwater constituents identified during Rounds 1 and 2. The results of the total metals analyses, as approved by U.S. EPA and Ecology in a meeting on May 10, 1995, will replace metals data from Rounds 1 and 2 for use in the Risk Assessment/MCS evaluation. The parameters included in Round 3 are summarized below:

- **Toluene**–22 wells located in or near the toluene plume area were analyzed for BTEX (benzene, toluene, ethylbenzene, and xylenes).

- **Volatile organic compounds** (volatiles)–Five wells in which volatiles other than BTEX were detected in Round 1 or Round 2 were analyzed for the full suite of volatiles in Round 3.

- **Semivolatile organic compounds** (semivolatiles)–Five wells in which semivolatiles were detected in Round 1 or Round 2 were analyzed for semivolatiles in Round 3.

- **Metals and hexavalent chromium**–33 Upper Aquifer wells and one Lower Aquifer well (well B1B) were analyzed for total metals. Low-flow well-purging techniques were used to minimize the uptake of suspended solids into the samples. The metals data from Round 3 will be used in the Risk Assessment/MCS evaluation. A separate aliquot from each well was analyzed for hexavalent chromium.

- **General water quality parameters and biological activity indicators**–14 wells were selected for analysis of general water quality parameters and biological activity indicators. These wells are generally located around the edge of the toluene plume, and they were analyzed in order to evaluate whether biodegradation of the toluene plume may be occurring. These analyses were included to provide data for the Risk Assessment/MCS evaluation and the Corrective Measures Study.

Table 2-1 provides a complete list of the parameters analyzed for each well during Round 3, and Table 2-2 lists the analytical methods used. Table 4-1 provides a statistical summary of the Round 3 groundwater data. For each parameter, Table 4-1 lists the detection frequency, the minimum and maximum detected concentrations, the action level for the constituent, and the source of the action level. Appendix C presents a complete list of all the constituents detected above the laboratory detection limits during Round 3.

Sections 4.1.1 through 4.1.5 describe the following:

- Groundwater constituents detected in Round 3 at concentrations above action levels
- Miscellaneous organic constituents detected in Round 3 groundwater samples
- The differences between Round 3 groundwater metals data and groundwater metals data collected in Rounds 1 and 2
- The extent of the toluene plume based on Round 3 groundwater data
- The overall results and findings of the Round 3 groundwater sampling

4.1.1 Constituents Exceeding Action Levels or Without Action Levels

The constituents that exceeded groundwater action levels in Round 3 are discussed below and summarized in Table 4-2. To allow comparison of the groundwater data from Rounds 1, 2, and 3 of the RFI, Tables 4-3 (for inorganic chemicals) and 4-4 (for other parameters) list the parameters exceeding action levels in any of the three rounds. For the purposes of discussion, the parameters are separated into the following constituent groups: total metals, volatiles, semivolatiles, and conventional water quality parameters.

Total Metals

The metals listed below were detected one or more times at concentrations exceeding action levels in Round 3 groundwater samples and will be addressed in the Risk Assessment/MCS evaluation. Some of the surface water action levels are based on the hardness of the sample water; therefore, the action level varies between samples. The metals are listed in the same order in which they were listed in the RFI Report.

Total Arsenic. 17 samples exceeded the 0.05 microgram per liter (µg/l) action level. The exceedances were in samples from the following wells: DM-05 (51.4 µg/l), DM-08 (28.7 µg/l), MW-12 (26.9 µg/l), MW-14 (42.3 µg/l), MW-15 (13.5 µg/l), MW-16 (94.1 µg/l), MW-17 (49.6 µg/l), MW-18 (33.9 µg/l), A2 (41.2 µg/l), A9 (3.7 µg/l, B-qualified [detected between the contract-required detection limit and the instrument detection limit]), B1A (5.2 µg/l, B-qualified), B1B (3.3 µg/l, B-qualified), B5 (3.3 µg/l, B-qualified), G1 (29.5 µg/l), G3 (10 µg/l), H10 (18 µg/l), and H11 (62.8 µg/l).

Total Copper. 27 samples exceeded the action level of 2.5 µg/l. The exceedances were in samples from the following wells: DM-2A (343.1 µg/l), DM-4 (5.1 µg/l, B-qualified), DM-5 (28 µg/l), DM-8 (44.8 µg/l), MW-12 (45.1 µg/l), MW-13 (8.8 µg/l, B-qualified), MW-14 (27.3 µg/l), MW-15 (38.9 µg/l), MW-16 (262 µg/l), MW-17 (39.2 µg/l), MW-18 (27.8 µg/l), MW-19 (16.4 µg/l, B-qualified), A2 (12.55 µg/l, B-qualified), A9 (17.7 µg/l, B-qualified), B1B (19.5 µg/l, B-qualified), B2 (181 µg/l), B4 (11.9 µg/l, B-qualified), B6 (42.3 µg/l), G1 (17.3 µg/l, B-qualified), G3 (15.4 µg/l, B-qualified), H1 (11.1 µg/l, B-qualified), H6 (167 µg/l, B-qualified), H9 (281 µg/l), H10 (14.9 µg/l, B-qualified), H11 (71.2 µg/l), DM-1A (4.4 µg/l [Background Area well]), and E3 (4.2 µg/l, B-qualified [Background Area well]).

Total Lead. Nine samples exceeded the surface water action levels (the action level varies according to the hardness of the sample). The exceedances were in samples from the following wells: DM-2A (6.9 µg/l [action level is 3.2 µg/l]), MW-12 (4.3 µg/l [action level is 1.4 µg/l], MW-15 (9.6 µg/l [action level is 1.3 µg/l]), MW-20 (18.4 µg/l [action level is 0.9 µg/l]), B2 (15 µg/l [action level is 3.2 µg/l]), G1 (7.1 µg/l [action level is 3.2 µg/l]), H6 (7 µg/l [action level is 1.4 µg/l]), H9 (9.5 µg/l [action level is 3.2 µg/l]), and H11 (7 µg/l [action level is 2.4 µg/l]).

Total Nickel. Eight samples exceeded the action level of 7.9 µg/l. The exceedances were in samples from the following wells: DM-2A (20.2 µg/l, B-qualified), DM-5 (12.8 µg/l, B-qualified), MW-12 (10.5 µg/l, B-qualified), MW-16 (104 µg/l), B2 (8.4 µg/l, B-qualified), H1 (8.8 µg/l, B-qualified), H6 (9.9 µg/l, B-qualified), and H9 (24.3 µg/l, B-qualified).

Total Vanadium. 11 samples exceeded the action level of 112 µg/l. The exceedances were in samples from the following wells: DM-2A (252.9 µg/l), DM-4 (112 µg/l), DM-5 (1,410 µg/l), DM-8 (1,410 µg/l), MW-14 (297 µg/l), MW-15 (261.9 µg/l), MW-16 (2,360 µg/l), MW-17 (1,290 µg/l), B2 (387 µg/l), H9 (121 µg/l), and H11 (1,660 µg/l).

Total Zinc. Four samples exceeded the surface water action levels (the action level varies according to the hardness of the sample). The exceedances were in samples from the following wells: DM-5 (216 µg/l [action level is 76.6 µg/l]), B2 (112 µg/l [action level is 76.6 µg/l]), G1 (129 µg/l [action level is 76.6 µg/l]), and H9 (186 µg/l [action level is 76.6 µg/l]).

Total Chromium. Eight samples exceeded the action level of 50 µg/l. The exceedances were in samples from the following wells: DM-2A (56.7 µg/l), DM-5 (301 µg/l), DM-8 (146 µg/l), MW-16 (302 µg/l), MW-17 (130 µg/l), B2 (73.2 µg/l), H6 (77.4 µg/l), and H11 (146 µg/l).

All groundwater samples were analyzed for hexavalent chromium using both EPA Method 7197 and EPA Method 218.4. Hexavalent chromium (Cr^{6+}) was not detected in any of the samples analyzed, indicating that total chromium detected in the above samples is trivalent chromium (Cr^{3+}).

Total Mercury. Three samples exceeded the action level of 0.012 µg/l. The exceedances were in samples from the following wells: B2 (0.15 µg/l, B-qualified), H6 (0.36 µg/l), and H9 (0.67 µg/l).

Total Cadmium. Three samples exceeded the variable surface water action levels (the action level varies according to the hardness of the sample). The exceedances were in samples from the following wells: MW-16 (2 µg/l, B-qualified [action level is 0.7 µg/l]), MW-20 (1.2 µg/l, B-qualified [action level is 0.6 µg/l]), and H9 (11.1 µg/l, B-qualified [action level is 1.7 µg/l]).

Total Selenium. Five samples exceeded the action level of 5 µg/l. The exceedances were in samples from the following wells: MW-14 (7.9 µg/l), MW-16 (22.8 µg/l), MW-17 (10.8 µg/l), A4 (5.5 µg/l), and G1 (6.9 µg/l).

Total Thallium. The sample from well MW-13 (3 µg/l, B-qualified) exceeded the action level of 2 µg/l.

The 11 metals listed above and detected in monitoring wells at concentrations exceeding action levels were compared to the metals identified in the RFI Report for inclusion in the Risk Assessment/MCS evaluation. Cadmium, selenium, and thallium are now added to the Risk Assessment/MCS evaluation list based on the Round 3 results, while beryllium and silver have been excluded from further evaluation. A comparison of the Round 3 metals results with the results from Rounds 1 and 2 is provided in Section 4.1.3.

With the exception of manganese in the sample collected from Lower Aquifer well B1B, concentrations of iron and manganese exceeded the action levels in all the Round 3 groundwater samples (Table 4-3). As stated in the RFI Report, however, iron and manganese concentrations are regionally high relative to their action levels, and neither will be addressed in the Risk Assessment/MCS evaluation.

Semivolatile Organic Compounds

Semivolatiles were detected at similar or decreased concentrations in Round 3 compared to Rounds 1 and 2. Bis(2-chloroethyl)ether, 2-methylphenol, 4-methylphenol, and bis(2-ethylhexyl)phthalate were detected at concentrations exceeding their respective action levels in Round 3, and all four will be addressed in the Risk Assessment/MCS evaluation. Phenanthrene was detected in Round 3 for the first time and does not have an action level. Therefore, phenanthrene will be included in the Risk Assessment/MCS evaluation. Dibenzofuran was detected again in Round 3, does not have an action level, and will be included in the Risk Assessment/MCS evaluation.

Bis(2-chloroethyl)ether. As in Rounds 1 and 2, bis(2-chloroethyl)ether was detected again only in the sample from well A2. The Round 3 concentration was 5.5 µg/l (J-qualified and the same concentration detected during Round 2), which exceeds the action level of 0.04 µg/l.

2-Methylphenol and 4-Methylphenol. These two compounds (also known as o-cresol and p-cresol) were detected at concentrations exceeding their respective action levels of 800 µg/l and 80 µg/l. Samples from the following wells exceeded the action levels: H11, in which both were detected above action levels (2-methylphenol at 3,900 µg/l and 4-methylphenol at 1,900 µg/l); MW-12 (4-methylphenol at 110 µg/l); and H10 (4-methylphenol at 180 µg/l). 2-methylphenol also was detected in wells H10 (at 520 µg/l) and MW-12 (at 75 µg/l), but at concentrations below the action level. Both compounds were detected above action levels in Rounds 1 or 2 in wells H11 and MW-12; only 4-methylphenol was previously detected above the action level in well H10, in Round 1. All three wells are within the toluene plume area.

Bis(2-ethylhexyl)phthalate. In Round 3, bis(2-ethylhexyl)phthalate was detected at a concentration exceeding the action level (5.9 µg/l) only in well H10 (45 µg/l, J-qualified); this well is in the toluene plume area. Bis(2-ethylhexyl)phthalate also exceeded the action level in well H10 in Round 1 (16 µg/l). As stated in the RFI Report, bis(2-ethylhexyl)phthalate is a common laboratory contaminant.

PAHs. PAH were only detected in samples from well B6 in Round 3. The PAHs detected for the first time in Round 3 were anthracene (at 0.4 µg/l, J-qualified) and phenanthrene (at 0.8 µg/l, J-qualified). Acenaphthene (3 µg/l, J-qualified), anthracene (0.4 µg/l, J-qualified), fluorene (1 µg/l, J-qualified), and pyrene (0.6 µg/l, J-qualified) were detected at concentrations below their respective action levels (960 µg/l, 4,800 µg/l, 640 µg/l, and 480 µg/l, respectively). 2-methylnaphthalene (0.4 µg/l, J-qualified) and phenanthrene do not

have action levels; therefore, they will be addressed in the Risk Assessment/MCS evaluation.

Dibenzofuran. Dibenzofuran was detected in well B6 (0.8 µg/l, J-qualified) in Round 3. Dibenzofuran was also detected in well B6 in Round 1 (2 µg/l).

Volatile Organic Compounds

Volatiles detected in Round 3 groundwater samples at concentrations exceeding their respective action levels were toluene, benzene, methylene chloride, acetone, and carbon disulfide. Action-level exceedances of all of these compounds except carbon disulfide also occurred in Round 1. It should be noted that while 23 wells were analyzed for BETX, only four wells were analyzed for the full suite of volatiles. Toluene, benzene, methylene chloride, and acetone will be addressed in the Risk Assessment/MCS evaluation, as indicated in the RFI Report. Carbon disulfide is considered a laboratory artifact, as discussed in Section 3.1.1, and so will not be included in the Risk Assessment/MCS evaluation.

Toluene. Toluene was detected in six samples in Round 3 at concentrations exceeding the action level of 1,000 µg/l, from the following wells: MW-15 (120,000 µg/l), MW-17 (120,000 µg/l), MW-18 (360,000 µg/l), MW-19 (1,400 µg/l), H10 (380,000 µg/l, J-qualified), and H11 (670,000 µg/l, J-qualified).

All these wells fall within the toluene plume as previously depicted in the RFI Report. Toluene was also detected at concentrations below the action level in wells B2 (15 µg/l) MW-12 (45 µg/l), MW-14 (4 µg/l), MW-16 (690 µg/l), and DM-3B (0.4 µg/l, J-qualified). The extent of the toluene plume is discussed further in Section 4.1.4.

Benzene. Benzene was detected in five samples in Round 3 at concentrations exceeding the action level of 1 µg/l: from wells DM-07 (3 µg/l), MW-12 (5 µg/l), B5 (2 µg/l), H10 (600 µg/l, J-qualified), and H11 (73 µg/l, J-qualified). Benzene was not detected in previous samples from well MW-12; however, MW-12 is within the toluene plume.

Methylene Chloride. Methylene chloride was detected in two samples in Round 3 at concentrations exceeding the action level of 5 µg/l: from wells H10 (8,300 µg/l, J-qualified) and H11 (15 µg/l, J-qualified). Both these wells are within the toluene plume. As discussed in Section 3.1.1, methylene chloride is a laboratory artifact and is not representative of actual groundwater conditions during this round of sampling. However, methylene chloride was detected above its action level in Round 1 groundwater samples from well H11. Methylene chloride is a common laboratory contaminant.

Acetone. Acetone was detected in the sample from well H10 at a concentration of 11,000 µg/l (J-qualified), which exceeds the action level of 800 µg/l. Acetone also was detected in the sample from well H11 (200 µg/l, J-qualified) at a concentration below the action level. Acetone had been detected previously above the action level in Round 1 at well H11, but had not been detected previously in H10.

Carbon Disulfide. Carbon disulfide was detected in the sample from well H11 at a concentration of 900 µg/l, above the action level of 800 µg/l. Carbon disulfide was also detected in well H11 at 1 µg/l (J-qualified). Carbon disulfide had not previously been detected in groundwater samples from the Facility. As discussed in Section 3.1.1, carbon disulfide is a laboratory artifact and is not representative of actual groundwater conditions.

Conventional Water Quality Parameters

Seventeen monitoring wells were analyzed for conventional water quality parameters (Table 2-2). The concentrations of total dissolved solids (TDS) exceeded the action level of 500,000 µg/l in nine of the wells, but the TDS concentrations generally were lower than those detected in Round 1. Groundwater at the Facility is hydraulically connected to the Duwamish Waterway, a brackish water body; therefore, TDS is expected to be present at relatively high concentrations, especially in wells near the shoreline. As stated in the RFI Report and as approved by U.S. EPA and Ecology, TDS will not be addressed in the Risk Assessment/MCS evaluation.

The pH of groundwater samples from two wells was outside the action-level range of 6.5 to 8.5 pH units: MW-12 (with a pH of 6.3) and MW-20 (with a pH of 5.9). As stated in the RFI Report, pH will not be addressed in the Risk Assessment/MCS evaluation.

The groundwater sample from well DM-5 contained 1,100 µg/l nitrite, which exceeded the action level of 1,000 µg/l. Nitrite had not previously been detected at the Facility, was analyzed as an indicator of biological activity, and will be addressed in the Risk Assessment/MCS evaluation.

4.1.2 Organic Constituents Detected Below Action Levels

A number of other organic constituents were detected in the Round 3 groundwater samples. These were detected at concentrations below their action levels. Four of them were detected in Rounds 1 or 2 and are discussed in the RFI Report: phenol, di-n-butyl phthalate, 1,1-dichloroethane, and xylene. Table 4-5 lists all the volatile and semivolatile organic compounds detected in Round 3, regardless of their detection frequency in previous sampling rounds. Only the organic constituents first detected at the Facility in Round 3 groundwater samples are discussed below.

Semivolatile Organic Compounds

Di-n-octyl Phthalate. Di-n-octyl phthalate was detected in well H10 at a concentration of 230 µg/l, below the action level of 320 µg/l.

Diethyl Phthalate. Diethyl phthalate was detected in well H10 at a concentration of 48 µg/l (J-qualified), below the action level of 12,800 µg/l.

Volatile Organic Compounds

1,2-Dichloroethene (total). 1,2-dichloroethene (total), also known as 1,2-dichloroethylene, was detected in well A2 at a concentration of 0.3 µg/l (J-qualified). This is below the action level of 70 µg/l for cis-1,2-dichloroethene, which is more stringent than the action level for trans-1,2-dichloroethene.

1,1,1-Trichloroethane. 1,1,1-trichloroethane was detected in well H11 at a concentration of 16 µg/l (J-qualified), below the action level of 200 µg/l.

Ethylbenzene. Ethylbenzene was detected in two wells at concentrations below the action level of 700 µg/l (MW-12 at 9 µg/l, and H11 at 33 µg/l, J-qualified).

4.1.3 Comparison of Round 3 Metals Results for Groundwater with Previous RFI Results

This section compares the Round 3 metals data with metals data collected during Rounds 1 and 2; only those results exceeding action levels are addressed. It should be noted that very few metals analyses were performed on Round 2 samples.

Previous analysis of metals during Round 1 included total metals from unfiltered samples and dissolved metals from filtered samples. Unfiltered samples contain both particulate and dissolved forms of metals, whereas filtered samples only contain the dissolved portion. Dissolved metals samples were filtered in the field during Round 1 using a 0.45-micron filter and were preserved with nitric acid.

Wells sampled in Round 3 were purged using low-flow micropurging techniques (Section 2.2) in order to minimize the turbidity of the groundwater samples. Micropurging was conducted at rates in the range of 0.25 liter to 0.45 liter per minute. The samples were not filtered and were analyzed for total metals. In general, the total metals concentrations

obtained in Round 3 averaged 60 percent of the Round 1 concentrations. This overall decrease reflects the reduced turbidity of the Round 3 samples (due to micropurging) compared with those collected in Round 1 (using a conventional purging technique).

Metals that exceeded their action levels in Round 3 are listed in Section 4.1.1, and metals that exceeded their action levels in Rounds 1, 2, or 3 are listed in Table 4-3. Cobalt, which has no action level, was also detected in Round 3. The majority of the metals detected in Round 3 were previously identified in the RFI Report for inclusion in the Risk Assessment/ MCS evaluation.

Beryllium, which was previously detected in several Round 1 samples at concentrations exceeding its action level (0.02 µg/l) and identified in the RFI Report for inclusion in the Risk Assessment/MCS evaluation, was not detected in any of the Round 3 samples at a concentration exceeding its action level. As such, beryllium will not be addressed in the Risk Assessment/MCS evaluation. Similarly, silver (previously detected in Round 1 above its action level at well DM-5) was not detected during Round 3 in any sample, and therefore will not be addressed in the evaluation.

Three metals detected above their action levels in Round 3–cadmium, selenium, and thallium–will be included in the Risk Assessment/MCS evaluation. Cadmium was previously detected at concentrations that exceeded action levels only in samples obtained from a background well (E3); therefore, it was not identified in the RFI Report for inclusion in the Risk Assessment/MCS evaluation. In Round 3, however, cadmium was detected in three monitoring wells (H9, MW-16, and MW-20) at concentrations above its action level. Selenium (detected in wells A4, G1, MW-14, MW-16, and MW-17) and thallium (detected in well MW-13) will also be added to the metals addressed in the Risk Assessment/MCS evaluation.

All the Round 3 groundwater samples were analyzed for hexavalent chromium using both EPA Methods 7197 and 218.4. Hexavalent chromium was not detected using either method in any of the samples, indicating that all chromium at the Facility is present in the trivalent

state. Groundwater beneath the Facility represents a chemically reducing environment, as discussed in Section 4.3.6 of the RFI Report. The presence of chromium in the reduced trivalent state is consistent with this condition.

In summary, based on the Round 3 results, cadmium, selenium, and thallium will be addressed in the Risk Assessment/MCS evaluation; these metals are added to the list previously presented in the RFI Report. Beryllium and silver are removed from the list and excluded from further evaluation.

4.1.4 Extent of Toluene Plume

Figure 4-1 shows concentration contours representing the magnitude and estimated horizontal extent of the toluene plume based on Round 3 groundwater data. Figures 4-2 and 4-3 are cross-sections depicting the vertical extent of the toluene plume in the Upper Aquifer. Note that Figures 4-1 through 4-3 depict Round 3 data only and do not reflect data from Rounds 1 and 2, including Round 1 HydroPunch data. A comparison of these figures with Figures 4-47 through 4-50 in the RFI Report indicates that the shape and size of the toluene plume have not changed significantly. However, the Round 3 data indicate some noteworthy differences in the general extent of the toluene plume and in toluene concentrations at individual monitoring wells, as discussed below.

The Round 3 data indicate that toluene concentrations remain high in the shallowest wells (screened across or near the groundwater table) in the center of the plume. The concentrations range from 120,000 to 670,000 µg/l in wells H10, H11, MW-15, MW-17, and MW-18. However, the concentrations in three wells along the perimeter of the plume (MW-12, MW-14, and MW-19) have declined significantly since Round 2, while the concentration in MW-18 has risen. Table 4-6 presents a historical comparison of the toluene data for these four wells, and shows a decreasing trend of toluene concentrations at well MW-12 since the beginning of the RFI fieldwork in early 1994. Well MW-19, installed during Round 2 and

located near MW-12, exhibits a similar trend, as does well MW-14 located near the north-west edge of the plume.

Well MW-18, installed in Round 2, shows an increase in toluene concentration between Rounds 2 and 3. The Round 3 concentration of 360,000 µg/l, an increase from 56,000 µg/l in Round 2, may be associated with the appearance of LNAPL in this well in March 1995 (see Table 4-21 and Section 4.3.4 in the RFI Report). As discussed in the RFI Report, the LNAPL in well MW-18 contained 92.0 percent toluene; toluene's solubility in water is 470,000 µg/l at 16°C (Verschueren, 1983), although solubility tends to be highly dependent on other constituents.

The vertical extent of the toluene plume as indicated by the Round 3 data (Figures 4-2 and 4-3) shows an overall decrease in toluene concentrations near the bottom of the Lower Aquifer compared to data from Rounds 1 and 2. A comparison of the data from the three well pairs available to monitor the vertical extent of toluene in the Upper Aquifer (H10/H1, H11/MW-13, and MW-15/MW-16) indicates that toluene concentrations decrease with depth in the Upper Aquifer, consistent with the findings of Rounds 1 and 2. The historical RFI data for the deeper wells in these three well pairs (wells H1, MW-13, and MW-16) are shown in Table 4-7. As shown in the table, the toluene concentrations in wells H1, MW-13, and MW-16 decreased substantially between Rounds 2 and 3. Toluene was not detected in wells MW-13 and MW-16 in Round 3.

Well DM-3B was the only Lower Aquifer well analyzed in Round 3 for toluene. Toluene was detected in this well at 0.4 µg/l (J-qualified), less than the 3 µg/l detected at the well during Round 1.

4.1.5 Summary of Round 3 Groundwater Sampling Results

The Round 3 groundwater sampling at the Facility was conducted in March 1995. Micro-purging and low-disturbance sampling techniques were used to obtain groundwater samples from 35 of the 38 monitoring wells. The Round 3 groundwater data were generally

consistent with the data from Rounds 1 and 2, although total metals concentrations were, in general, approximately 60 percent lower than the total metals concentrations detected previously. Cadmium, selenium, and thallium were detected above their respective action levels. No hexavalent chromium was detected in groundwater samples.

A number of volatile and semivolatile organic compounds continue to be detected at the Facility. During Round 3, several compounds not detected in previous RFI sampling rounds were detected in groundwater. One of these compounds, phenanthrene, does not have an action level. This compound will be addressed in the Risk Assessment/MCS evaluation.

The Round 3 data indicate that the toluene plume remains approximately the same size and shape as noted during Rounds 1 and 2. Substantial decreases in toluene concentrations were found at certain wells near the perimeter of the plume, and toluene was not detected in two of the wells screened in the lower portion of the Upper Aquifer (MW-13 and MW-16).

The RFI Report lists a number of constituents that will be addressed in the Risk Assessment/MCS evaluation based on the groundwater data from Rounds 1 and 2. The Round 3 groundwater data indicate that the following additional constituents will be addressed in the Risk Assessment/MCS evaluation:

- Metals: Cadmium, selenium, and thallium
- Semivolatiles: Phenanthrene
- Conventional parameters: Nitrite

Beryllium and silver will be removed from the list of constituents to be addressed in the Risk Assessment/MCS evaluation. Section 6 presents the entire list of constituents that will be addressed in the Risk Assessment/MCS evaluation.

4.2 Seep Sampling Results

This section summarizes the results of the RFI seep sampling. The action level for seep data is the most stringent of the surface water criteria discussed earlier in Section 4, because the seeps discharge directly to the Duwamish Waterway and Slip No. 6. The seeps are observed only at very low tides (e.g., minus 2 feet mean lower low water). During rising tides, surface water appears to infiltrate into the near-shore subsurface soil via the intertidal zone. Water subsequently discharged through seeps at low tide represents a mixture of groundwater and surface water that previously infiltrated into the subsurface.

Seven seeps were sampled and analyzed for an extensive suite of organic and inorganic parameters (see Table 2-4). The analysis of all seven seep samples included guaiacol and resin acids at the request of Ecology; none were detected. The seep samples and two surface water samples (obtained from approximately 12 feet below the surface of the Duwamish Waterway up- and downgradient from the Facility) were analyzed for hexavalent chromium (Cr^{+6}); it was not detected in any of the samples. Therefore, chromium detected is present as trivalent chromium (Cr^{+3}).

Figure 2-2 shows the seep locations. Table 4-8 presents a statistical summary of the seep data. Appendix C presents a complete list of all the constituents detected above the laboratory detection limits. Subsections 4.2.1 through 4.2.5 describe the following:

- Constituents detected above their action levels
- Constituents detected below their action levels
- A comparison of seep, groundwater, and surface water chemistry

- The potential impact of the seeps on sediment quality along the Facility shoreline

- The overall results and findings of the seep sampling

4.2.1 Constituents Exceeding Action Levels or Without Action Levels

Table 4-9 lists the constituents detected in seep samples at concentrations above their action levels. Only seven metals and one semivolatile organic compound (bis[2-ethylhexyl]phthalate) were detected in seeps at concentrations above their action levels. Six of the metals exceedances were in samples from seep 2 (sample 02-SP), which was the only significantly discolored seep observed during sampling (seep 3 was tinted light brown, "tea-colored," but only slightly).

The following metals were detected in the seep samples at concentrations exceeding their action levels, and therefore will be addressed in the Risk Assessment/MCS evaluation:

- Arsenic was detected in sample 02-SP at 31 µg/l, above the action level of 0.14 µg/l.

- Cadmium was detected in sample 02-SP at 11.6 µg/l, above the action level of 7.6 µg/l.

- Copper was detected in sample 02-SP at 202.5 µg/l, above the action level of 2.5 µg/l.

- Lead was detected in sample 02-SP at 44.05 µg/l, above the action level of 3.2 µg/l.

- Mercury was detected in sample 05-SP at 0.65 µg/l, above the action level of 0.012 µg/l.

- Nickel was detected in sample 02-SP at 70 µg/l, above the action level of 7.9 µg/l.

- Zinc was detected in sample 02-SP at 222.5 µg/l, above the action level of 76.6 µg/l.

Only one semivolatile was detected in seep samples at concentrations above its action level. Bis(2-ethylhexyl)phthalate was detected in samples from seep 2 (at 26.95 µg/l) and seep 7 (at 13.8 µg/l), above the action level of 5.9 µg/l. Bis(2-ethylhexyl)phthalate is a commonly used plasticizer and is a common laboratory contaminant.

In addition, the following metals were detected in the seeps but do not have action levels, and will be addressed in the Risk Assessment/MCS evaluation:

- Barium–detected in all seeps
- Cobalt–detected in seeps 2 and 3
- Vanadium–detected in all seeps

4.2.2 Constituents Detected Below Action Levels

Other constituents were detected in seeps at concentrations below their action levels, as summarized below.

- The following metals were detected in seeps at concentrations below their action levels:

  Beryllium (seep 2)
  Chromium (seep 2)

- Formaldehyde was detected at seep 6 at 24 µg/l (J-qualified). It should be noted that formaldehyde analyses require the addition of 2,4-dinitrophenylhydrazine (DNPH) to the sample during the extraction process. When DNPH was added to the seep 2 sample, the sample emulsified nearly instantaneously. The remaining aliquot from the sample container was then diluted, and the analysis was completed with no other problems. As a result of the dilution, the laboratory detection limit was 1,000 µg/l. No formaldehyde was detected above this concentration. The laboratory's lead organic chemist indicated that the vast majority of classes of compounds known as aldehydes and ketones, many of which are found in wood-derived lignin that is present in black liquor (believed to be a key ingredient of the "Black Liquid"), will react with DNPH. Consequently, no inference should be drawn from the emulsification during the formaldehyde analysis.

4.2.3 Comparison of Seep, Groundwater, and Surface Water Chemistry

As previously stated, the seeps are believed to represent a mixture of groundwater discharging from the Facility and surface water that infiltrates the near-shore soils during rising tides. The general water chemistry parameters measured in seep and groundwater samples are compared below. A comparison of seep chemistry with that of brackish or marine waters is also included; this information is useful in evaluating the degree to which surface water and groundwater are mixed in the near-shore soils.

The seep data for total dissolved solids (TDS), chloride, sodium, dissolved oxygen, specific conductance, and pH were compared to the groundwater data for nearby monitoring wells. Only groundwater data from wells located directly upgradient from the seeps were used in this comparison (wells DM-1A, DM-2A, DM-7, H6, H9, B6, E3, G1, and G3). TDS, chloride, and sodium values were determined in the laboratory; dissolved oxygen was measured in the field; specific conductance and pH were measured both in the field and laboratory. Field measurements for specific conductance and pH were used for the seep/groundwater

comparison as both parameters (especially pH) can change significantly with time after sample collection. Only some of the groundwater samples were submitted for analysis of general chemistry parameters; where available, these were used for this comparison. The general chemistry parameters for groundwater, seep, and surface water samples are shown in Table 4-10.

The concentrations of all the above-referenced parameters, with the exception of pH, are significantly different in the groundwater samples compared with the seep samples. Each parameter is discussed below.

The TDS concentrations in seep samples 01-SP, 03-SP, 04-SP, and 06-SP fall into the saline water range (10,000 to 100,000 mg/l); the other seeps fall in the brackish water range. The TDS concentrations in the groundwater samples fall into the freshwater range (0 mg/l to 1,000 mg/l) except for one sample, from well DM-2A (1,600 mg/l), which falls into the brackish water range (1,000 to 10,000 mg/l; Driscoll, 1986).

The chloride concentrations detected in the seep samples (ranging from 2,900 to 9,100 mg/l; however, given the TDS concentration in 07-SP, the 9,100 mg/l chloride value is suspect) are one to two orders of magnitude greater than the chloride concentrations detected in groundwater (ranging from 3.6 to 52 mg/l) at wells located near the shoreline. Chloride is the most highly concentrated ion present in seawater. The average concentration of chloride in seawater is 19,000 mg/l (Driscoll, 1986). The chloride concentrations in the seep samples fall between the seawater concentration and the concentrations noted in groundwater at near-shore monitoring wells. However, the seep chloride concentrations are closer to the average seawater concentration than to groundwater concentrations.

The distribution of sodium concentrations in seeps and groundwater is similar to that discussed above for chloride. The sodium concentrations detected in the seep samples (ranging from 693 to 3,380 mg/l) are generally an order of magnitude greater than the sodium concentrations detected in groundwater (ranging from 11 to 617 mg/l) at wells located near the shoreline. Sodium is the second most highly concentrated ion present in seawater, with an

average concentration of 10,500 mg/l (Driscoll, 1986). Like the chloride concentrations, the sodium concentrations fall between the average seawater concentration and the concentrations noted in groundwater at near-shore monitoring wells.

Specific conductance is a measurement of the concentration of charged ions dissolved in water. The specific conductance of the seep samples (ranging from 2,450 to 14,200 μmhos/cm) is two to five orders of magnitude higher than the specific conductance of groundwater samples collected from monitoring wells located near the shoreline, whose specific conductance ranged from 112 to 1,957 μmhos/cm. (Note that the 7.12 field measurement value at well H9 is probably erroneous. The laboratory value was 700 μmhos/cm, indicating that the field value reflects an instrument scale error of 100x.) By comparison, the specific conductance of seawater is approximately 54,000 μmhos/cm (Linsley and Franzini, 1972).

Differences in dissolved oxygen (DO) concentrations between seep and groundwater samples are less striking but still evident. The DO concentrations range from 2.6 to 9.9 mg/l in the seep samples, and in groundwater samples range from 1.35 to 6.5 mg/l in wells located near the shoreline. The ranges of DO measured in the seeps and groundwater overlap, but the groundwater range is lower, and the seep range is higher. The discolored seep (seep 2) had a DO concentration of 2.6 mg/l, which is on the low end of the seep range and within the range noted above for groundwater.

DO concentrations were also measured in the Duwamish Waterway at two locations, one upstream and one downstream of the Facility; the concentrations are near saturation (approximately 10 mg/l) and are higher than any of the groundwater or seep measurements. It should be noted that the solubility of DO decreases as the salinity and temperature increase; therefore, any comparison between seeps, groundwater, and the Duwamish Waterway should be made with caution.

There is no significant difference in the range of pH measured in seeps and groundwater. The pH measured in the seep samples ranges from 6.4 to 7.8. The pH of groundwater samples collected from wells located near the shoreline ranges from 6.5 to 7.6. The similarity in pH among samples from the different sources is to be expected because all the samples contained bicarbonate, which acts as a buffer.

The concentrations of metals in groundwater samples collected from wells located near the shoreline were also compared to the concentrations of metals in the seeps. The seep concentrations were similar (within an order of magnitude) to the groundwater metals concentrations. No recent metals data in Duwamish surface water near the Marginal Way Facility were available from Metro; these data have not been collected since 1986 because of budget cuts and difficulty in interpreting the metals data because of salt water interference (Metro, personal communication). In 1987, the Renton Sewage Treatment Plant was diverted from the Duwamish River upgradient of the Facility to a discharge point off the Duwamish Head. Re-routing this discharge should have had a significant effect on downstream metals concentrations; therefore, the available surface water data are not applicable.

The general chemistry data from seep and groundwater samples support the conclusion that the seeps observed at extreme low tide are a mix of groundwater discharging from the Facility and surface water that infiltrates and exfiltrates the near-shore soil during tidal cycles. However, the mixing ratio of these two waters likely varies with location, site-specific aquifer conditions, and seasonal groundwater levels and tidal conditions.

4.2.4 Potential Impacts on Sediments

The potential impact of the seeps on sediment quality in the Duwamish Waterway and Slip No. 6 was evaluated as part of the seep investigation. For those constituents that exceeded their action levels in seeps, the estimated maximum sediment concentrations that could potentially occur were calculated. Based on these calculations, cadmium, copper, chromium, mercury, zinc, and bis(2-ethylhexyl)phthalate could potentially exceed the Sediment Quality Standards (SQS) or the Cleanup Screening Levels and Minimum Cleanup Levels

(CSL/MCUL), all of which are subsets of the Washington State Marine Sediment Management Standards (SMS) (WAC 173-204).

Table 4-11 summarizes the results of these calculations. It should be noted that these calculations are based on certain input values found in the literature; inorganic partitioning is very site-specific, so the results probably represent a worst-case scenario.

The results of the evaluation indicate that mercury (based on seep 5 data), cadmium, copper, chromium, zinc, and bis(2-ethylhexyl)phthalate (based on seep 2 data) could potentially exceed the CSL/MCUL. Because of these potential exceedances, sediments from the seep 2 sampling location should be analyzed for metals and bis(2-ethylhexyl)phthalate; sediments from the seep 5 location should be analyzed for mercury; and sediments from the seep 7 location should be analyzed for bis(2-ethylhexyl)phthalate.

In order to locate the seeps for such a sampling event, sediment sampling would need to occur during a minus-1- to 2-foot tide. The next time that a minus-1-foot tide occurs during daylight hours is on May 3, 1996. Potential further sediment sampling is discussed in Section 6 of this Memorandum.

4.2.5 Summary of Seep Sampling Results

Seep sampling was conducted to evaluate the potential cross-media transfer of contaminants from groundwater to surface water. Seven metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, and zinc) and one semivolatile organic compound (bis[2-ethylhexyl]-phthalate) were detected in seep samples at concentrations that exceeded surface water action levels. The metals and bis(2-ethylhexyl)phthalate detected in the seeps will be addressed in the Risk Assessment/MCS evaluation.

All the constituents detected in the seeps were also detected in the Round 3 groundwater samples. The concentrations of the metals detected in the seeps that exceeded action levels

are close (within an order of magnitude) to the maximum concentrations of the same constituents detected in the groundwater samples. The conclusion that the seeps consist of a mixture of groundwater and surface water is supported by the Round 3 analytical data.

The action-level exceedances in the seep samples suggest that the intertidal/subtidal sediments at seeps 2, 5, and 7 may exceed selected SQS or CSL/MCUL. However, because natural seawater also contains low concentrations of several metals that have been detected in the seep samples, sediment tests should be interpreted with caution. Proposed additional sampling is discussed in Section 6.

4.3 Sewer Sediment Sampling Results

As discussed in Section 2, sediments in the storm sewer outfall lines and other sewers (mainly process sewers) at the Facility were sampled (1) to determine whether sediments were above the action levels (the state Sediment Management Standards [SMS], Sediment Quality Standards [SQS, WAC 173-204-320], or Cleanup Screening Levels and Minimum Cleanup Levels [CSL/MCUL, WAC 173-204-520]) could have potentially discharged off-site, and (2) to determine whether the sewers required cleaning before portions were placed in service as a storm sewer line discharging to the Duwamish Waterway. Because of the difference in focus, the storm sewer outfall sampling and other sewer sediment sampling are discussed separately in the following subsections.

4.3.1 Storm Sewer Outfall Sediment Sampling

Over the years, the sewers at the Marginal Way Facility have been cross-connected and routed to different destinations using pumps and new sewer sections. For example, until the plant shut down, rainfall that fell in the northeast portion of the Facility was directed to the vanillin production process. Portions of this area also historically drained to outfalls 2

and 3 at various times. Because of this complicated history, outfall sewer sediments were sampled as closely as possible to the outfall discharge points, as discussed in Section 2.

Figure 4-4 and its overlays (Figures 4-4a through 4-4e) show the sampling locations for the storm sewers and the sections of storm sewer that discharged to a specific outfall at any time in the past; as shown, several lines have discharged to more than one outfall. Therefore, stormwater runoff from a particular production area could have discharged to more than one outfall. The locations of these lines, as shown on the figures, are based on historical Facility maps.

While cleaning the lines in the southeast portion of the Facility (Figure 4-4), care was taken to keep the outfall 2 line from discharging to any other part of the sewer system; lines that branched off what was believed to be the outfall 2 system were plugged. The "outfall 2" sediment samples contained high concentrations of the PCB Arochlor 1254. During outfall 2 cleaning, water was found in a ditch that had been dug to expose the line believed to go to outfall 2. After lancing and cleaning the lines, it became apparent that the PCB-contaminated line was connected to the process sewer system rather than to outfall 2. In the following discussion and in the tables and appendices, the PCB-contaminated line will be referred to as outfall 2 for sample-tracking purposes, although cleaning (discussed in Section 5) showed that this line was not connected to outfall 2.

Seven storm sewer sediment samples were collected and tested for BTEX, conventional compounds, total metals, PCBs, and semivolatile organics. One duplicate sample was also taken. The detected results were then compared to the SQS and CSL/MCUL. Table 4-12 presents the outfall sewer sediment statistical data, and Table 4-13 lists the constituents detected above their action levels, grouped by outfall. Appendix C presents a complete list of all the constituents detected above the laboratory detection limits. Sections 4.3.1.1 through 4.3.1.3 describe the following:

- Constituents detected above their CSL/MCUL

- Constituents detected above their SQS
- Grain size analysis

4.3.1.1 Storm Sewer Sediment Constituents Detected Above the CSL/MCUL

A number of constituents were detected above the CSL/MCUL in storm sewer sediment samples.

Metals

Four metals were detected in storm sewer outfall sediment samples at concentrations exceeding the CSL/MCUL, as follows:

Arsenic. Arsenic was detected in sample 01-SWO at 156 mg/kg, above the CSL/MCUL of 93 mg/kg. Arsenic was also detected in samples 02-SWO (78 mg/kg), 06-SWO (67 mg/kg), and 07-SWO (60 mg/kg), below the CSL/MCUL but above the SQS of 57 mg/kg.

Cadmium. Cadmium was detected in samples 03-SWO at 10 mg/kg, 04-SWO at 16 mg/kg, 05-SWO at 8 mg/kg, 06-SWO at 15 mg/kg, 07-SWO at 27 mg/kg (18 mg/kg field duplicate). These detections exceeded the CSL/MCUL of 6.7 mg/kg.

Copper. Copper was detected in samples 01-SWO at 1,010 mg/kg, 02-SWO at 24,200 mg/kg (note that this sample is actually on a process sewer line), 03-SWO at 31,200 mg/kg, 04-SWO at 6,710 mg/kg, 05-SWO at 888 mg/kg, 06-SWO at 1,480 mg/kg, 07-SWO at 1,650 mg/kg (1,600 mg/kg field duplicate). These detections exceeded the CSL/MCUL of 390 mg/kg. Copper concentrations in samples 02-SWO and 03-SWO were significantly higher than in the other samples. The reasons for the high concentrations are not known, but both of these samples were collected from the south side of the old autoclave building,

close to the autoclave process area; copper sulfate was used as a catalyst in the autoclave process and may be the source of the copper.

Zinc. Zinc was detected in samples 03-SWO at 1,790 mg/kg, 05-SWO at 1,650 mg/kg, 06-SWO at 1,940 mg/kg, and 07-SWO at 4,570 mg/kg (3,290 mg/kg field duplicate). These detections exceeded the CSL/MCUL of 960 mg/kg. Zinc was also detected in samples 01-SWO (886 mg/kg), 02-SWO (704 mg/kg), and 04-SWO (417 mg/kg), below the CSL/MCUL but above the SQS of 410 mg/kg.

Semivolatile Organic Compounds

Three semivolatiles were detected in storm sewer outfall sediment samples at concentrations exceeding the CSL/MCUL, as follows:

2-methylphenol. 2-methylphenol was detected in sample 04-SWO at 330 µg/kg (J-qualified), above the CSL/MCUL of 63 µg/kg.

4-methylphenol. 4-methylphenol was detected in sample 04-SWO at 31,000 µg/kg (D-qualified), above the CSL/MCUL of 670 µg/kg.

Phenol. Phenol was detected in sample 04-SWO at 7,600 µg/kg, above the CSL/MCUL of 1,200 µg/kg. Phenol was also detected in sample 06-SWO at 250 µg/kg, below the SQS (420 µg/kg).

All semivolatile CSL/MCUL exceedances were in sample 04-SWO. This sample was also high in toluene (76,000 µg/kg), which has no SQS but is a known site-specific contaminant. Outfall 4 drained the resin sumps beside the old resin building (later known as the Maintenance Building) on the south side of the Facility. Phenols were used in the resin-making process and appeared in resin waste. Methylphenols were present in sodium hydrosulfide complex (waste caustic from the petroleum industry), which was used in the vanillin manu-

manufacturing process. In addition, 4-methylphenol and phenol were present in vanillin black liquor solids, which were also managed in this area of the Facility.

Pesticides/PCBs

PCBs. Arochlor 1254 was detected at 526 mg/kg (344 ppm TOC-normalized) in sample 02-SWO, above the CSL/MCUL of 65 ppm TOC. This sampling location is actually on a process sewer line, as described above. Arochlor 1254 was also detected in samples 03-SWO (4.1 mg/kg) and 07-SWO (9.96 mg/kg) (11 mg/kg field duplicate) at concentrations below the SQS (12 ppm TOC). No sediment sample is available for the actual outfall 2 line. According to Monsanto, the former property owner, Pydraul AC was used to maintain the air compressors. Pydraul AC, a PCB oil, contained 57 percent Arochlor 1254 and no other PCBs; Arochlor 1254 is the only PCB detected in the above samples.

4.3.1.2 Storm Sewer Sediment Constituents Detected Above the SQS

The only constituent that exceeded an SQS (360 µg/kg) that did not also have an MCUL exceedance (690 µg/kg) was pentachlorophenol. Pentachlorophenol exceeded the SQS in 05-SWO (480 µg/kg, J-qualified). This outfall previously collected runoff from the west side of the Maintenance Building, which was used as a wood preservatives storage area in 1949. Pentachlorophenol may have been stored in this building.

4.3.1.3 Grain Size Analysis

Outfall sediment samples were also analyzed for grain size to help determine if CSL/MCUL exceedances could be expected in Duwamish Waterway sediments at the outfalls. If the sediment grain size was large, the sewer sediments would likely settle out in the sewer manholes. Large grain-size sediments also might be less leachable than finer sediments. If the grain size was small, the sewer sediments would more likely be transported to the

Waterway and could have higher potential to cause CSL/MCUL exceedances in the Waterway sediments. A high percentage of the samples from outfalls 4, 5, and 6 were larger than 4.7 millimeters (mm). Between 23 and 30 percent of the screenings from these samples were retained on (or larger than) the 4.7-mm screen. The large grain size from samples 04-SWO and 05-SWO may be caused by resin buildup, as these outfalls once drained resin sumps and fragments of resin were noted in the outfalls. The sample from outfall 6, 06-SWO, contained the greatest percentage of solids larger than 4.7 mm.

Table 4-14 shows the results of the grain size analyses for the outfall samples. It should be noted, as discussed in Section 5, that TCLP analysis for sludge disposal after the sewers were cleaned showed that the sludge was not a hazardous waste. This indicates that the metals present are not leachable.

4.3.2 Other Sewer Sediment Sampling

Thirteen sediment samples were collected from other sewers and tested for BTEX, conventional parameters, total metals, PCBs, and semivolatiles (one duplicate sample was also obtained). The detected results were then compared to the SQS and CSL/MCUL. Table 4-15 presents the other sewer sediment statistical data, and Table 4-16 lists the detected constituents that were above the action levels, grouped according to sample number. Figure 4-5 shows the other sewer sampling locations. Appendix C presents a complete list of all the constituents detected above the laboratory detection limits. Sections 4.3.2.1 and 4.3.2.2 describe the following:

- Constituents detected above their CSL/MCUL
- Constituents detected above their SQS

4.3.2.1 Other Sewer Sediment Constituents Detected Above the CSL/MCUL

A number of constituents were detected above the CSL/MCUL in the other sewer sediment samples.

Metals

Six metals were detected in other sewer sediment samples at concentrations exceeding the CSL/MCUL, as follows:

Arsenic. Arsenic was detected in sample 040-SEW at 400 mg/kg, above the CSL/MCUL of 93 mg/kg. Arsenic was also detected in samples 030-SEW (64.1 mg/kg) and 045-SEW (70.9 mg/kg), below the CSL/MCUL but above the SQS of 57 mg/kg.

Cadmium. Cadmium was detected in samples 010-SEW at 10.1 mg/kg, 014-SEW at 23.1 mg/kg (24.5 mg/kg field duplicate), 026-SEW at 16.9 mg/kg, 030-SEW at 15.9 mg/kg, 040-SEW at 46 mg/kg, 045-SEW at 36.5 mg/kg, 047-SEW at 11.3 mg/kg, 084-SEW at 9.8 mg/kg, and 089-SEW at 7.6 mg/kg. These detections exceeded the CSL/MCUL of 6.7 mg/kg. Cadmium was also detected in samples 068-SEW (5.1 mg/kg) and 088-SEW (6.6 mg/kg), below the CSL/MCUL but above the SQS of 5.1 mg/kg.

Copper. Copper was detected in samples 010-SEW at 41,300 mg/kg, 014-SEW at 10,900 mg/kg (10,200 mg/kg field duplicate), 016-SEW at 470 mg/kg, 026-SEW at 6,000 mg/kg, 030-SEW at 6,250 mg/kg, 038-SEW at 11,800 mg/kg, 040-SEW at 4,230 mg/kg, 045-SEW at 1,040 mg/kg, 047-SEW at 2,190 mg/kg, 068-SEW at 1,430 mg/kg, 084-SEW at 18,000 mg/kg, 089-SEW at 835 mg/kg. These detections exceeded the CSL/MCUL of 390 mg/kg. The copper concentration in sample 010-SEW was significantly higher than in other sewer sediment samples. This sample was collected

from a process sewer that drained the area south of the autoclave building. As previously stated, copper sulfate was used as a catalyst in the autoclave process.

Lead. Lead was detected in samples 026-SEW at 1,290 mg/kg, 030-SEW at 530 mg/kg, 040-SEW at 2,920 mg/kg, and 045-SEW at 805 mg/kg. These detections exceeded the CSL/MCUL of 530 mg/kg. Lead was not detected in any samples below the CSL/MCUL but above the SQS of 450 mg/kg.

Silver. Silver was detected in samples 040-SEW at 9.2 mg/kg, 047-SEW at 17.1 mg/kg, and 084-SEW at 318 mg/kg, all above the CSL/MCUL of 6.1 mg/kg.

Zinc. Zinc was detected in sample 010-SEW at 1,420 mg/kg, 014-SEW at 3,590 mg/kg (3,720 mg/kg field duplicate), 026-SEW at 2,670 mg/kg, and 030-SEW at 1,650 mg/kg, 040-SEW at 2,740, 045-SEW at 4,410 mg/kg. These detections exceeded the CSL/MCUL of 960 mg/kg. Zinc was also detected in samples 038-SEW (413 mg/kg), 047-SEW (474 mg/kg), and 068-SEW (560 mg/kg), 084-SEW (763 mg/kg), 088-SEW (908 mg/kg), and 089-SEW (518 mg/kg). These detections were below the CSL/MCUL but above the SQS of 410 mg/kg.

Semivolatile Organic Compounds

Four semivolatile organic compounds were detected in other sewer sediment samples at concentrations exceeding the CSL/MCUL, as follows:

4-methylphenol. 4-methylphenol was detected in samples 014-SEW at 910 µg/kg (930 µg/kg field duplicate) and 088-SEW at 8,500 µg/kg, above the CSL/MCUL of 670 µg/kg. These sewers drained the north technical quality vanillin production area and a small tank farm containment area on the east side of the Facility.

Phenol. Phenol was detected in samples 040-SEW at 3,500 µg/kg and 045-SEW at 1,300 µg/kg, above the CSL/MCUL of 1,200 µg/kg. Phenol was detected in sample 014-SEW at 880 µg/kg (1,100 field duplicate) below the CSL/MCUL but above the SQS of 420 µg/kg. These samples were collected from lines that drained containment areas in the east and southwest tank farms. Phenols were stored in tanks at the Facility and were used in the resin-making process.

Benzyl alcohol. Benzyl alcohol was detected in sample 026-SEW at 2,500 µg/kg, above the CSL/MCUL of 73 µg/kg. The line where this sample was located drained the area around the technical vanillin building on the northern edge of the Facility.

Bis(2-ethylhexyl)phthalate. Bis(2-ethylhexyl)phthalate was detected in sample 045-SEW at 1,120 mg/kg (D-qualified), above the CSL/MCUL of 78 mg/kg. The line where this sample was located drained a small contained area in the southwest tank farm where di-n-octyl-phthalate was stored.

Pesticides/PCBs

PCBs. Arochlor 1254 was detected at 526 mg/kg (344 ppm TOC-normalized) in 02-SWO, above the CSL/MCUL of 65 ppm TOC. This sampling location is actually on a process sewer line, as described above.

4.3.2.2 Other Sewer Sediment Constituents Detected Above the SQS

The only constituent that exceeded an SQS (58 ppm TOC-normalized) that did not also have an MCUL exceedance (4,500 ppm TOC) was di-n-octylphthalate. Di-n-octylphthalate exceeded the SQS in 045-SEW (112 ppm, D-qualified or 1,400 ppm TOC). This sample also exceeded the CSL/MCUL for bis(2-ethylhexyl)phthalate. The line where this sample was located drained a small contained area in the southwest tank farm where di-n-octylphthalate was stored.

Methylphenols were present above the CSL/MCUL in samples 014-SEW and 088-SEW. These sewers drained the north technical-quality vanillin production area and a small tank farm containment area on the east side of the Facility. The only storm sewer sample that contained methylphenols in excess of the CSL/MCUL was collected from outfall 4, which drained the south-central part of the Facility.

4.3.3 Summary of Sewer Sediment Sampling Results

All the sewer sediments sampled exceeded at least one CSL/MCUL; the vast majority of CSL/MCUL exceedances were for metals. Because all the sewer sediment samples exceeded at least one CSL/MCUL, the sediments in all accessible sewers were cleaned out, as described in Section 5. RPI also decided to plug the lines and catch basins that are no longer needed.

Because the plant once manufactured resins, much of the metals content in the samples may be contained in resin fragments. This would make a portion of the metals unleachable, and therefore unavailable to the biota. This possibility is supported by the following observations:

- Even though total metals content for the sewer samples was high, the TCLP metals test performed by Philip Environmental on the combined sediment sump sample showed very low levels of barium and cadmium (copper was not tested using this method); all other metals were nondetectable.

- Grain size analyses showed that up to 30 percent of the sediments for several outfall samples were too large to pass the 4.7 mm screen (process sewer sediments were not analyzed for grain size). Large grain size equates to lower surface area and less leaching potential.

- Field observations noted large fragments of resin in samples with large grain sizes.

4.3.3.1 Storm Sewer Outfall Sediment Results

All storm sewer sediment samples exceeded at least one CSL/MCUL. Because of this, all accessible storm sewers were cleaned to remove the sediments.

Sediment samples taken from what was believed to be outfall 2 exceeded the CSL/MCUL for total PCBs; this line was cleaned and managed separately, as described in Section 5. Samples could not be collected closer to the outlet because field personnel were unable to locate the line by digging test pits (see Section 2). The test pit locations are shown in Figure 4-4. The line sampled actually discharged to the process sewer system and not to outfall 2.

In addition to cleaning the sewers, an effort was made to estimate the approximate depth from the present sediment surface to the upper surface of the sediments that may have been affected by Facility discharges. The most recent studies in which sedimentation rates were estimated were conducted by Tetra Tech (1988) and Weston & Associates (1993). Tetra Tech selected a rate of 0.7 cm/yr to evaluate the recovery of contaminated sediments off Duwamish Slip No. 4 (approximately 1.5 miles down stream). Weston & Associates estimated 2.5 cm/yr for the south end of Harbor Island. In 1983, Harper-Owes estimated 3-4 cm/yr for the lower Duwamish Waterway; they also reported that deposition rates are significantly more in the upper Duwamish. Sediments are also known to be scoured in the upper Duwamish Waterway during high flow events (Harper-Owes, 1983; the Marginal Way Facility, is at the upper end of the lower Duwamish Waterway). In addition, the Duwamish Waterway (including Slip No. 6, Slip No. 4, and Harbor Island) is dredged at regular intervals; portions, including the turning basin near the Facility, are dredged every 2 years (Metro, 1994).

Assuming a deposition rate of 1 to 2 cm/yr (on the low end of the above rates) with no scouring, the estimated depths to sediments potentially affected by Facility discharges are shown in Table 4-17.

Sediment sampling is not proposed for outfalls 4 and 5 because the sediments affected by Facility discharges are estimated to be below the upper-10-centimeter biologically active zone for estuaries discussed in the SMS; the sediments deposited by the Duwamish Waterway after the Facility outfalls were closed act as a cap over underlying sediments potentially affected by Facility discharges. The Duwamish Waterway will continue to add sediments to these areas that are not dredged, thereby continuously supplying sediments to this natural cap.

Based on the conservatively estimated depositional rates above, sediment sampling in the intertidal areas is recommended at the location of the former discharges from outfalls 2, 3, 6, and 7. These samples would be collected from zero to 10 cm in depth, thereby characterizing the Facility constituents exposed to Duwamish Waterway biota. While only the bottom half of the sediments might have been affected by the Facility outfalls, biological activity effectively mixes these sediments; therefore, characterizing the entire biologically active zone is a valid approach to determine whether action is necessary to protect the environment. The specifics of the recommended sampling are discussed in Section 6.2.2.

4.3.3.2 Other Sewer Sediment Results.

All other sewer sediment samples exceeded at least one CSL/MCUL. Because of this, all accessible sewers were cleaned as described in Section 5. No further action is recommended.

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Section 5
Sewer Cleaning

As discussed in Section 4, the Sewer System Sediment Sampling Plan stated that the sewer sediment data would be compared to the Sediment Management Standards (SMS) Sediment Quality Criteria (SQS). The sewer sediment data indicated that all seven storm sewer outfall samples exceeded the SQS for copper and zinc. Sediments in all the outfalls also exceeded the less stringent SMS Cleanup Screening Level/Minimum Cleanup Level (CSL/MCUL) for copper. The results were similar for the other sewer sediments: 12 of the 13 samples exceeded the SQS for both copper and zinc, while 12 also exceeded the CSL/MCUL for copper. The one sample that did not exceed the SQS for copper (088-SEW) exceeded the SQS and MCUL for 4-methylphenol and the SQS for cadmium and zinc. Because of these results, RPI decided to clean all accessible sewer lines.

Stormwater from the Facility had not been discharged offsite to surface water since shortly after the plant closed in 1991. After demolition of the plant, Facility stormwater was discharged to the Metro sanitary sewer after appropriate testing. However, in the spring of 1995, Metro notified RPI that stormwater from the Facility would no longer be accepted. This notification was one impetus for sampling the sediments in the sewer lines. During the final period of plant operations, outfall 7 was used to drain part of the Facility stormwater runoff; much of the Facility stormwater was directed to the process sewer line for use in the process. As a result, these process lines needed to be connected to the storm sewer. In addition, some of the storm sewer lines were known to be in poor condition, and replacement lines or cross-connections with nearby former process lines were needed to drain runoff from some of the areas. Given these requirements and the sediment sampling results, the lines needed cleaning before the outfall was re-opened to the Duwamish Waterway, in order to minimize the potential for discharges that could affect contaminant loading of Waterway sediments and exceed the potentially applicable discharge limits. Figure 5-1 shows the lines that are now being used for stormwater discharge from the

Facility and the location where the original storm sewer and process sewer lines have been cross-connected.

Figures 5-2 and 5-3 show the locations of the storm and other sewer lines, respectively, that were cleaned. Ventilation Power Inc., a 40-hour-trained contractor, cleaned the lines on July 5, 6, 7, 10, 11, and 13, and August 16, 19, and 26, 1995. Because the property is now leased to Northwest Container, the sewer cleaning needed to be scheduled around its operations and so was performed in several shifts on these dates. Ventilation Power used a vacuum truck with a back-pressure sparger to pressure-wash the sewer lines. All accessible storm and process sewer lines were cleaned during July and August except outfalls 3 and 4 (because of the difficulty in cleaning from the riprap on the edge of Slip No. 6) and outfall 2 (because of this riprap and the potential PCB contamination). (During outfall cleaning in September, RPI discovered that outfall 2 was not connected to the line containing the PCB contamination.)

After the lines to outfall 7 were cleaned and cross-connected, RPI wanted to ensure that stormwater through outfall 7 would not exceed (1) the calculated allowable discharge concentration (based on information from Ecology), (2) Water Quality Criteria (WAC 173-201A) (if [1] was not available), or (3) MTCA Method C Surface Water concentrations if (1) and (2) were not available. The cleaned lines leading to outfall 7 were flushed to remove possible loose sediments left by the cleaning process. In order to flush the lines, potable water from onsite fire hydrants was directed to the uppermost end of the outfall 7 lines. This rinsing was performed twice. On September 7, during a third rinse, rinse water was sampled; the sample was analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), semivolatiles, pesticides/PCBs, metals (including hexavalent chromium and mercury), oil and grease, pH, and hardness. The resulting data were compared to the above criteria, and some of the parameters exceeded the criteria (see Table 5-1). Because of these findings, the outfall 7 system was re-cleaned on September 16.

Since Seattle's rainy season begins in late September/early October, RPI decided to sample an actual storm event to see if this second cleaning was adequate. To the extent possible, RPI wanted this sampling to follow NPDES stormwater sampling guidance even though Ecology had stated that the outfall would not be subject to NPDES stormwater permitting. Sampling under the NPDES guidance included a first flush sample taken within the first 30 minutes of an acceptable storm event, aliquots taken over the next several hours of the storm event, and the aliquots combined into a composite sample for analysis.

After the decision had been made to use NPDES stormwater guidance and after the second cleaning of the lines, but before the stormwater sampling equipment was in place, a storm event filled the outfall 7 system. This water was pumped out and discharged to Metro, as approved by Metro. In addition, the sediments in the manholes were removed again.

A rainfall event meeting the NPDES criteria occurred early in the morning of October 20. A first flush sample was taken and analyzed for BTEX, oil and grease, semivolatiles, pesticides/PCBs, metals (including hexavalent chromium and mercury), pH, and hardness. Aliquots were taken over the next 1-1/2 hours, composited, and analyzed for semivolatiles, pesticides/PCBs, metals (including hexavalent chromium and mercury), pH, and hardness. These results were compared to the same criteria (see Table 5-1). The individual aliquots for the composite were also analyzed for BTEX; none was detected. All the results were below potential allowable discharge concentrations. On October 26, RPI received concurrence from Ecology and began discharging stormwater through outfall 7 to the Duwamish Waterway.

Because the lines to outfalls 2, 3, and 4 were not going to be connected to the revised outfall 7 system, they could be cleaned separately. Ventilation Power cleaned the outfalls on September 18 through 22. In order to clean outfalls 2, 3, and 4 from the Slip No. 6 end, RPI needed permission from Boeing to access Boeing-owned property surrounding the slip; this was granted on September 19. Boeing personnel visited the site, reviewed the work plan, and discussed the outfall cleaning operation.

On September 20, the outfall 2 discharge end at Slip No. 6 was cleaned. At low tide, AETS (a division of Chemical Waste Management) and Ventilation Power personnel set up cleaning equipment adjacent to Slip No. 6 to clean upgradient pipe. The 8-inch-outside-diameter steel pipe contained a considerable amount of water, much more than expected. As the pipe was being drained, the pressure of the hydrostatic head pushed out the end plug. Because the end plug came out and the water volume was uncontrolled, the suction and containment devices (a 5-gallon bucket and plastic sheeting) were overpowered and a spill occurred. The water was clear with very little sediment and no noticeable odor. An estimated 15 gallons of water washed down the riprap of Slip No. 6. The area covered by the spilled water extended from the end of the pipe, approximately 10 feet above the water line, to approximately 6 feet along the shoreline. A light sheen was noted on the water in Slip No. 6 that started from the spill location and proceeded west. AETS personnel placed sorbent pads on the spill and on the sheen on the water. Because the AETS personnel struggled to position the end plug immediately, the water never exited the pipe at full force. Within 20 to 30 seconds, the end plug was returned to position and control was restored.

At Boeing's request, cleaning was suspended until Boeing personnel arrived onsite. Boeing requested that a large 55-gallon plastic drum, capable of handling a larger spill, be cut and placed under the outfalls so that any additional spills could be collected. AETS reopened the end plug to allow fluid samples to be collected by Boeing for analysis. Data obtained from Boeing indicated that the spilled water did not contain detectable concentrations of contaminants. **[waiting for receipt of Boeing data]** Since a discharge had occurred, Boeing reported the spill to the appropriate authorities.

With improvements to the pipe-cleaning operation in place (the modified 55-gallon plastic drum) and Boeing personnel onsite to observe, the end plug was again opened. Water continued to flow for 15 minutes. Once water stopped draining from the pipe, a jet-rodding operation was started. Jet-rodding reached refusal at 254 feet.

RPI staff discovered that the jet-rod nozzle "daylighted" in the ditch dug to expose the PCB-contaminated line. The ditch now contained significant quantities of water where previously it had been dry. However, the jet rod did not come out of the pipe that was assumed to be connected to outfall 2. At the start of the outfall 2 drainline cleaning, it had been assumed that the north-south-trending 8-inch-diameter clay pipe (i.e., the PCB-contaminated line) was tied to outfall 2. Marks in the dirt where the jet rod traveled showed that the rod exited from a 4-inch concrete pipe approximately 4 feet west of the clay pipe. Prior to cleaning the outfall 2 end, the clay pipe had been fitted with a ball plug to prevent flooding of the ditch dug to expose the PCB-contaminated line.

Gelco, a 40-hour-trained contractor, was contracted to videotape the PCB-contaminated lines leading from the ditch to determine whether the lines were adequately cleaned and to identify branches off the main lines. On September 18, 1995, Gelco staff attempted to videotape the PCB-contaminated line from the exposed north-trending 8-inch clay pipe in the ditch (the sediment containing 1.3 percent Arochlor 1254 came from this line); however, sediment in the pipe prevented the camera from getting enough traction to move forward. As a result, on September 19 the line was cleaned prior to videotaping. Because of other commitments, Gelco staff were unable to return to the site until October 12, when they videotaped the three 8-inch PCB-contaminated lines leading away from the ditch; the north-trending pipe was re-cleaned at this time. The videotape indicated that the lines were thoroughly cleaned.

As the various sewer lines were cleaned, the unneeded outlets in manholes were grouted up and the unneeded catch basins were filled with sand and topped with grout. Two sewer access points where sand could not be compacted were filled with controlled density fill (CDF) instead; these were the sump pump in the old copper intercept area (sampled as 014-SEW) and the outfall 3 sampling point.

Certain lines could not be accessed for cleaning purposes. The reasons for this included: the line was around a corner that the cleaning lance could not get past; the line was

connected to a roof drain so that the access point was a 90-degree turn that the lance could not pass; the manhole was missing or buried and not accessible; the line "wyed" near the entrance to the closest manhole and therefore could not be reached without breaking the line; or the line was crushed. Figure 5-4 illustrates the reasons for not cleaning storm sewer lines, and Figure 5-5 illustrates the reasons for not cleaning other sewer lines.

Sewer sediments removed during sewer cleaning were placed in a concrete sump while awaiting disposal; sediments from the PCB-contaminated lines were placed in 55-gallon drums. On July 13, 1995, Philip Environmental collected composite samples of the sediments aggregated by Ventilation Power for waste characterization profiling. Philip tested the sediments for routine disposal parameters including PCBs (EPA Method 8081), total copper (EPA Method 6010), toxicity characteristic leaching procedure (TCLP) metals (EPA Methods 1311 and 6010), and F-listed solvents (EPA Method 8260). Table 5-2 lists the constituents detected in the composite sediment sample.

Five drums of PCB-contaminated sewer sediments were sampled on October 20; 500 mg/kg of Arochlor 1254 were detected. The waste profile was approved on October 23 by Chemical Waste Management. The drums were removed from the site by AETS under waste profile BR2294 on October 30, and were shipped to Chemical Waste Management's Henderson, Colorado, facility pending incineration at the Rollins APTUS facility in Argonite, Utah. The other sewer sediments were solidified and transferred to two roll-off boxes by AETS. The first roll-off box was filled during September; this box was sampled on September 22. The sample was analyzed for free liquids; none were present. The waste profile was approved on October 2. Approximately 10 tons of solidified sediment were taken offsite on October 2 for disposal at Chemical Waste Management's Arlington, Oregon, landfill. The second roll-off box was only partially full and was kept onsite to receive sediments from cleaned outfalls 3 and 4, the round sediment sump, the rectangular tank, and the round process sump. This second roll-off box was sampled on October 18. The sample was analyzed for free liquids; none were present. The waste profile was approved on October 24. The box contained 9 tons of solidified sediments when it was

shipped offsite on October 27 for disposal at Chemical Waste Management's Arlington, Oregon, landfill.

Because concentrations of copper (a known fish toxicant) were fairly high in the sewer sediments, RPI decided to analyze the sludge for the Washington State Dangerous Waste fish bioassay [WAC 173-303-100(5)]. On August 16, 1995, the sample for the fish bioassay was collected with a long-handled polyethylene dipper from the midpoint of the sump. Fish survival rates were 17 out of 30 in the 1,000-ppm sediment solution and 30 out of 30 in the 100-ppm sediment solution. Based on these results, the sewer sediments were designated as a Washington State Dangerous Waste, WT02.

Approximately 3,500 gallons of wash water from the PCB-contaminated lines and outfall 2 were produced; this water was placed in a 20,000-gallon Rain-for-Rent tank. Approximately 20,000 gallons of wash water from cleaning the other sewer lines were also produced; this water was placed in a separate 20,000-gallon Rain-for-Rent tank. An additional 1,500 gallons of wash water were produced while cleaning the round sediment sump, the rectangular tank, and the round process sump; because there was insufficient space left in the non-PCB-contaminated Rain-for-Rent tank, this water was placed in the PCB-contaminated tank. In addition, a black fluid was found in the discharge end of outfall 4 when it was cleaned on September 21. Because of this fluid, the 900 gallons of wash water from outfall 4 were not placed with the other wash waters but were placed in an existing aluminum tank.

At the end of November 1995, the 5,000 gallons of wash water in the PCB-contaminated Rain-for-Rent tank were filtered through a 5-micron filter and then through two activated carbon drums in series, in order to remove the PCB and copper contamination. The filtrate was sampled and analyzed for Metro discharge parameters. Concentrations of PCBs (Arochlor 1254) and copper exceeded Metro discharge limits at 870 µg/l and 24 mg/l, respectively. The filtrate was then re-filtered during early December, re-sampled, and re-analyzed. The results indicate that [**to be provided after this is complete**].

The outfall 4 wash water also contained elevated levels of copper at 30 mg/l. This wash water was filtered during late December. The filtrate was sampled and analyzed; copper concentrations were ___, below the Metro discharge limit. The outfall 4 wash water was discharged to Metro on **[to be completed when filtering and discharge are complete]**.

The 20,000 gallons of wash water in the non-PCB-contaminated tank also had elevated levels of copper (28 mg/l). This wash water will be filtered in late December 1995/early January 1996, and the filtrate will be discharged to Metro.

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Section 6

Conclusions and Recommendations

This section presents the conclusions of the RFI Round 3 and sewer sediment investigations described in this Technical Memorandum, and makes recommendations for future action at the Marginal Way Facility. Section 6.1 summarizes the principal findings and conclusions of the Round 3 groundwater, seep, and sewer sediment sampling and analysis. Section 6.2 presents recommendations regarding the forthcoming Risk Assessment/MCS evaluation and further characterization of sediments in the Duwamish Waterway and Slip No. 6.

6.1 Conclusions

The data obtained during Round 3 support and supplement the information gathered during Rounds 1 and 2 of the RFI. In the case of the eight monitoring wells installed during Round 2 (wells MW-13 through MW-20), Round 3 provided a second set of data to corroborate those collected during Round 2. Seeps along the Facility shoreline were sampled for the first time during Round 3, allowing the direct measurement of contaminants entering the Duwamish Waterway and Slip No. 6 via groundwater discharge. The onsite storm and process sewers were also sampled during Round 3 to assess (1) the presence and nature of contaminants that may have been discharged to the adjacent waterways via historical outfalls, and (2) the need to clean the sewer system. The principal findings and conclusions relating to groundwater, seeps, and sewer sediments at the Facility are summarized in the following sections.

6.1.1 Groundwater

The general size and shape of the toluene plume remain unchanged relative to the findings presented in the RFI Report. Several wells screened in the upper portion of the Upper

Aquifer and located near the perimeter of the plume show a substantial decrease in toluene concentrations (wells MW-12, MW-14, and MW-19); one other such well (MW-18) showed an increase (from 56,000 µg/l in Round 2 to 360,000 µg/l in Round 3). The three existing wells available in the plume area for monitoring of the lower portion of the Upper Aquifer (wells H1, MW-13, and MW-16) show a substantial decrease in toluene concentrations and the vertical extent of the plume. The concentration in MW-16 decreased from 1,100 µg/l in Round 2 to 690 µg/l in Round 3; toluene was not detected in wells H1 and MW-13.

Several organic compounds were detected for the first time at the Facility during Round 3:

Semivolatiles	**Volatiles**
Di-n-octyl-phthalate	1,2-dichloroethene (total)
Anthracene	Carbon disulfide
Phenanthrene	1,1,1-trichloroethane
	Ethylbenzene

Of the above compounds, carbon disulfide is a laboratory artifact and will not be included in the Risk Assessment/MCS evaluation. Phenanthrene does not have an action level; therefore, it will be addressed in the Risk Assessment/MCS evaluation. All the other compounds were below their respective action levels.

During Round 3, the monitoring wells were purged prior to sampling using the low-flow micropurging technique. Compared to the conventional well-purging technique used during previous RFI rounds, this method yields samples that have fewer suspended solids. Metals analyses were subsequently conducted on unfiltered, unpreserved samples. In accordance with an agreement with EPA and Ecology, the total metals data from Round 3 will be compared to action levels. Metals exceeding action levels on this basis will be addressed in the Risk Assessment/MCS evaluation.

A comparison of Round 1 and Round 3 total metals data was conducted to identify changes to the list of metals identified in the RFI Report for inclusion in the Risk Assessment/MCS

evaluation. Based on the Round 3 data, three metals will be added to the list: cadmium, selenium, and thallium. Beryllium and silver were identified in the RFI Report for inclusion, but neither was detected during Round 3; therefore, these two metals will not be addressed in the Risk Assessment/MCS evaluation.

Nitrite was detected in the groundwater samples collected from well DM-5 at a concentration of 1,100 µg/l, above the action level of 1,000 µg/l. Therefore, nitrite will be addressed in the Risk Assessment/MCS evaluation.

In summary, beryllium and silver will be deleted from the list of constituents to be addressed in the Risk Assessment/MCS evaluation, while the following additional constituents will be included in the evaluation for groundwater:

- Metals: Cadmium, selenium, and thallium
- Semivolatiles: Phenanthrene
- Conventional parameters: Nitrite

6.1.2 Seeps

Seep sampling was conducted at the Facility to evaluate the potential cross-media transfer of contaminants from groundwater to surface water. Seven seeps, located along the shoreline of Slip No. 6 or the nearby Duwamish Waterway were sampled at extreme low tide (minus 2.0 feet MLLW). These samples were analyzed for an extensive suite of inorganic and organic constituents, including guaiacol and resin acids. Based on a comparison of the general chemistry of the seeps and groundwater, the seeps appear to be a mixture of groundwater and surface water.

The seep data were compared to surface water action levels. Seven metals and one semivolatile organic compound were each detected at least once at concentrations exceeding their action levels:

Metals	**Semivolatiles**
Arsenic	Bis(2-ethylhexyl)phthalate
Cadmium	
Copper	
Lead	
Mercury	
Nickel	
Zinc	

Mercury was detected above its action level at seep 5. All of the other metals action-level exceedances occurred at seep 2.

Three metals detected did not have action levels. These metals were barium (detected in all seeps), cobalt (detected in seeps 2 and 3), and vanadium (detected in all seeps).

Several other constituents were detected in the seeps but at concentrations below their action levels:

Metals	**Organics**
Beryllium (seep 2)	Formaldehyde (seep 6)
Chromium (seep 2)	

The maximum concentrations that could be expected in sediments, based on their contact with seep water, were also estimated. Based on these calculations, the following constituents could potentially exceed the Sediment Management Standards (SMS) Sediment Quality Standards (SQS) or Cleanup Screening Levels and Minimum Cleanup Levels (CSL/MCUL) at a seep location: cadmium, copper, chromium, mercury, zinc, and bis(2-ethylhexyl) phthalate.

6.1.3 Sewer Sediments

Sediments in the Facility sewers were analyzed to determine whether they (1) exceeded the SQS or the CSL/MCUL and (2) should be removed from the sewers, particularly in light of RPI's plans to cross-connect sewers and place stormwater outfall 7 back into service. The sewer sediments were analyzed for an extensive suite of inorganic and organic constituents.

The following constituents were found to exceed the SQS or the CSL/MCUL in sediment samples collected from the outfall sampling locations:

Metals	**Organics**
Arsenic	PCBs (sample 02-SWO, which is not from an outfall line)
Cadmium	Methylphenols
Copper	Pentachlorophenol
Zinc	Phenol

The following constituents were found to exceed the SQSs or CSLs/MCULs in sediment samples collected from other sewers:

Metals	**Organics**
Arsenic	4-methylphenol
Cadmium	Benzyl alcohol
Copper	Phenol
Lead	Bis(2-ethylhexyl)phthalate
Silver	Di-n-octyl phthalate
Zinc	

Because the sewer sediments contained contaminants above the SQS or CSL/MCUL, the sewers were cleaned. Unneeded lines were plugged before the sewers were cross-connected and outfall 7 was placed back in service.

6.2 Recommendations for Future Actions

6.2.1 Groundwater and Seeps

No additional sampling is recommended for groundwater or seeps. As stated in the RFI Report, a Risk Assessment/MCS evaluation is needed. The constituents previously proposed for evaluation were presented in the RFI Report. Table 6-1 presents an amended list of constituents to be included in the Risk Assessment/MCS evaluation. This list identifies the constituents to be evaluated, the associated media, and the rationale for their inclusion in the Risk Assessment/MCS evaluation in terms of their relation to the identified action levels.

The need for, and the scope of, a Corrective Measures Study (CMS) will be determined based on the results of the Risk Assessment/MCS evaluation. If a CMS is necessary, it will evaluate corrective measures applicable to contaminants exceeding the Media Cleanup Standards developed in the Risk Assessment/MCS evaluation. Several anthropogenic constituents detected in soil (see Table 6-1) will be addressed as part of the Risk Assessment/MCS evaluation because they do not have action levels. However, no exceedances of soil action levels requiring a Risk Assessment/MCS evaluation were identified during the RFI. Therefore, a CMS specifically focusing on soil is not anticipated. However, any CMS addressing groundwater remediation will also consider the need to remediate Unsaturated Zone soil to better ensure the effectiveness and permanence of any groundwater remediation that is implemented at the Facility.

Pursuant to the Consent Order, the report presenting the findings of the Risk Assessment/MCS evaluation will be submitted to U.S. EPA 30 days after approval of this Round 3 and Sewer Sediment Technical Memorandum. The information developed in the Risk Assessment/MCS evaluation will be used primarily to evaluate the need for, and the objectives of, future remedial actions. The evaluation will focus on the groundwater action-level exceedances, most of which are associated with the toluene plume. Anthropogenic

chemical constituents that do not have action levels but were detected in soil and groundwater will also be addressed (see Table 6-1).

6.2.2 Sediments

In addition to the Risk Assessment/MCS evaluation, sampling of Duwamish Waterway and Slip No. 6 sediments near outfalls and seeps is recommended to evaluate whether there are exceedances of the CSL/MCUL. Significant contamination of the Duwamish Waterway sediments caused by releases from the Marginal Way Facility appears unlikely, as previous random grid sampling of the intertidal zone indicated that the sediments did not contain any constituents above a CSL/MCUL.

Because each of the storm sewer sediment samples exceeded at least one CSL/MCUL, additional sampling is recommended of the intertidal and/or adjacent subtidal sediments in Slip No. 6 and the Duwamish Waterway (depending on the location of the outfall). The sediments at the ends of the outfalls (as discussed in Section 4.3.3) and adjacent to the seeps (as discussed in Section 4.2.5) would be analyzed for those constituents that exceeded a CSL/MCUL (for the outfall sewer sediments) or may exceed a CSL/MCUL (based on seep data). For each sampling location, the recommended analytical parameters are listed in Table 6-2.

It should be noted that The Boeing Company owns Slip No. 6 and its shoreline; Boeing's permission would be required to gather the sediment samples.

The type of sample collected would vary depending on where the sample was taken. Each former outfall discharge pipe would be located; if it could not be located, the location would be selected based on historical maps. Six sample aliquots are recommended, and they would be equally spaced along an arc with an approximate radius of 5 feet from the end of the outfall. The samples would be composited to form one sample from each outfall discharge area. For those samples taken near the Slip No. 6 outfalls, the outfall discharge

may be in the riprap along the shoreline. In this case, the sample aliquots would be taken from the sediments adjacent to the riprap and composited as described above.

Samples from sediments at each seep would consist of a composite of 4 grab sample aliquots taken no more than 12 inches away from, and around, the location of the seep; these samples would be collected from the upper 10 centimeters of the sediment and would be analyzed for the constituents detected in the seep. In order to re-locate the seeps, sampling would need to be conducted during a minus-1 to minus-2-foot tide; the next minus-1 to minus-2-foot tide during daylight hours will occur on May 3, 1996.

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Section 7
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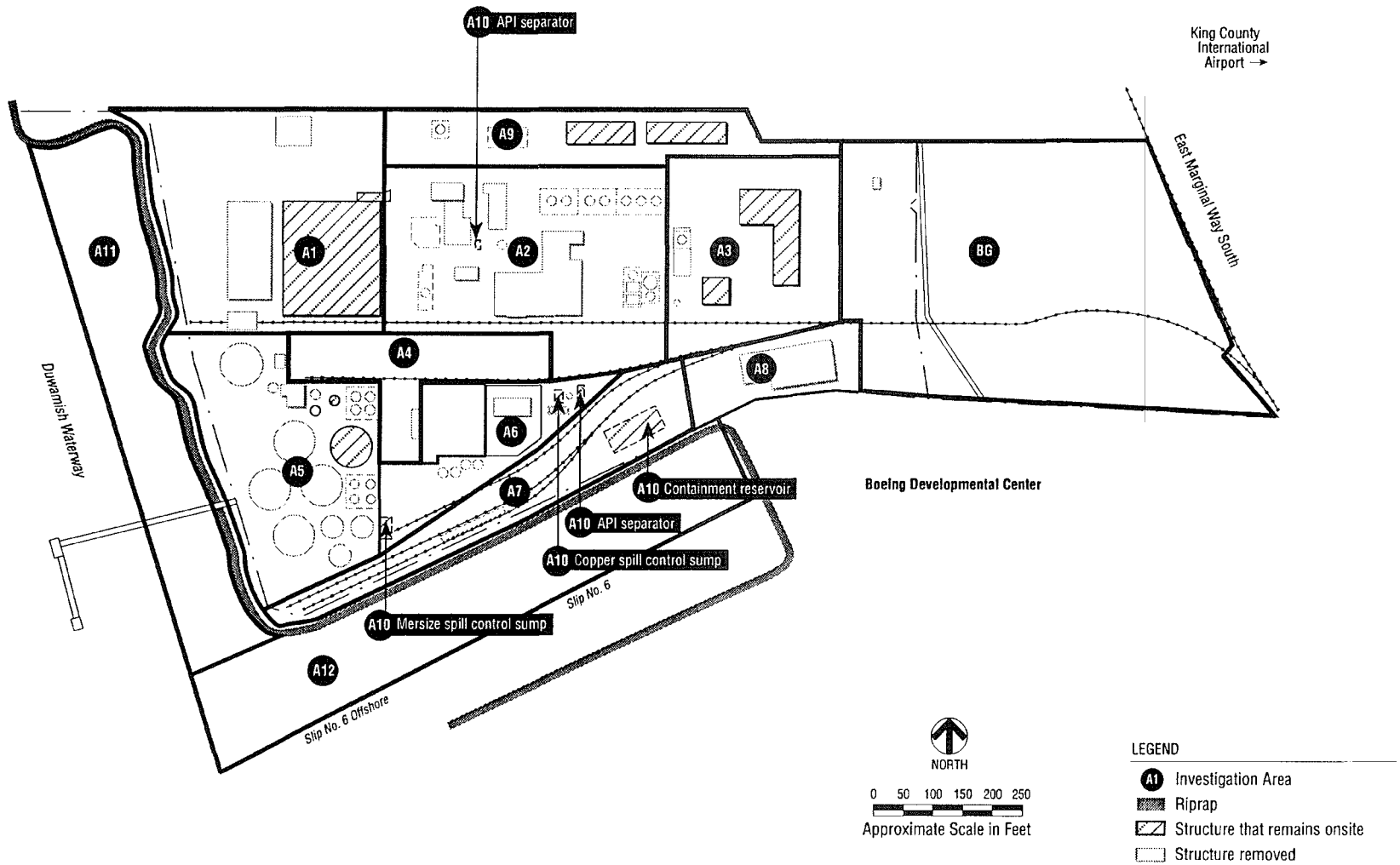
Figures

106063.A8 ZZ • Rhone Poulenc • 2-01/RFI Invest. Areas • 10-10-95 • LW



NOTE: Area A10 consists of a reservoir, sumps, and API separators located across the Facility. Area A12 was added for Round 3 seep sampling.

Figure 2-1
RFI Investigation Areas

106063.A8.ZZ • Rhone Poulenc • 2-03/Seep Sample • 12-12-95 • LW

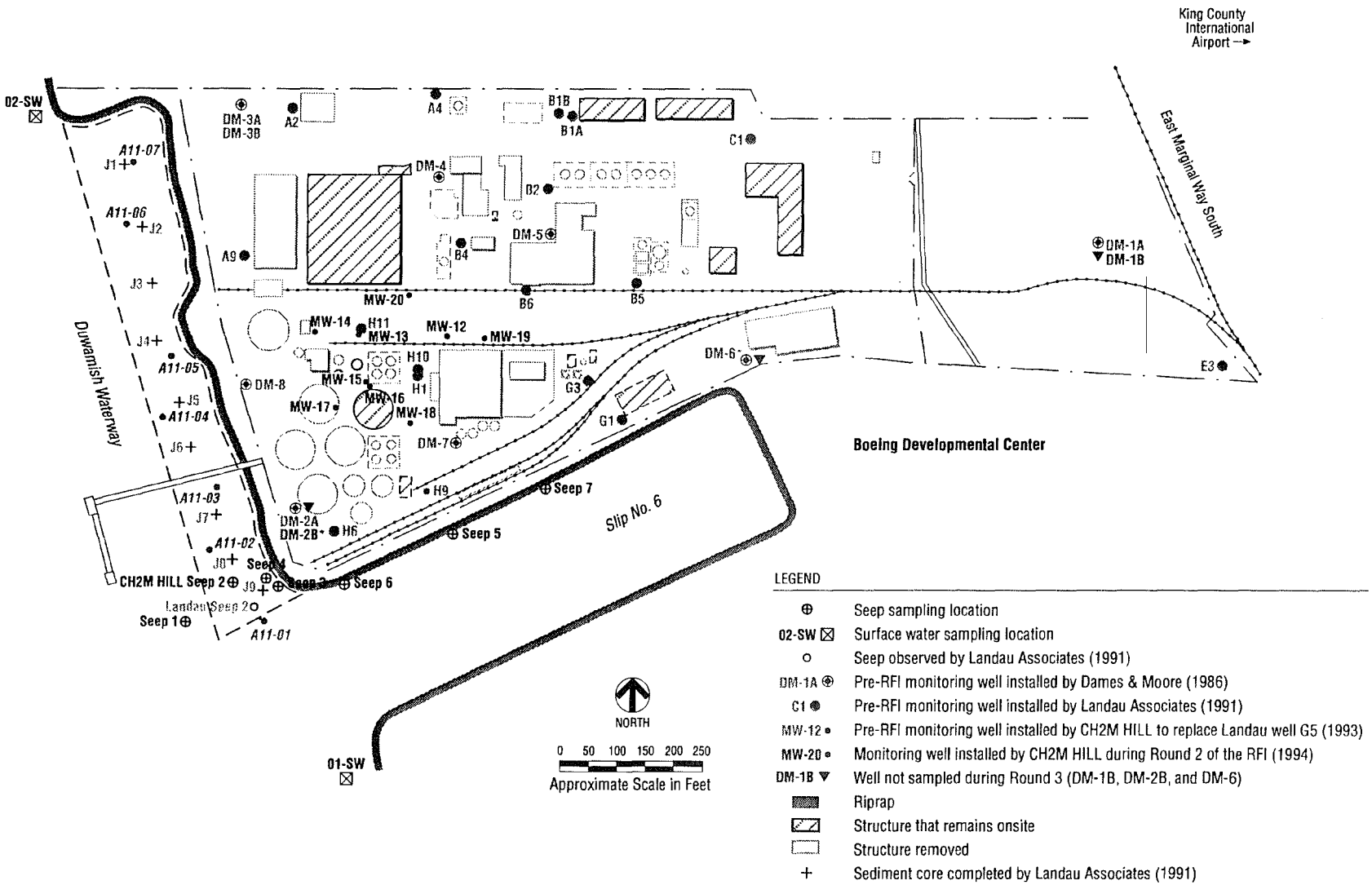


Figure 2-2
Locations of Round 3 Groundwater Sampling Wells and Seep and Surface Water Sampling

106063.A8 ZZ • Rhone-Poulenc • 2-3/Storm sewer cleaned-BW • 12-12-95 • LW • JG

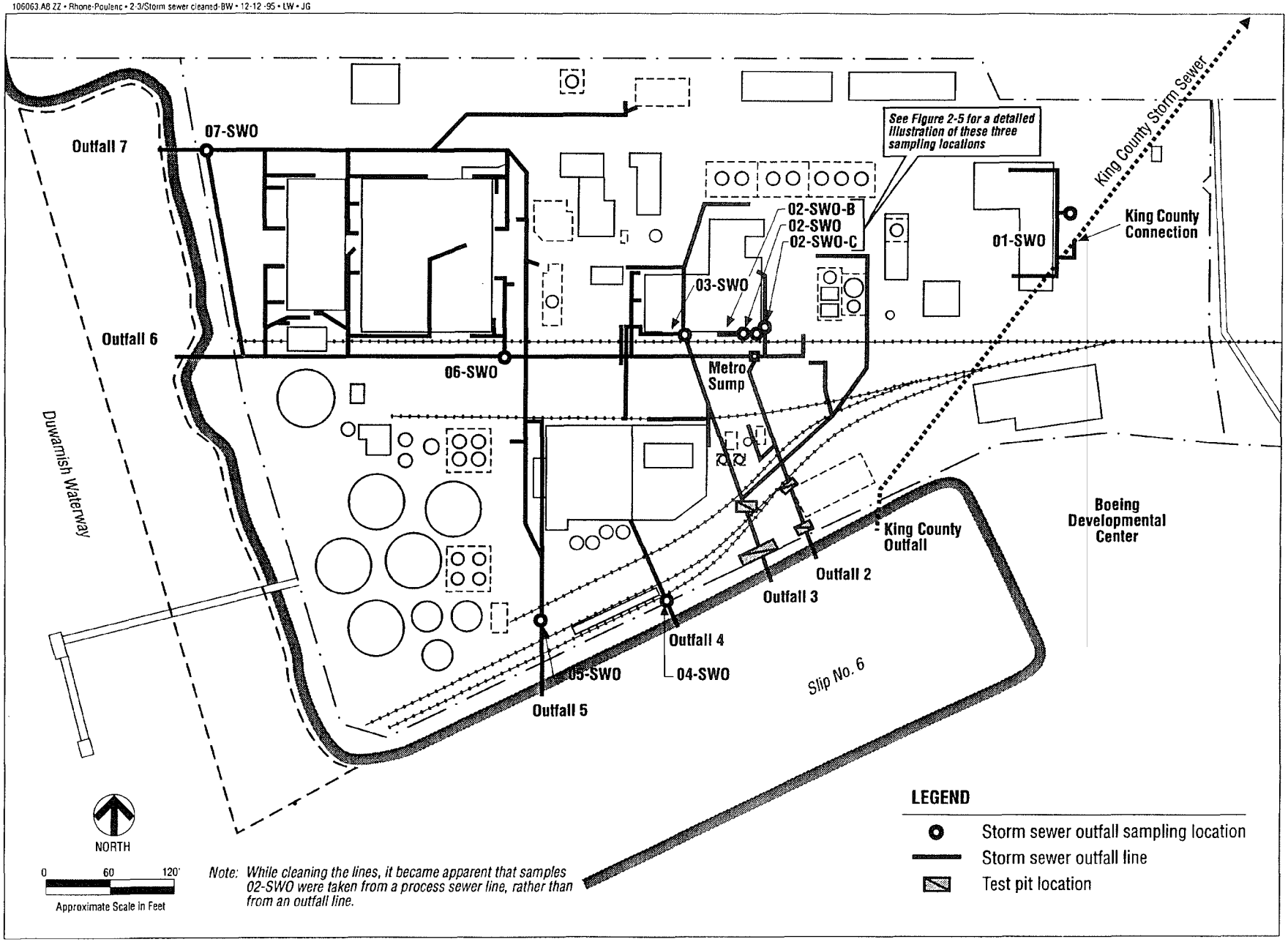


Figure 2-3
Locations of Storm Sewer Outfall Lines Sampled

106063.A8.ZZ • Rhone-Poulenc • 2-4/Pro. sewer cleaned-BW • 12-12-95 • LW • JG

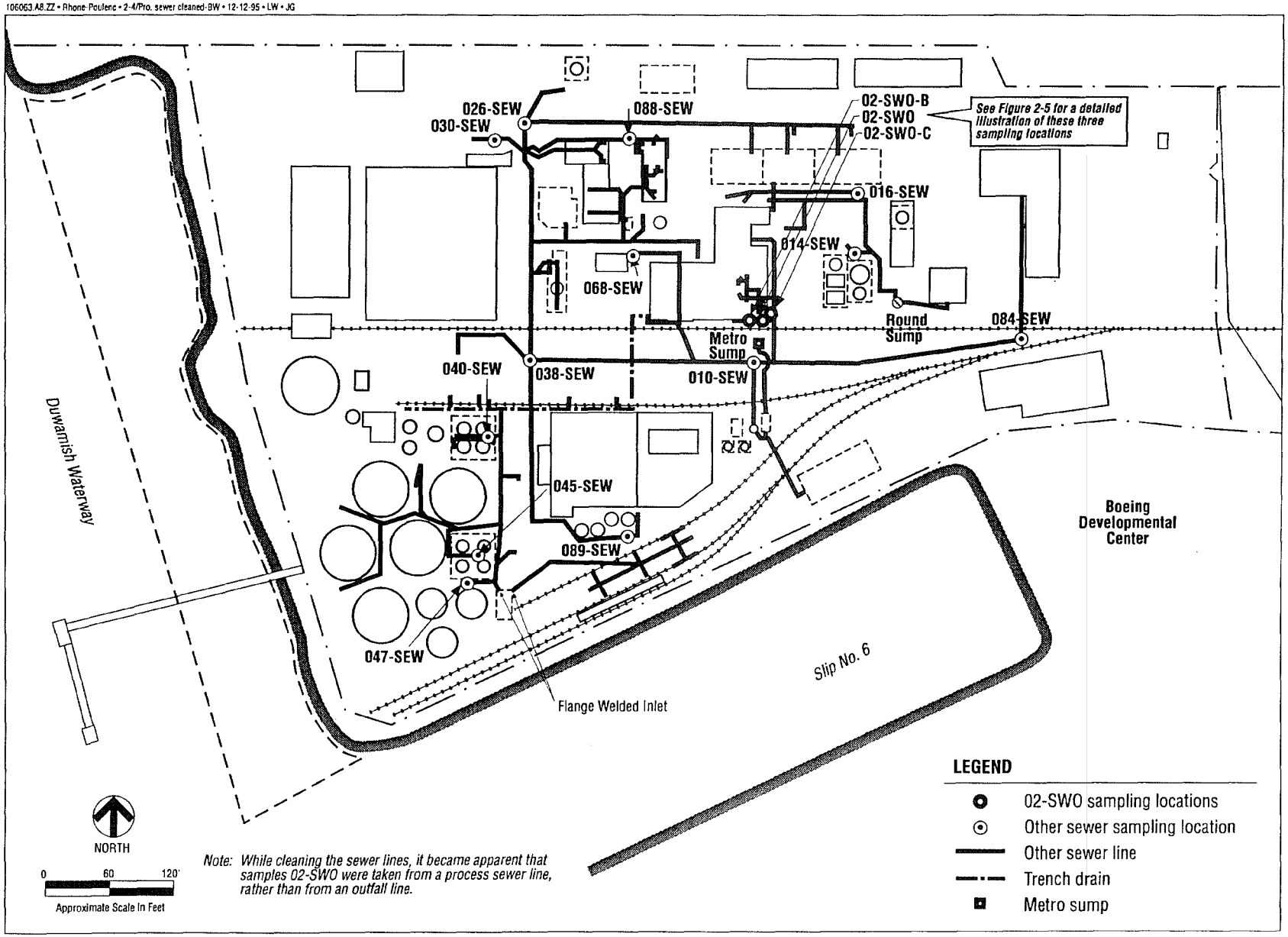


Figure 2-4
Locations of Other Sewer Lines Sampled

106063.A8 • Rhone-Poulenc • 2-5 Sediment Sample Locatns • 12-12-95 • JG • LW

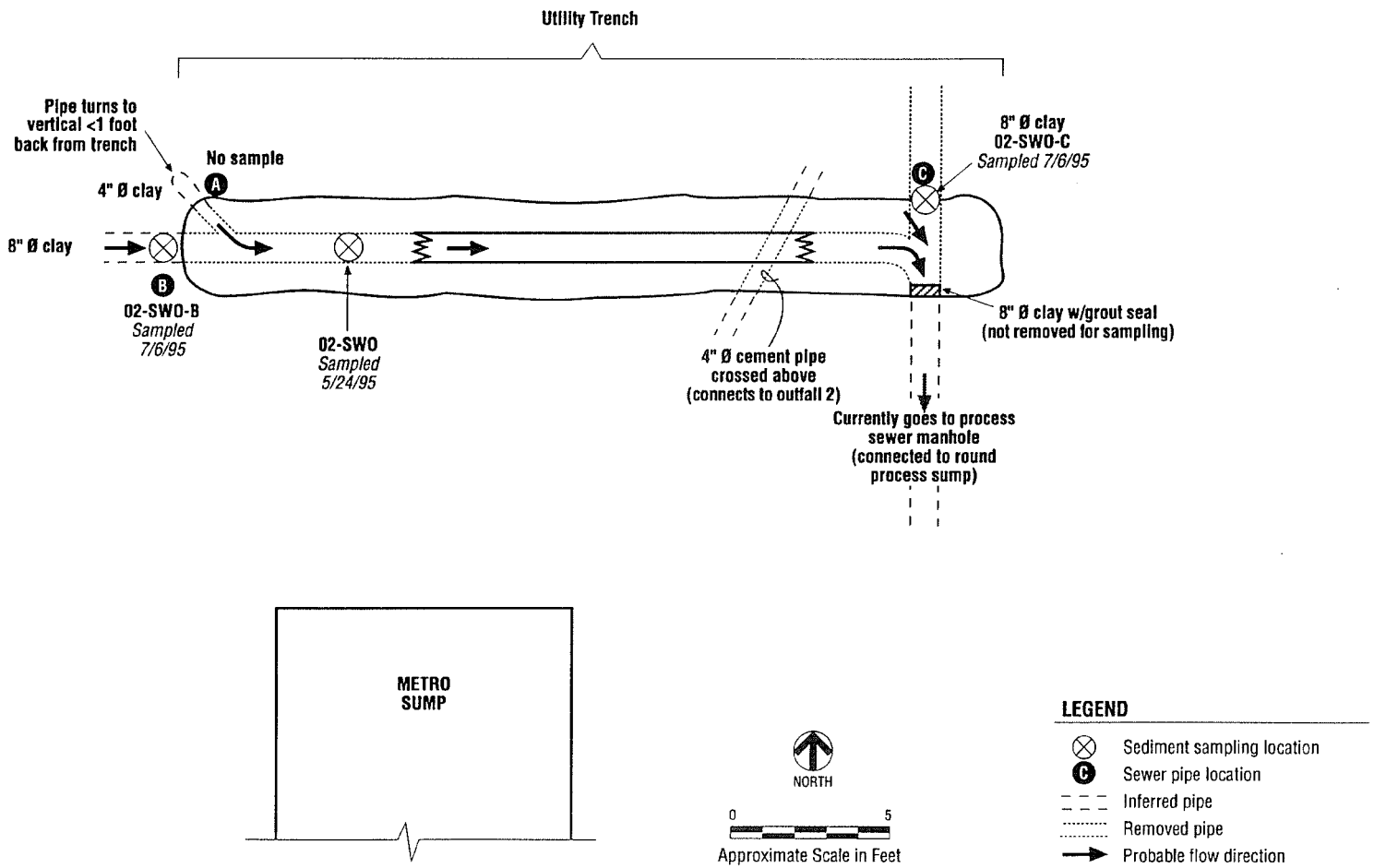
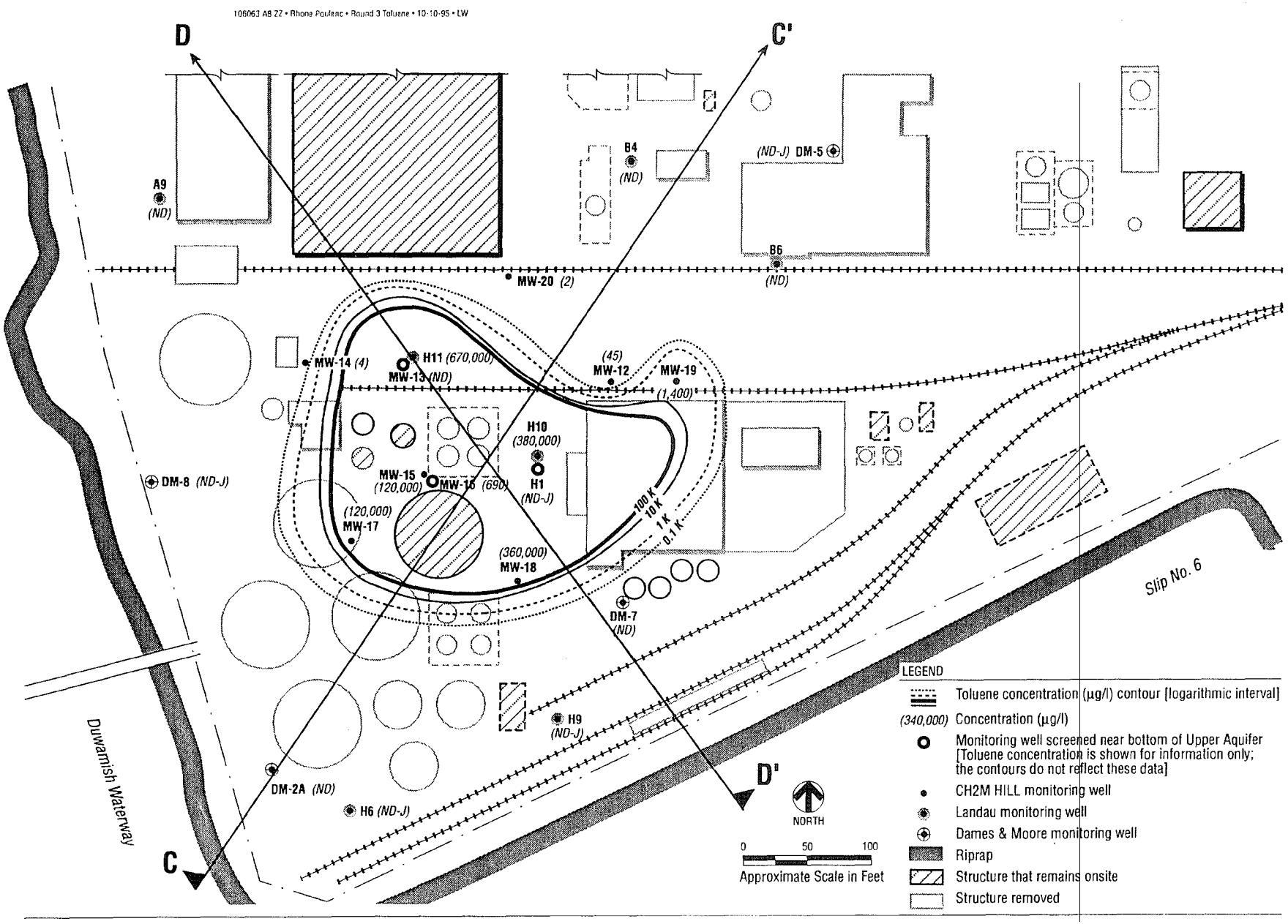


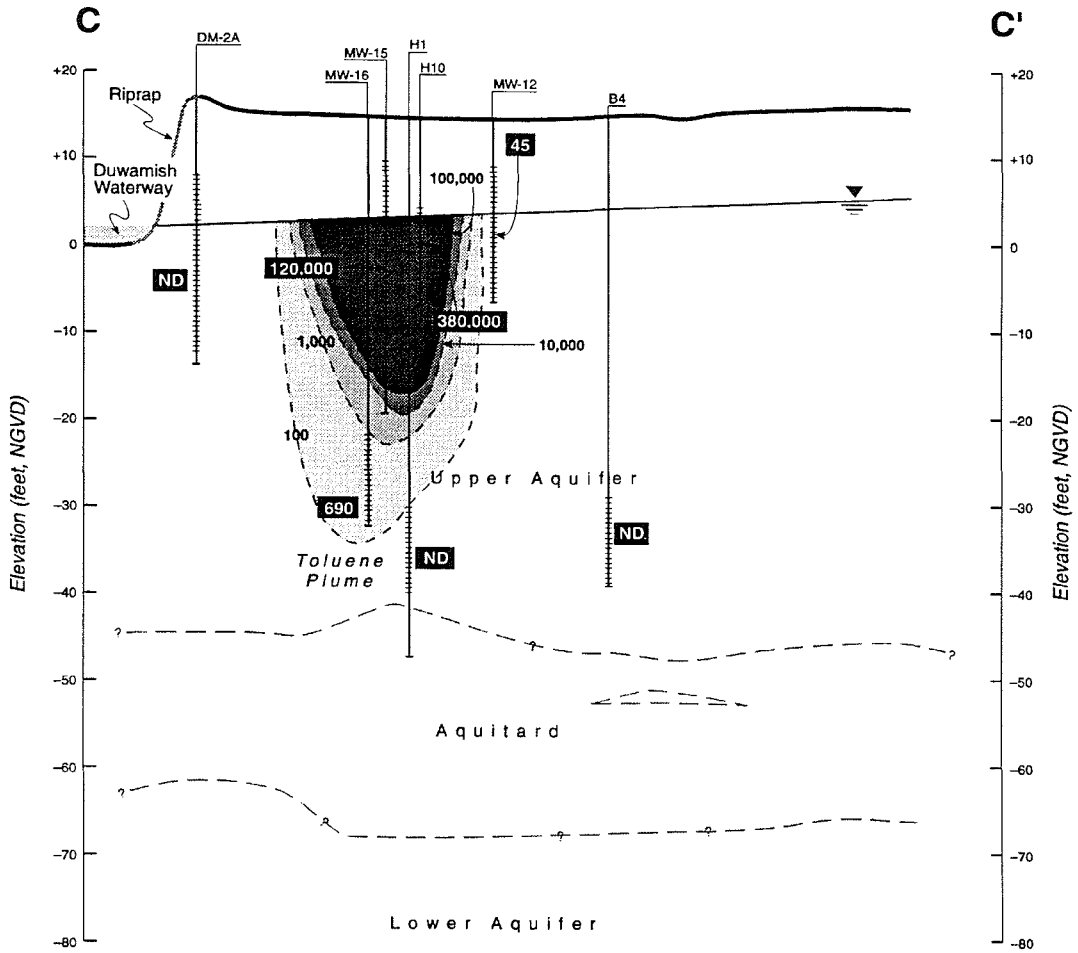
Figure 2-5
Detail of Locations of 02-SWO Samples



ND = not detected
J = J-qualified result

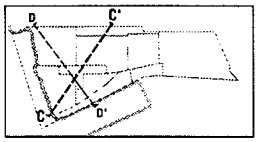
Figure 4-1

Upper Aquifer Toluene Concentration Contour Map for Round 3 Groundwater Data



106063.A8.ZZ • Rhone Poulenc • 4-02/C-C' Toluene • 9-8-95 • LW

Vertical Scale: 1" = 20'
Horizontal Scale: 1" = 250'



LEGEND

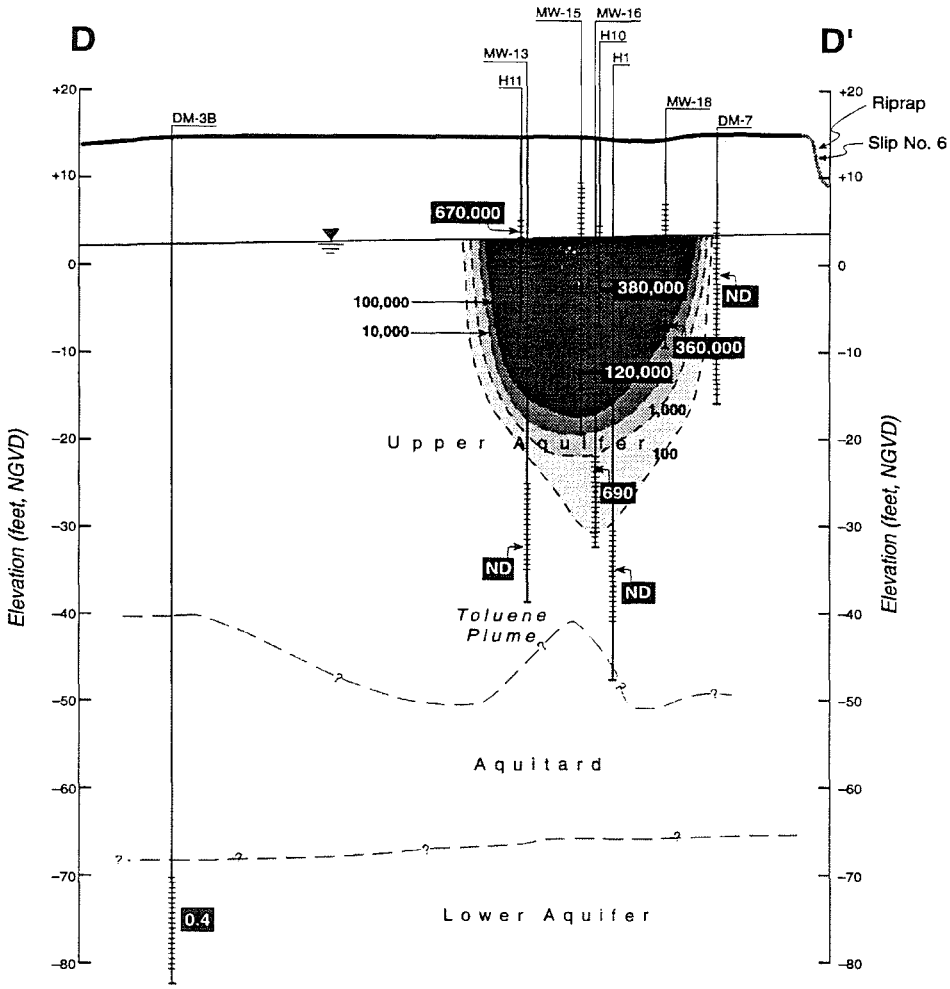
H10	Monitoring well	ND	Not detected
	Low-permeability layer		Area equal to or greater than 100,000 µg/l toluene
	Screened interval for monitoring well		Area with 10,000 to 99,999 µg/l toluene
	General water table elevation		Area with 1,000 to 9,999 µg/l toluene
4,000	Toluene concentration (µg/l)		Area with 100 to 999 µg/l toluene

NOTES: Groundwater elevations are based on the averages of four water-level measurements taken February 4, 1994.

HydroPunch and soil boring data are not shown.

Figure 4-2

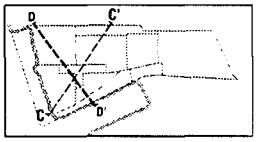
Cross-Section C – C' of Vertical Extent of Toluene Contamination – Round 3



105063.AB.ZZ • Rhone Poulenc • 4-03/D-D' Toluene • 9-8-95 • LW

LEGEND

Vertical Scale: 1" = 20'
Horizontal Scale: 1" = 250'



H10	Monitoring well	ND	Not detected
	Low-permeability layer		Area equal to or greater than 100,000 µg/l toluene
	Screened interval for monitoring well		Area with 10,000 to 99,999 µg/l toluene
	General water table elevation		Area with 1,000 to 9,999 µg/l toluene
4.000	Toluene concentration (µg/l)		Area with 100 to 999 µg/l toluene

NOTES: Groundwater elevations are based on the averages of four water-level measurements taken February 4, 1994.

HydroPunch and soil boring data are not shown.

Figure 4-3
Cross-Section D–D' of Vertical Extent of Toluene Contamination – Round 3

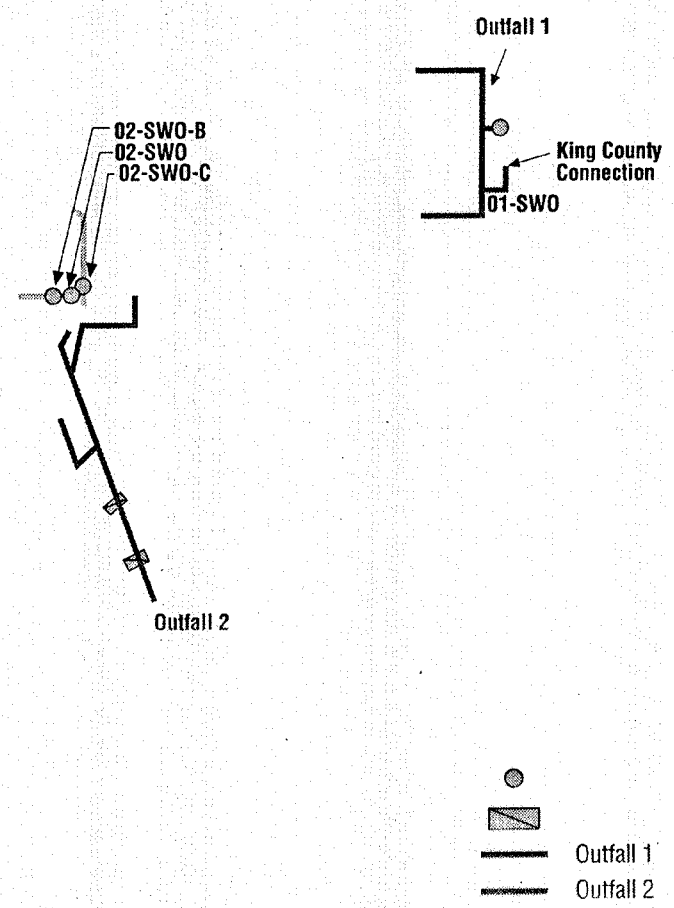
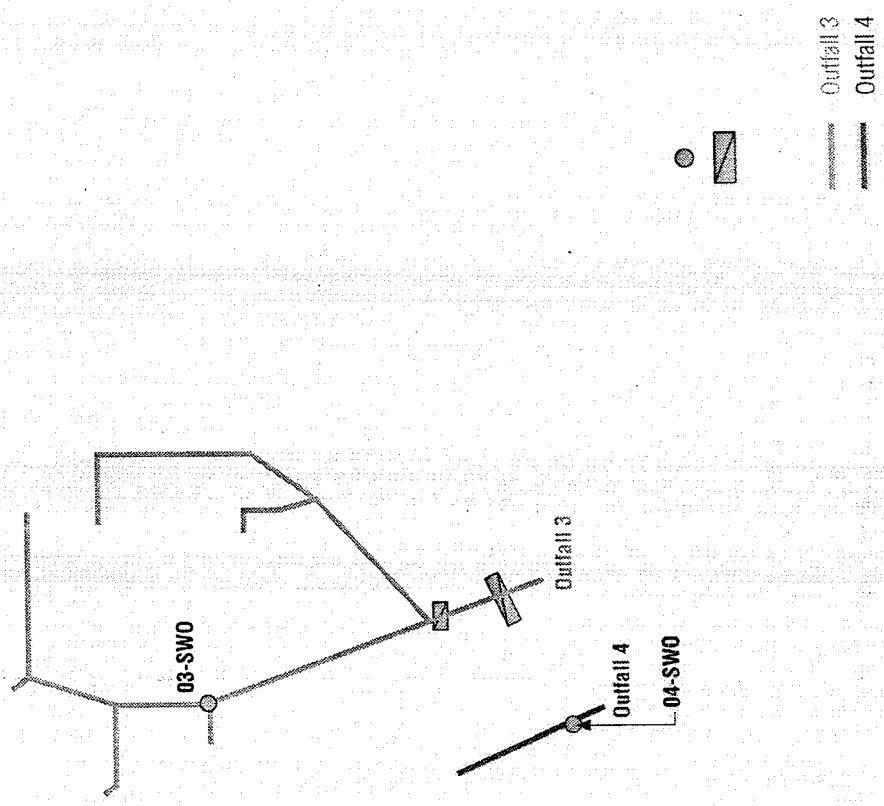
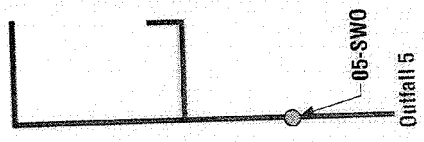

Outfall 1
King County Connection
01-SWO
02-SWO-B
02-SWO
02-SWO-C
Outfall 2
Outfall 1
Outfall 2

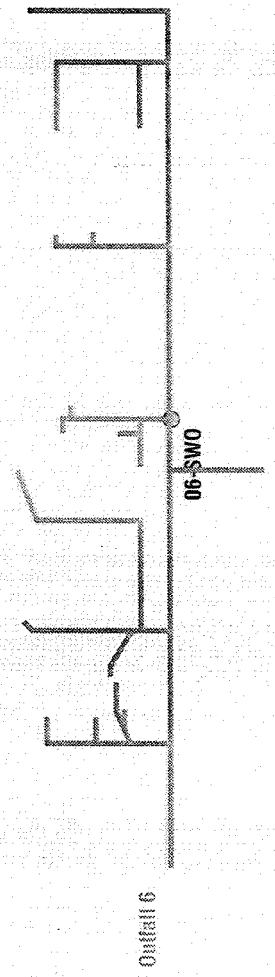
Figure 4-4 a



b

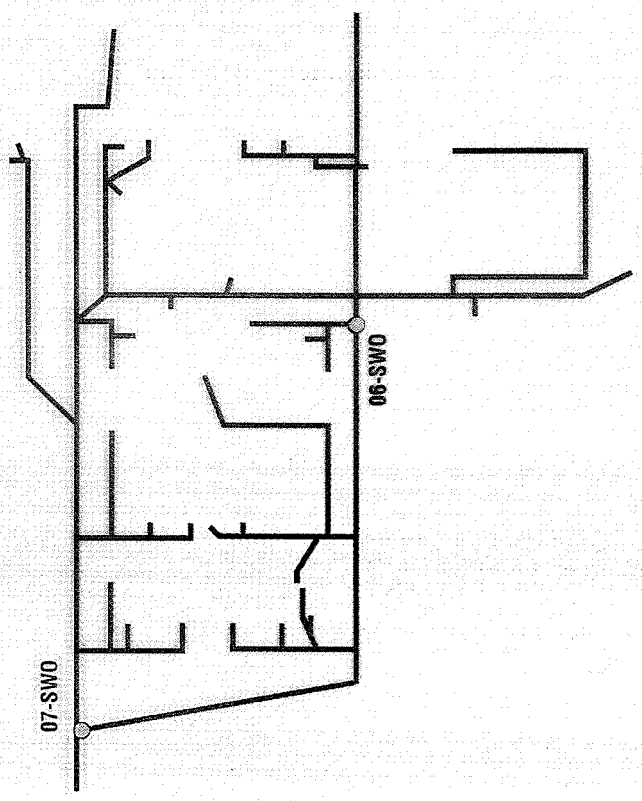


Outfall 5



Outfall 6

d



Outfall 7

e

106063.A8.ZZ • Rhone Poulenc • Historical sewer flows • 10-10-95 • LW JG

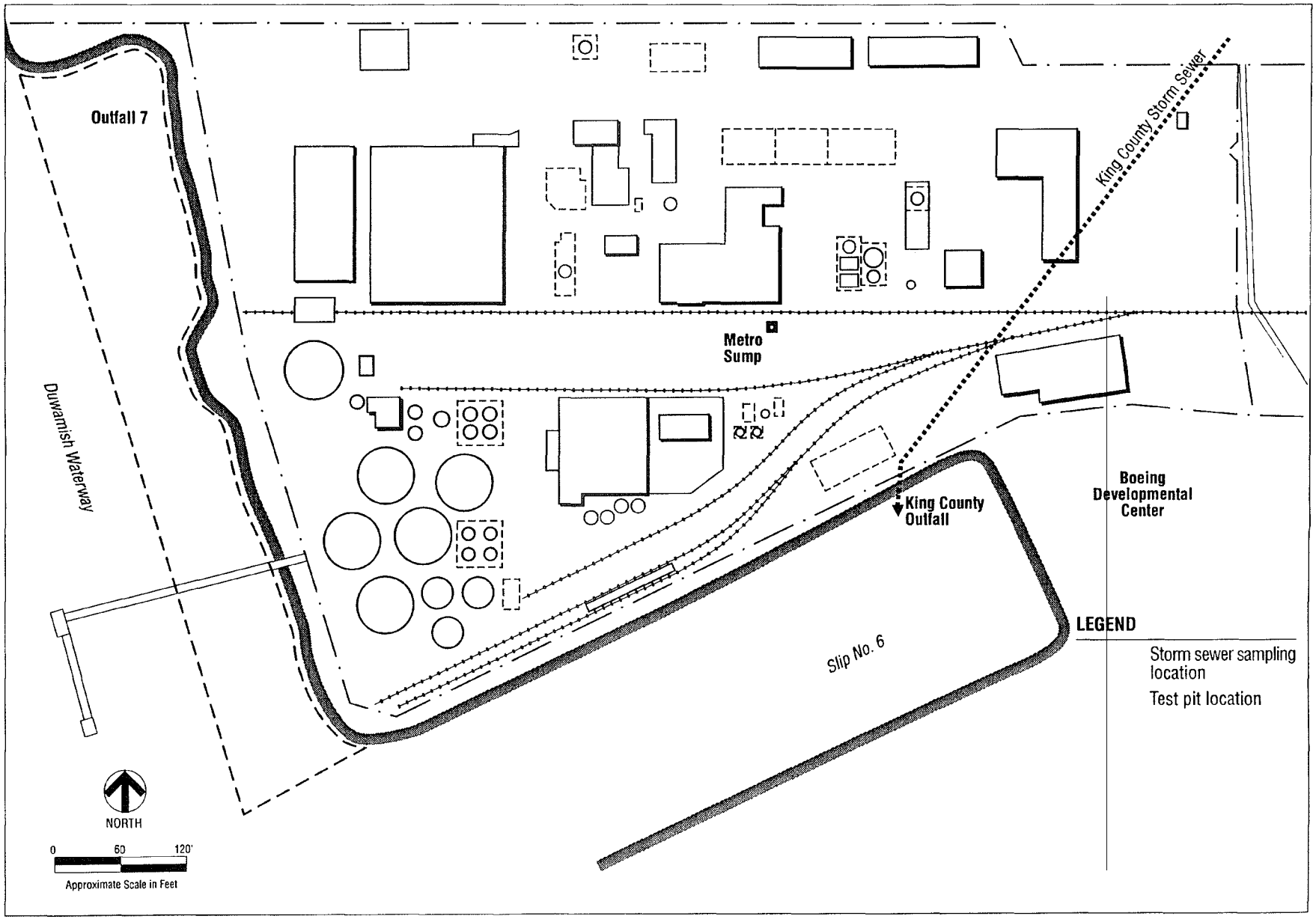


Figure 4-4
Historical Storm Sewer Flows and Sediment Sampling Locations

106063 A8.ZZ • Rhone-Poulenc • Proc.sewr lines/samples • 12-12-95 • LW

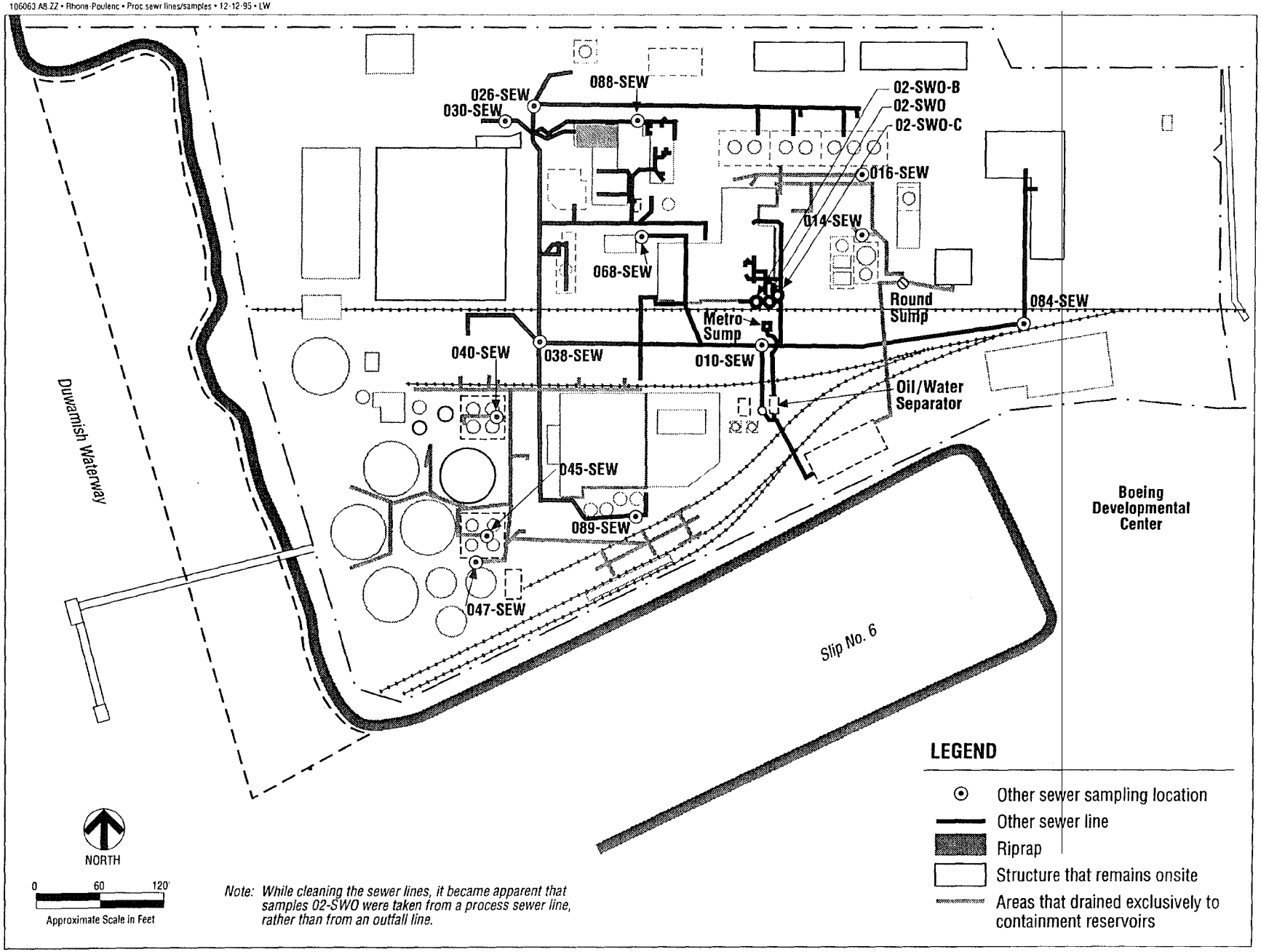


Figure 4-5
Locations of Other Sewer Lines and Samples

106063.A8.ZZ • Rhone-Poulenc • New flow to outfall 7 • 12-12-95 • LW • JG

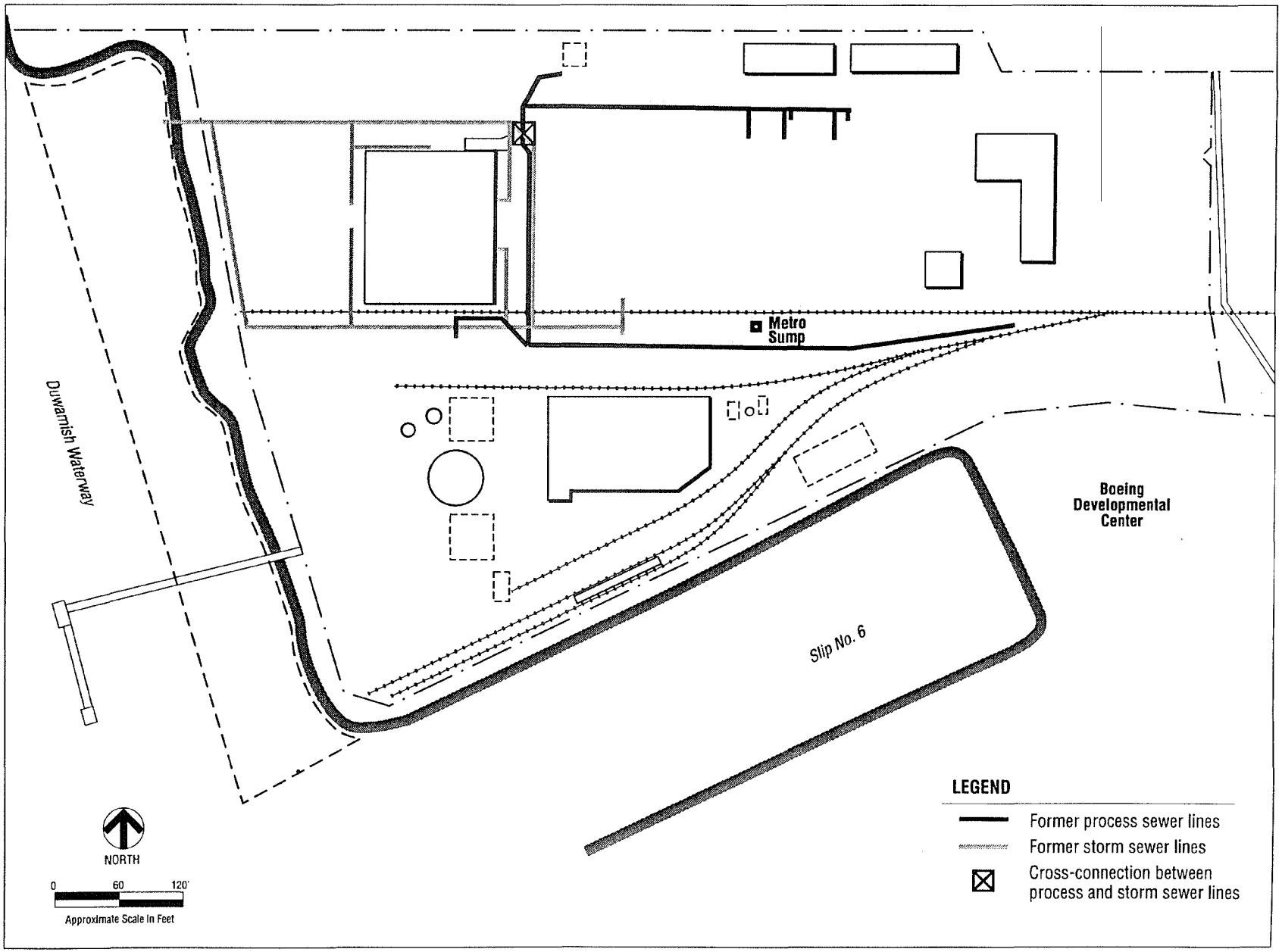
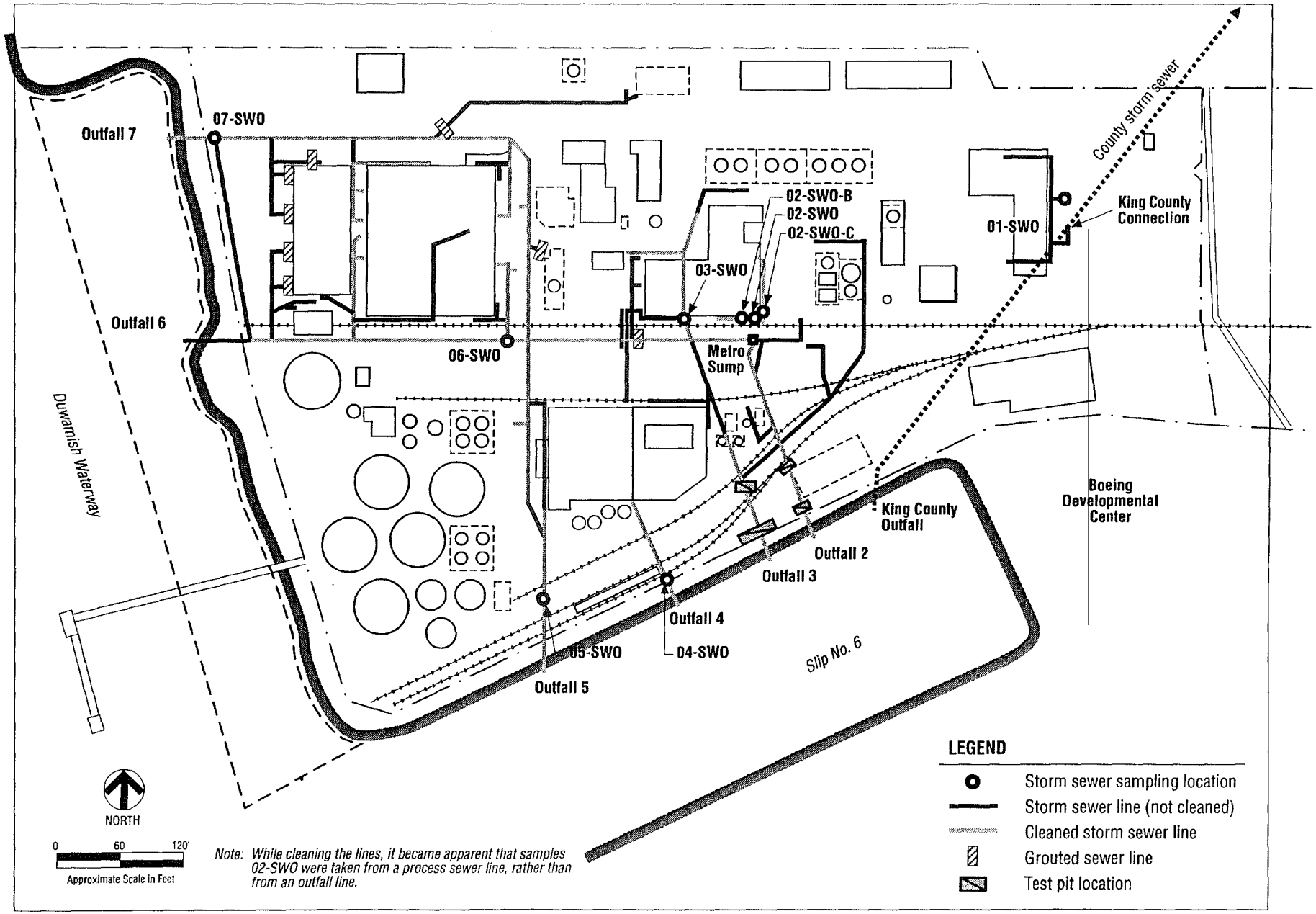


Figure 5-1
New Flow to Outfall 7

106063.A8 Z2 • Rhone-Poulenc • Storm sewer cleaned-BW • 12-12-95 • LW • JG



Note: While cleaning the lines, it became apparent that samples 02-SWO were taken from a process sewer line, rather than from an outfall line.

Figure 5-2
Locations of Storm Sewer Lines Cleaned

106063.A8.ZZ • Rhone-Poulenc • Pro. sewer cleaned-BW • 12-12-95 • LW • JG

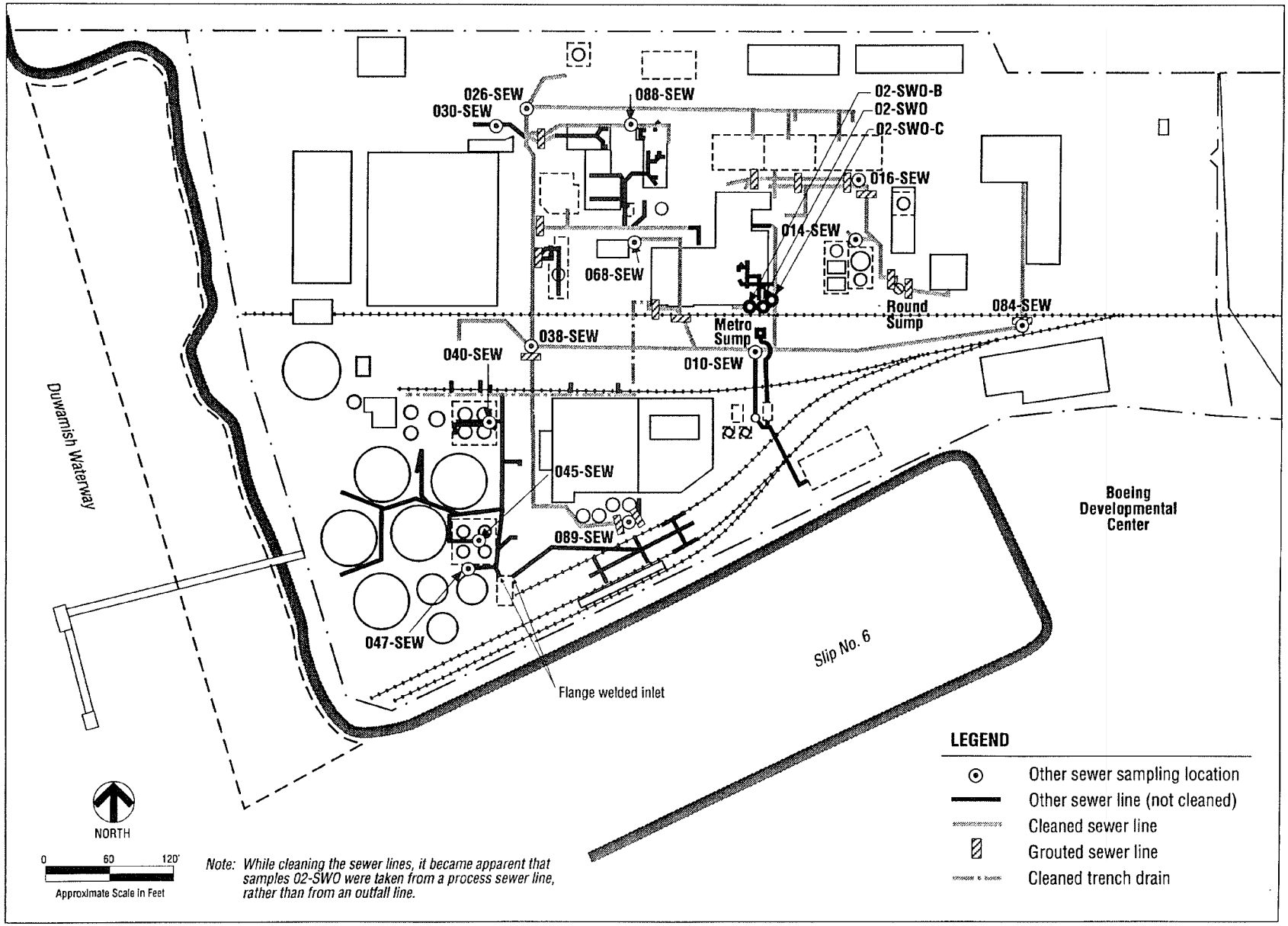
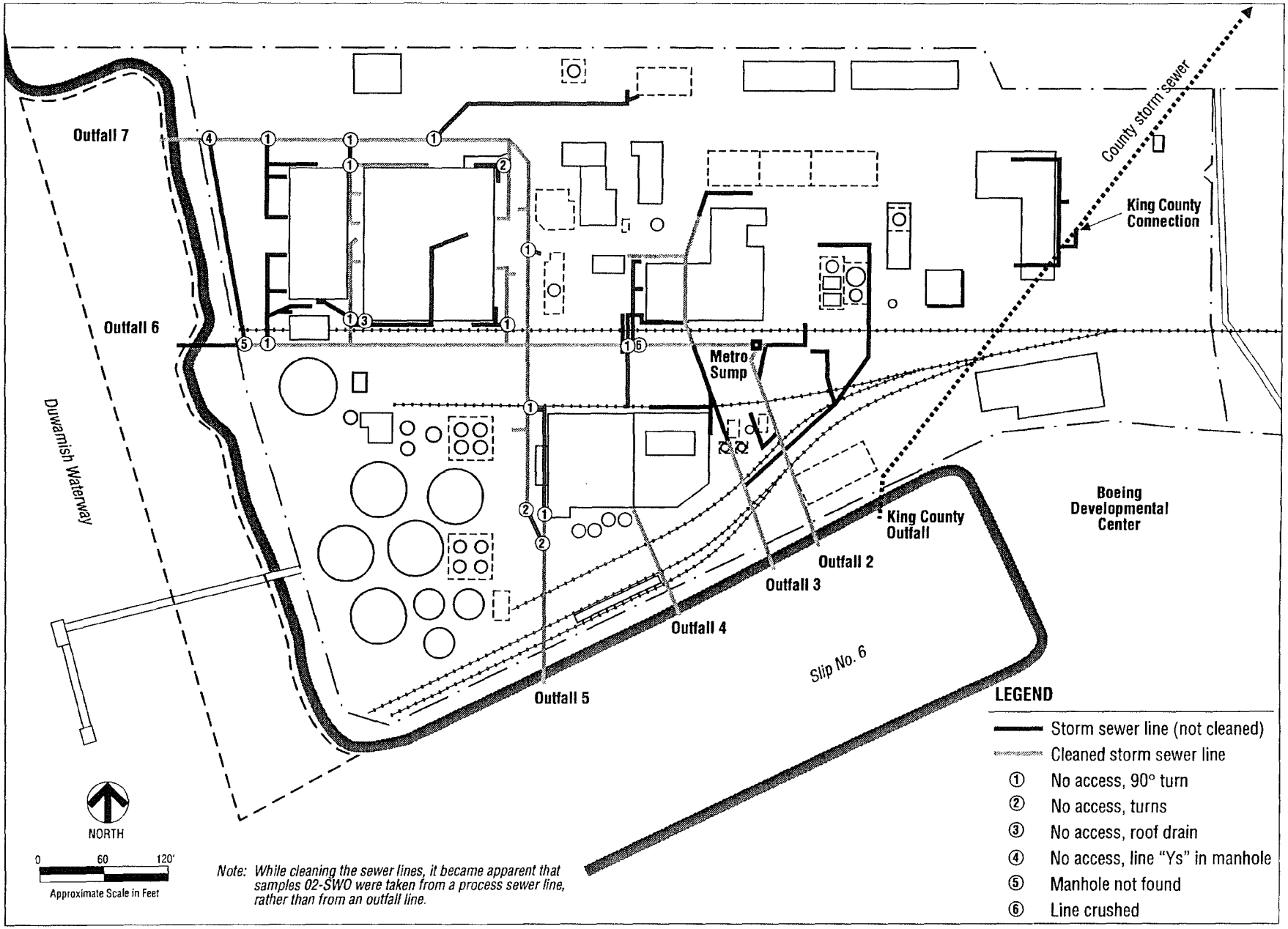


Figure 5-3
Locations of Other Sewer Lines Cleaned

106063 A8 ZZ • Rhone-Poulenc • 5-4/Storm sewer cleaned-BW • 12-12-95 • LW • JG



Note: While cleaning the sewer lines, it became apparent that samples 02-SWO were taken from a process sewer line, rather than from an outfall line.

Figure 5-4
Reasons for Not Cleaning Storm Sewer Lines

106063.A8.ZZ • Rhone-Poulenc • 5-5/Pro. sewer cleaned-BW • 12-12-95 • LW • JG

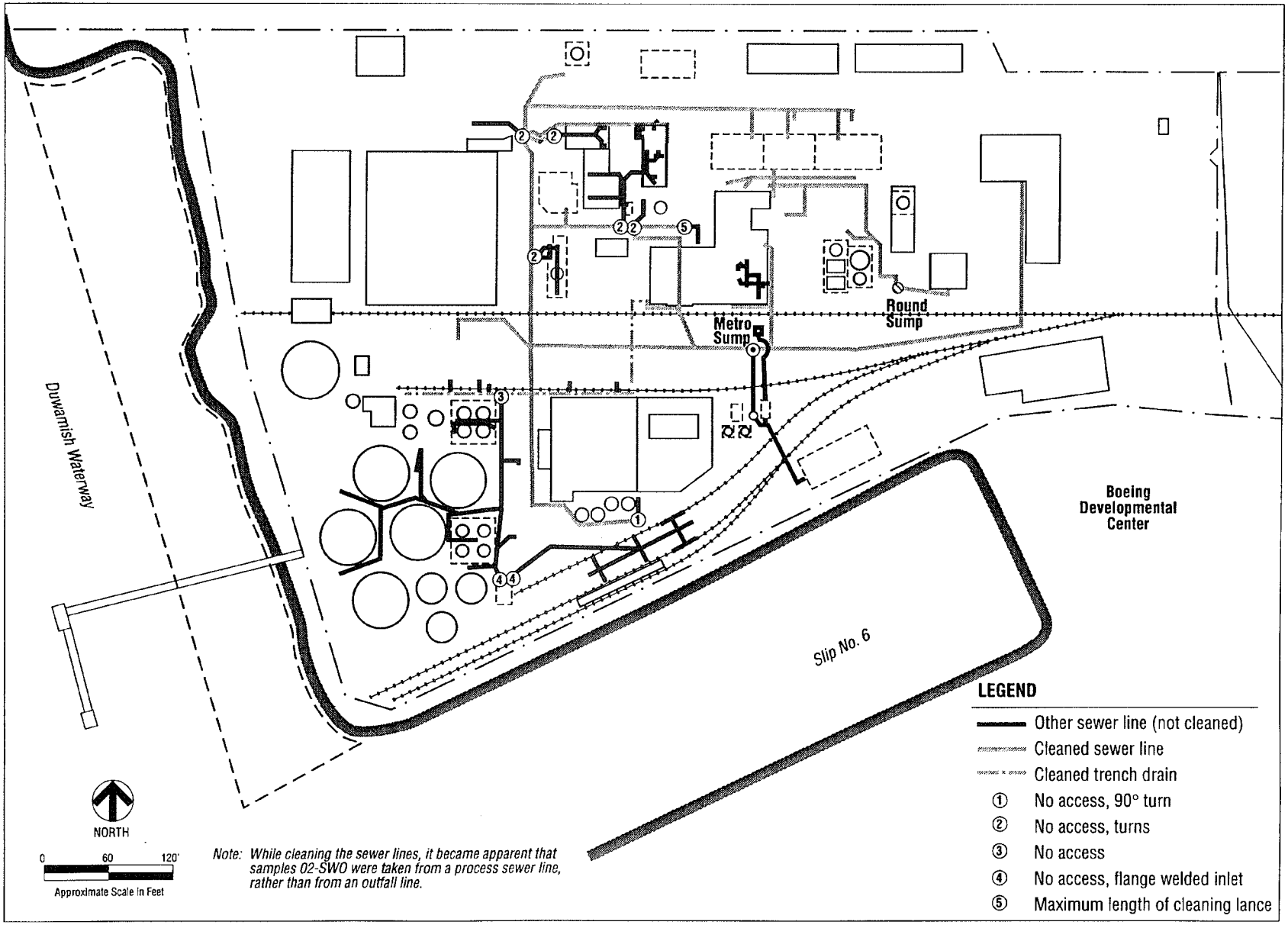


Figure 5-5
Reasons for Not Cleaning Other Sewer Lines

Tables

Table 2-1
Round 3 Groundwater Sampling and Analysis Matrix

Monitoring Well	BTEX	Conventionals[a]	Inorganics[b]	Semivolatiles	Volatiles
DM-1A			X		
DM-2A	X	X	X		
DM-3A			X		
DM-3B					X
DM-4	X		X		
DM-5	X	X	X		
DM-7	X	X	X		
DM-8		X	X		X
MW-12	X	X	X	X	
MW-13	X	X	X		
MW-14	X	X	X		
MW-15	X	X	X		
MW-16	X	X	X		
MW-17	X	X	X		
MW-18	X	X	X		
MW-19	X		X		
MW-20	X	X	X		
A2			X	X	X
A4			X		
A9	X		X		
B1A			X		
B1B			X		
B2	X		X		
B4	X		X		
B5	X	X	X		
B6	X	X	X	X	
C1			X		
E3			X		
G1			X		
G3	X	X	X		
H1	X		X		
H6	X	X	X		
H9	X	X	X		
H10			X	X	X
H11			X	X	X

[a] Conventional water quality parameters include phosphorus, nitrate, nitrite, total Kjeldahl nitrogen (TKN), methane in water, sulfide, total dissolved solids (TDS), total organic carbon (TOC), carbonate, bicarbonate, chloride, alkalinity as $CaCO_3$, and sulfate.
[b] Inorganics include Target Analyte List (TAL) metals and hexavalent chromium.

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12/7/95

Table 2-2
Analytical Methods for Round 3 Groundwater Samples

Parameter	Method
Volatiles	8240/CLP[a]
Semivolatiles	8270/CLP[a]
Metals	6010/7000/CLP[a]
Sulfide	9030[b]
Purgeable Aromatics (BTEX)	8020[b]
Sulfate	300.0[c]
Alkalinity as $CaCO_3$	310.1[c]
Carbonate/bicarbonate	310.1[c]
Nitrate	352.1[c] or 300.0[c]
Total Kjeldahl Nitrogen	351[c]
Total Dissolved Solids	160.1[c]
Total Organic Carbon	415.1[c]
Phosphorus (total and ortho)	365[d]
Chloride	325.2[c]
Methane	TO-3[e]
Dissolved Oxygen	Field manual
pH	Field manual
Temperature	Field manual
Specific Conductance	Field manual
Hexavalent Chromium	7197[f]/218.4[c]

[a]These parameters will be analyzed by U.S. EPA SW-846 methods (*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*) and U.S. EPA Contract Laboratory Program (CLP) QA/QC as described in EPA 1990 or later CLP Statement of Work. These analyses and QA/QC are described in Appendix G of the RFI Workplan.
[b]U.S. EPA SW-846 methods (see above); the QA/QC is described in Appendix G of the RFI Workplan.
[c]U.S. EPA. *Methods for Chemical Analysis of Water and Wastes*. EPA-600/4-79-020, 1979, revised 1983.
[d]American Public Health Association. *Standard Methods for the Examination of Water and Wastewater*, 16th edition, 1985.
[e]U.S. EPA. *Compendium of Methods for the Determination of Toxic Compounds in Ambient Air*, 1984.
[f]U.S. EPA SW-846 methods (see above); the QA/QC is equivalent to other non-CLP parameters in Appendix G of the RFI Workplan.
NA = Not applicable.

Table 2-3
Round 3 Groundwater Field Parameter Measurements

Well ID	Date	Depth to Water (feet)	Purge Volume (liters)	Temp. (°C)	pH	Spec. Conduct. (µm/cm)	Dissol. Oxygen (ppm)	ORP* (mv)	Comments
A2	3/30/95	12.64	0	---	---	---	---	---	
	3/30/95	NM	4	15.9	7.09	909	2.60	+001	Cloudy, no odor
	3/30/95	NM	6	16.1	7.17	909	2.95	-029	
	3/30/95	NM	8	15.9	7.16	895	2.65	-52	
	3/30/95	NM	10	15.9	7.2	874	2.70	-59	Clear, no odor
	3/30/95	13.30	Sample	15.9	7.19	880	2.70	-61	Clear, no odor
A4	3/31/95	13.09	0	---	---	---	---	---	Cloudy, odor
	3/31/95	NM	4	14.3	6.75	395	3.10	-061	
	3/31/95	NM	6	14.3	6.6	482	2.95	-049	
	3/31/95	NM	8	14.2	6.54	548	2.70	-037	
	3/31/95	NM	10	14.2	6.49	563	2.75	-037	Slight cloudiness
	3/31/95	13.40	Sample	14.2	6.47	565	2.75	-035	Slight cloudiness, odor
A9	3/30/95	14.36	0	---	---	---	---	---	
	3/30/95	NM	2	14.4	6.42	285	2.45	+032	Cloudy, odor
	3/30/95	NM	4	14.4	6.38	270	1.95	+027	
	3/30/95	NM	6	14.4	6.38	276	2.00	+026	
	3/30/95	14.49	Sample	14.4	6.38	272	2.00	+025	Clear, odor
B1A	3/31/95	8.25	0	---	---	---	---	---	
	3/31/95	NM	4	11.1	6.98	788	1.90	-070	Slight cloudiness, no odor
	3/31/95	NM	6	11.1	6.86	777	1.85	-038	
	3/31/95	NM	8	11.1	6.78	719	1.90	-035	
	3/31/95	NM	10	11.1	6.76	751	1.95	-034	Clear, no odor
	3/31/95	8.30	Sample	11.1	6.76	745	1.90	-032	Clear, no odor

Monsanto Company 104(e) Response

Monsanto 2A000930

Table 2-3
Round 3 Groundwater Field Parameter Measurements

Well ID	Date	Depth to Water (feet)	Purge Volume (liters)	Temp. (°C)	pH	Spec. Conduct. (µm/cm)	Dissol. Oxygen (ppm)	ORP* (mv)	Comments
B1B	3/31/95	8.24	0	---	---	---	---	---	Dark yellow tint, some odor
	3/31/95	NM	8	13.5	8.24	785	1.10	-088	
	3/31/95	NM	10	13.5	8.50	815	1.20	-102	
	3/31/95	NM	12	13.5	8.54	823	1.10	-121	
	3/31/95	NM	14	13.5	8.55	832	1.10	-124	
	3/31/95	NM	16	13.5	8.60	835	1.05	-126	
	3/31/95	8.39	Sample	13.5	8.61	838	1.05	-125	Clear, yellow tint, slight odor
B2	3/29/95	13.84	0	---	---	---	---	---	Dark black, turbid
	3/29/95	NM	4	16.2	7.23	1812	1.95	-018	
	3/29/95	NM	6	16.5	7.16	1612	1.45	-049	
	3/29/95	NM	8	16.5	7.16	1595	1.40	-062	
	3/29/95	NM	10	16.4	7.08	1606	1.40	-066	Dark black
	3/29/95	13.72	Sample	16.4	7.06	1602	1.40	-065	Clear, slight odor
B4	3/31/95	13.70	0	---	---	---	---	---	Cloudy, odor
	3/31/95	NM	4	14.9	7.42	2170	2.05	+021	Dark color
	3/31/95	NM	6	14.8	7.51	2200	1.90	+018	
	3/31/95	NM	8	14.7	7.54	2200	2.00	+014	
	3/31/95	NM	10	14.6	7.57	2220	1.95	+012	
	3/31/95	14.95	Sample	14.6	7.59	2224	2.00	+011	
B5	3/31/95	10.89	0	---	---	---	---	---	
	3/31/95	NM	4	14.6	6.73	617	2.60	-001	Cloudy, dark, odor
	3/31/95	NM	6	14.5	6.68	588	2.65	-014	
	3/31/95	NM	8	14.4	6.68	581	2.60	-018	
	3/31/95	NM	10	14.4	6.65	584	2.60	-021	Dark tint
	3/31/95	11.23	Sample	14.4	6.66	582	2.60	-022	Clear, slight odor

Monsanto Company 104(e) Response

Monsanto 2A000931

Table 2-3
Round 3 Groundwater Field Parameter Measurements

Well ID	Date	Depth to Water (feet)	Purge Volume (liters)	Temp. (°C)	pH	Spec. Conduct. (µm/cm)	Dissol. Oxygen (ppm)	ORP* (mv)	Comments
B6	3/31/95	12.59	0	15.5	6.41	765	3.30	+002	Cloudy, dark
	3/31/95	NM	4	15.5	6.85	737	3.80	-015	No odor
	3/31/95	NM	6	15.5	6.82	724	3.90	-022	
	3/31/95	NM	8	15.5	6.79	720	3.80	-024	Dark tint
	3/31/95	14.44	Sample	15.5	6.78	722	3.80	-025	Clear, no odor
C1	3/30/95	10.71	0	---	---	---	---	---	Cloudy, yellow
	3/30/95	NM	2	14.2	6.36	478	1.85	+080	Some odor
	3/30/95	NM	4	14.6	6.53	492	1.85	+062	
	3/30/95	NM	6	14.8	6.57	499	1.60	+050	
	3/30/95	NM	10	15.2	6.59	494	1.40	+039	
	3/30/95	NM	12	15.4	6.59	487	1.45	+038	Clear, yellow tint
	3/30/95	10.8	Sample	14.4	6.59	490	1.40	+039	No odor
DM-1A	3/30/95	3.57	0	---	---	---	---	---	
	3/30/95	NM	4	14.0	6.56	119	6.50	-018	Cloudy, no odor
	3/30/95	NM	6	13.9	6.57	118	6.50	-022	
	3/30/95	NM	8	14.1	6.61	119	6.50	-022	
	3/30/95	3.80	Sample	14.0	6.60	112	6.50	-021	Clear, no odor
DM-2A	3/29/95	15.19	0	---	---	---	---	---	Cloudy, odor
	3/29/95	NM	4	15.8	7.27	1957	1.80	+091	Dark color
	3/29/95	NM	6	15.7	7.31	1957	1.35	+071	
	3/29/95	NM	8	15.8	7.34	1960	1.35	+069	
	3/29/95	15.24	Sample	15.7	7.34	1957	1.35	+064	Clear, dark, odor

Monsanto Company 104(e) Response

Monsanto 2A000932

Table 2-3
Round 3 Groundwater Field Parameter Measurements

Well ID	Date	Depth to Water (feet)	Purge Volume (liters)	Temp. (°C)	pH	Spec. Conduct. (µm/cm)	Dissol. Oxygen (ppm)	ORP * (mv)	Comments
DM-3A	3/30/95	13.19	0	---	---	---	---	---	
	3/30/95	NM	4	13.9	6.87	225	3.50	+037	Turbid, no odor
	3/30/95	NM	6	13.7	6.89	230	3.50	+009	
	3/30/95	NM	8	13.7	6.91	239	2.80	+001	
	3/30/95	NM	10	13.7	6.94	246	2.75	+002	
	3/30/95	13.27	Sample	13.7	6.92	244	2.75	+007	Slight cloudiness, no odor
DM-3B	3/30/95	9.93	0	---	---	---	---	---	Cloudy, yellow
	3/30/95	NM	4	14.3	7.69	1302	1.90	+029	No odor
	3/30/95	NM	6	14.1	8.07	1350	1.55	+018	
	3/30/95	NM	8	14.1	8.09	1356	1.60	+012	
	3/30/95	NM	10	13.9	8.10	1358	1.50	+011	Clear, yellow
	3/30/95	NM	Sample	14.0	8.10	1361	1.50	+009	No odor
DM-4	3/29/95	12.41	0	---	---	---	---	---	
	3/29/95	NM	2	15.6	6.74	1355	2.00	+044	Cloudy, yellow
	3/29/95	NM	4	15.2	6.87	1320	1.80	+016	No odor
	3/29/95	NM	6	15.2	6.87	1291	1.80	-009	
	3/29/95	NM	8	15.1	6.87	1279	1.90	-037	
	3/29/95	NM	10	15.1	6.88	1273	1.90	-041	Clear, yellow
	3/29/95	12.38	Sample	15.1	6.87	1272	1.85	-043	No odor
DM-5	3/29/95	14.31	0	---	---	---	---	---	
	3/29/95	NM	4	16.1	7.35	5110	3.60	+050	Turbid, some odor
	3/29/95	NM	6	16.2	7.32	5160	2.70	+043	
	3/29/95	NM	8	16.1	7.31	5180	2.45	+031	
	3/29/95	NM	10	16.1	7.29	5180	2.50	+030	
	3/29/95	14.45	Sample	16.1	7.29	5170	2.45	+031	Dark, slight odor*

Monsanto Company 104(e) Response

Monsanto 2A000933

Table 2-3
Round 3 Groundwater Field Parameter Measurements

Well ID	Date	Depth to Water (feet)	Purge Volume (liters)	Temp. (°C)	pH	Spec. Conduct. (µm/cm)	Dissol. Oxygen (ppm)	ORP* (mv)	Comments
DM-7	3/30/95	12.55	0	---	---	---	---	---	Cloudy, odor
	3/30/95	NM	4	17.4	6.67	1067	1.30	+026	
	3/30/95	NM	6	17.3	6.72	1066	1.50	-001	
	3/30/95	NM	8	17.3	6.72	1066	1.50	-004	
	3/30/95	12.60	Sample	17.3	6.72	1066	1.55	-006	Clear, slight odor
DM-8	3/29/95	16.29	0	---	---	---	---	---	Cloudy, odor
	3/29/95	NM	4	18.1	6.79	2370	0.85	+026	Dark color
	3/29/95	NM	8	18.0	7.10	2530	0.60	+013	
	3/29/95	NM	10	17.8	7.02	2560	1.00	-054	
	3/29/95	NM	12	17.7	7.00	2550	0.95	-059	
	3/29/95	16.31	Sample	17.6	7.00	2540	0.95	-064	Clear, dark, odor*
E3	3/30/95	8.99	0	---	---	---	---	---	
	3/30/95	NM	4	13.6	6.38	482	2.30	+037	Cloudy, odor
	3/30/95	NM	6	13.7	6.46	533	1.95	+026	
	3/30/95	NM	8	13.8	6.47	542	2.05	+016	
	3/30/95	NM	10	13.7	6.48	549	1.90	+015	
	3/30/95	9.90	Sample	13.7	6.52	546	1.95	+014	Clear, odor
G1	3/31/95	11.15	0	---	---	---	---	---	
	3/31/95	NM	4	14.2	6.70	917	1.95	-035	Turbid, dark black, odor
	3/31/95	NM	6	14.2	6.73	917	1.75	-046	
	3/31/95	NM	8	14.2	6.70	947	1.80	-052	
	3/31/95	11.41	Sample	14.2	6.71	945	1.75	-055	Clear, no odor

Table 2-3
Round 3 Groundwater Field Parameter Measurements

Well ID	Date	Depth to Water (feet)	Purge Volume (liters)	Temp. (°C)	pH	Spec. Conduct. (µm/cm)	Dissol. Oxygen (ppm)	ORP[a] (mv)	Comments
MW-12	3/30/95	12.07	0	---	---	---	---	---	Dark color, sheen
	3/30/95	NM	4	16.8	6.82	1266	1.70	-082	Strong odor
	3/30/95	NM	6	17.0	6.76	1212	1.65	-070	
	3/30/95	NM	8	17.0	6.70	1205	1.75	-070	Clear, dark tint
	3/30/95	13.51	Sample	16.9	6.66	1198	1.65	-069	Odor
MW-13	3/30/95	12.42	0	---	---	---	---	---	
	3/30/95	NM	10	18.1	7.68	2890	0.75	+007	Cloudy, dark color
	3/30/95	NM	12	18.4	7.68	2770	1.30	+006	Odor
	3/30/95	NM	14	18.4	7.73	2780	0.65	+20	
	3/30/95	NM	16	18.4	7.72	2790	0.60	+17	Clear, dark yellow
	3/30/95	NM	Sample	18.4	7.75	2800	0.50	+16	Odor
MW-14	3/31/95	14.88	0	---	---	---	---	---	Cloudy, dark color
	3/31/95	NM	6	16.4	6.62	1628	1.50	-082	Slight odor
	3/31/95	NM	8	16.6	6.67	1623	1.25	-076	
	3/31/95	NM	10	16.7	6.67	1637	1.35	-074	
	3/31/95	NM	12	16.7	6.65	1649	1.30	-083	Clear, yellow tint
	3/31/95	15.05	Sample	16.7	6.67	1645	1.30	-087	No odor*
MW-15	3/31/95	13.90	0	---	---	---	---	---	
	3/31/95	NM	5	13.7	**	905	1.15	-020	Cloudy, sheen
	3/31/95	NM	7	13.6	**	1040	1.05	-035	Strong odor of toluene
	3/31/95	NM	9	13.6	**	1090	1.00	-038	
	3/31/95	14.00	Sample	13.5	**	1095	1.15	-042	Clear, dark tint, odor

Table 2-3
Round 3 Groundwater Field Parameter Measurements

Well ID	Date	Depth to Water (feet)	Purge Volume (liters)	Temp. (°C)	pH	Spec. Conduct. (µm/cm)	Dissol. Oxygen (ppm)	ORP* (mv)	Comments
MW-16	3/31/95	14.05	0	15.0	11.25	9780	0.35	---	Cloudy, dark color
	3/31/95	NM	6	15.0	11.26	9870	0.15	-300	Odor
	3/31/95	NM	8	15.0	11.30	10920	0.05	-310	
	3/31/95	NM	10	15.0	11.20	11200	0.05	-303	Clear, dark tint
	3/31/95	15.10	Sample	15.0	11.24	11190	0.05	-295	Some odor
G3	3/31/95	12.78	0	---	---	---	---	---	
	3/31/95	NM	4	15.0	7.05	432	2.60	+002	Turbid, odor
	3/31/95	NM	6	15.0	7.18	430	2.70	+001	
	3/31/95	NM	8	14.9	7.20	440	2.70	000	
	3/31/95	NM	10	14.8	7.26	451	2.60	-002	
	3/31/95	13.51	Sample	14.8	7.25	450	2.55	-004	Cloudy, slight odor
H1	3/29/95	12.48	0	---	---	---	---	---	
	3/29/95	NM	4	16.4	7.40	2560	0.65	+026	Cloudy, yellow
	3/29/95	NM	6	16.4	7.54	2540	1.05	+021	Slight odor
	3/29/95	NM	8	16.3	7.55	2520	0.95	+017	
	3/29/95	NM	10	16.3	7.60	2520	0.75	+019	Clear, yellow tint
	3/29/95	15.30	Sample	16.3	7.61	2520	0.65	+021	No odor
H6	3/29/95	16.00	0	13.5	7.46	422	2.60	+077	Cloudy, dark tint
	3/29/95	NM	1	13.4	7.49	424	2.40	+067	Odor
	3/29/95	NM	3	13.4	7.57	439	2.45	+067	
	3/29/95	NM	4	13.3	7.56	449	2.45	+059	
	3/29/95	16.62	Sample	13.3	7.57	451	2.40	+059	Clear, yellow, odor

Table 2-3
Round 3 Groundwater Field Parameter Measurements

Well ID	Date	Depth to Water (feet)	Purge Volume (liters)	Temp. (°C)	pH	Spec. Conduct. (µm/cm)	Dissol. Oxygen (ppm)	ORP* (mv)	Comments
H9	3/29/95	12.43	0	---	---	---	---	---	
	3/29/95	NM	6	13.4	7.00	6.90	2.60	+031	Cloudy, dark, odor
	3/29/95	NM	8	13.4	7.11	6.89	2.75	+025	
	3/29/95	NM	10	13.4	7.19	7.13	2.75	+018	
	3/29/95	12.91	Sample	13.4	7.20	7.12	2.70	+016	Clear, dark tint, odor
H10	3/30/95	12.48	0	No readings taken because of emulsified product in purge water; pH probe contaminated					Visible product, odor
	3/30/95	NM	20						
	3/30/95	12.92	Sample						
H11	3/30/95	12.8	0	---	---	---	---	---	
	3/30/95	NM	2	17.3	6.91	3290	0.40	-122	Cloudy, dark color
	3/30/95	NM	4	17.4	7.09	3370	0.25	-133	Strong odor
	3/30/95	NM	6	17.4	7.04	3420	0.25	-135	
	3/30/95	NM	8	17.4	7.02	3430	0.25	-136	
	3/30/95	12.87	Sample	17.2	7.01	3410	0.30	-136	Clear, dark yellow, odor*
MW-17	3/31/95	14.27	0	---	---	---	---	---	Cloudy, dark tint
	3/31/95	NM	4	15.0	6.81	2480	0.75	-055	Odor
	3/31/95	NM	6	15.0	6.94	2220	0.80	-070	
	3/31/95	NM	8	14.9	6.98	2305	0.75	-077	
	3/31/95	NM	10	14.9	6.98	2340	0.75	-079	Clear, dark color
	3/31/95	14.73	Sample	14.9	6.97	2330	0.80	-072	Slight odor*
MW-18	3/30/95	14.75	0	---	---	---	---	---	
	3/30/95	NM	2	16.5	6.89	670	1.10	-020	Sheen, dark tint
	3/30/95	NM	4	16.4	6.88	668	1.05	-026	Strong odor
	3/30/95	NM	6	16.4	6.86	662	0.95	-030	
	3/30/95	NM	8	16.4	6.86	666	0.95	-034	Clear, dark tint
	3/30/95	14.92	Sample	16.4	6.87	660	0.90	-035	Strong odor

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Table 2-3
Round 3 Groundwater Field Parameter Measurements

Well ID	Date	Depth to Water (feet)	Purge Volume (liters)	Temp. (°C)	pH	Spec. Conduct. (µm/cm)	Dissol. Oxygen (ppm)	ORP* (mv)	Comments
MW-19	3/30/95	11.85	0	---	---	---	---	---	Cloudy, dark color
	3/30/95	NM	6	16.2	6.95	567	1.85	-018	Odor
	3/30/95	NM	8	16.2	6.82	604	1.95	-018	
	3/30/95	NM	10	16.2	6.73	660	1.85	-022	
	3/30/95	NM	12	16.2	6.75	693	1.80	-023	Clear, dark tint
	3/30/95	11.88	Sample	16.1	6.72	699	1.80	-026	Odor
MW-20	3/31/95	13.99	0	---	---	---	---	---	
	3/31/95	NM	4	14.6	6.74	193	2.80	-054	Cloudy, no odor
	3/31/95	NM	6	14.6	6.48	145	2.25	-044	
	3/31/95	NM	8	14.6	6.32	137	2.30	-028	
	3/31/95	NM	10	14.5	6.28	140	2.40	-032	
	3/31/95	14.20	Sample	14.5	6.31	138	2.35	-030	Slight cloudiness, no odor

* = Sample effervesces when added to acid.
** = pH readings not stable.
*ORP = Oxidation reduction potential in millivolts.
NM = Not measured.

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Table 2-5
Analytical Methods for Seep Samples

Parameter	Method
Volatiles	8240/CLP[a]
Semivolatiles	8270/CLP[a]
Pesticides/PCBs	8080/CLP[a]
Metals and common ions (Na, K, Mg, Ca)	6010/7000/CLP[a]
Sulfide	9030[b]
Herbicides	8150[b]
Organophosphorus Pesticides	8140[b]
Formaldehyde	8315[b]
Sulfate	300.0[c]
Alkalinity as $CaCO_3$	310.1[d]
Carbonate/Bicarbonate	310.1[d]
Nitrate/Nitrite	353.2[c]
Total Kjeldahl Nitrogen	351[c]
Total Dissolved Solids	160.1[c]
Total Organic Carbon	415.1[c]
Phosphorus (total and ortho)	365[b]
Chloride	325.2[c]
Hexavalent Chromium	7197[e]
Guaiacol, Vanillin, and Resin Acids	NCASI Method RA/FA-85.01M

[a]These parameters were analyzed by U.S. EPA SW-846 methods (*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*) and U.S. EPA Contract Laboratory Program (CLP) QA/QC as described in EPA 1990 or later CLP Statement of Work.
[b]U.S. EPA SW-846 methods (see above).
[c]U.S. EPA. *Methods for Chemical Analysis of Water and Wastes*. EPA-600/4-79-020, 1979, revised 1983.
[d]American Public Health Association. *Standard Methods for the Examination of Water and Wastewater*, 16th edition, 1985.
[e]U.S. EPA SW-846 methods (see above); the QA/QC is equivalent to other non-CLP parameters in Appendix G of the RFI Workplan.

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Table 2-6
Seep and Surface Water Field Parameters

Sample Number	Time and Date	Tide Height[a] (ft)	Salinity (ppt)	Dissolved Oxygen (mg/l)	Electrical Conductance (µmhos)	Temperature (°C)	pH
Seep Samples							
01-SP	1430 4/18	-1.7	NM	2.6	14,200	11.9	6.37
02-SP[b]	1435 4/19	-1.6	7.2	2.6	8,800	12.4	7.16
03-SP	1500 4/18	-1.2	NM	8.0	12,200	11.0	6.78
04-SP	1540 4/19	-1.1	12.3	7.8	14,000	10.8	7.79
05-SP	1510 4/20	-0.7	4.5	9.9	5,000	12.7	6.87
06-SP	1540 4/20	-1.0	8.2	8.6	10,400	11.0	6.91
07-SP	1610 4/20	-1.0	2.5	8.4	2,450	13.8	7.54
Surface Water Samples							
01-SW	1120 4/19	+4.8	5.0	10.6	600	9.0	6.63
02-SW	1140 4/19	+4.0	5.8	11.8	5,100	9.0	6.97

[a]Approximate height of tide (with respect to mean lower low water) at the time of the sample collection.
[b]This sample was collected from seep 2, which had a dark brown tint. Seep 3 was slightly tea-colored. All other seeps were clear.
NM = Not measured.
ppt = Parts per thousand.

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Table 2-7
Sewer Sediment Sampling Locations and Rationale

Sample Number	Sewer System	Sampling Location[a] and Rationale	Actual Sampling Point
01-SWO	Storm	One of several catch basins remaining upstream of the Facility discharge to the King County Storm Drain	Catch basin
02-SWO	Storm	Believed to be part of historical outfall 2; sampled from broken pipe just north of Metro sump, in trench	Pipe in utility trench
03-SWO	Storm	Historical outfall 3; tried unsuccessfully to locate pipe near fence line; partial sample from valve box	Pipe in catch basin
04-SWO	Storm	Historical outfall 4; sampled from pipe exposed in test pit	Pipe in backhoe pit
05-SWO	Storm	Historical outfall 5; sampled from pipe exposed in test pit	Pipe in backhoe pit
06-SWO	Storm	Only sampling point accessible; line was rerouted to outfall 7	Pipe in manhole
07-SWO	Storm	Historical outfall 7 just up from outfall; duplicate sample	Manhole
10-SEW	Process	Centrally located, received flow from laboratory and street	Manhole
14-SEW	Process	Catch basin to intercept drain, tank storage area; duplicate sample	Catch basin
16-SEW	Process	Portion of closed-loop intercept drain system, vanillin production area	Catch basin
26-SEW	Process	Junction downstream from process tank storage area, vanillin and toluene areas, and sulfuric acid storage and unloading areas	Manhole
30-SEW	Storm/ Process	Part of a loop that received stormwater from northwest corner of Facility; capability to reroute to process system	Manhole
38-SEW	Process	Junction of process lines	Manhole
40-SEW	Process	Toluene tank farm	Catch basin

Table 2-7
Sewer Sediment Sampling Locations and Rationale

Sample Number	Sewer System	Sampling Location[a] and Rationale	Actual Sampling Point
45-SEW	Process	Monsize tank farm	Catch basin
47-SEW	Process	Caustic tank farm	Catch basin
61-SEW or 64-SEW	Process	Vanillin black liquid/lignin tank farm; not sampled, catch basins under water	Not sampled[b]
62-SEW	Process	Larox area of vanillin black liquid/lignin tank farm; not sampled, no sediment present	Not sampled[b]
68-SEW	Process	Only available catch basin, center of Facility (Control Building)	Catch basin
84-SEW	Process	Manhole from laboratory	Manhole
88-SEW	Process	Process drain in vanillin production area	Sump
89-SEW	Process	Catch basin near mersize tanks by maintenance shop	Catch basin

SWO = Sewer sediment samples from outfall pipes or discharge pipe to King County Storm Drain.
SEW = Other sewer sediment samples.
[a]The sampling locations are shown in Figures 2-3 and 2-4.
[b]Sampling locations 61, 62, and 64 were not sampled because of insufficient sediment.

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Table 2-8
Sewer Sediment Sampling and Analysis Matrix

Sample Number	BTEX	TOC	Inorganics	Semivolatiles	PCBs	Grain Size
01-SWO	X	X	X	X	X	X
02-SWO	X	X	X	X	X	X
03-SWO	X	X	X	X	X	X
04-SWO	X	X	X	X	X	X
05-SWO	X	X	X	X	X	X
06-SWO	X	X	X	X	X	X
07-SWO[a]	X	X	X	X	X	X
10-SEW	X	X	X	X	X	
14-SEW	X	X	X	X	X	
16-SEW[a]	X	X	X	X	X	
26-SEW	X	X	X	X	X	
30-SEW	X	X	X	X	X	
38-SEW	X	X	X	X	X	
40-SEW	X	X	X	X	X	
45-SEW	X	X	X	X	X	
47-SEW	X	X	X	X	X	
68-SEW	X	X	X	X	X	
84-SEW	X	X	X	X	X	
88-SEW	X	X	X	X	X	
89-SEW	X	X	X	X	X	

[a]Duplicate samples were collected and analyzed.

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Table 2-9
Analytical Methods for Sewer Sediment Samples

Parameters	Methods
Stormwater Outfall Sampling	
BTEX	8240/CLP[a]/PSEP[b]
Semivolatile Organic Compounds	8270/CLP[a]/PSEP[b]
PCBs	8081/CLP[a]/PSEP[b]
Total Metals (arsenic, cadmium, chromium, copper, lead, silver, zinc)	6010/CLP[a]/PSEP[b]
Total Organic Carbon	Standard Methods 5310B[c]/PSEP[b]
pH	150.1[d]
Grain Size	ASTM D422[e]/PSEP[b]
Specific Gravity	ASTM D854[e]
Process and Sewer System Sampling	
BTEX	8240/CLP[a]/PSEP[b]
Semivolatile Organic Compounds	8270/CLP[a]/PSEP[b]
PCBs	8081/CLP[a]/PSEP[b]
Total Metals (arsenic, cadmium, chromium, copper, lead, silver, zinc)	6010/CLP[a]/PSEP[b]
Total Organic Carbon	Standard Methods 5310B[c]/PSEP[b]

[a]These parameters will be analyzed by U.S. EPA SW-846 methods (*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*) and U.S. EPA Contract Laboratory Program (CLP) QA/QC as described in EPA 1990 or later CLP Statement of Work.
[b]Puget Sound Estuary Program.
[c]American Public Health Association, *Standard Methods for the Examination of Water and Wastewater*, 16th edition, 1985.
[d]U.S. EPA. *Methods for Chemical Analysis of Water and Wastes*. EP-600/4-79-020, 1979, revised 1983.
[e]American Society for Testing and Materials.

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Table 3-1
Groundwater Field Duplicates–Detected Results

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	Units	A-2 (Original)	A-2D (Duplicate)	RPD	DM-7 (Original)	DM-7 (Duplicate)	RPD
BTEX							
Benzene	µg/l				3	3	0.0%
Conventional Parameters							
Alkalinity (as $CaCO_3$)	mg/l				490	510	4.0%
Ammonia	mg/l				3.7	3.5	5.6%
Bicarbonate (from alkalinity)	mg/l				490	510	4.0%
Chloride	mg/l				52	52	0.0%
Methane	ppmv				510	700	**31.4%**
Nitrate Nitrogen	mg/l				ND	0.35	NC
Nitrite Nitrogen	mg/l				0.05	0.06	18.2%
Nitrogen, Kjeldahl	mg/l				5.1	5.1	0.0%
Phosphate, Ortho	mg/l				2.1	2.6	21.3%
Phosphorus	mg/l				2.1	2	4.9%
Specific Conductance	µmhos/cm				1,400	1,400	0.0%
Sulfate	mg/l				13	13	0.0%
Sulfide as S	mg/l				ND	0.1	NC
Total Dissolved Solids	mg/l				860	800	7.2%
Total Hardness, $CaCO_3$	mg/l				110	96	13.6%
Total Organic Carbon	mg/l				51	59	14.5%
pH (lab)	-log+H				6.5	6.5	0.0%
Inorganics							
Aluminum, Total	µg/l	1,140	1,630	**35.4%**			
Arsenic, Total	µg/l	40	42.5	6.1%			
Barium, Total	µg/l	18B	21.3B	16.8%	28.4B	24.3B	15.6%
Boron, Total	µg/l	807	417B	**63.7%**	289B	322B	10.8%
Calcium, Total	µg/l	3,820B	4,450B	15.2%	15,900	16,100	1.3%
Chromium, Total	µg/l	16.8	18.3	8.5%	9.1B	8.9B	2.2%
Copper, Total	µg/l	12.5B	12.6B	0.8%			
Iron, Total	µg/l	14,500	15,800	8.6%	27,900	28,400	1.8%

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12/14/95

Table 3-1
Groundwater Field Duplicates–Detected Results

	Units	A-2 (Original)	A-2D (Duplicate)	RPD	DM-7 (Original)	DM-7 (Duplicate)	RPD
Magnesium, Total	µg/l	6,280	6,920	9.7%	11,500	11,600	0.9%
Manganese, Total	µg/l	668	706	5.5%	3,540	3,550	0.3%
Potassium, Total	µg/l	7,590	7,880	3.7%	8,460	8,510	0.6%
Sodium, Total	µg/l	222,000	228,000	2.7%	246,000	244,000	0.8%
Vanadium, Total	µg/l	207	220	6.1%	54	54.1	0.2%
Zinc, Total	µg/l	8.4B	11.5B	**31.2%**	41.8	7.2B	**141.2%**
Semivolatiles							
Bis(2-chloroethyl)ether	µg/l	1J	ND	NC			
Volatiles							
1,1-dichloroethane	µg/l	0.6J	0.6J	0.0%			
1,2-dichloroethene (Total)	µg/l	0.3J	0.3J	0.0%			

B = Below Contract-Required Detection Limit.
J = Estimated value.
NC = Not calculable.
ND = Nondetection.
RPD = Relative Percent Deviation = $\frac{\text{(Original - Duplicate)}}{\text{(Original + Duplicate)/2}} \times 100$
RPD percentages in bold are those RPDs that did not meet the quality assurance objective for precision.

Table 3-2
Quality Assurance Objectives for Groundwater Analyses

Parameter	Method	Target Detection Limit[a]	Accuracy (percent recovery)	Precision (relative percent deviation)	Completeness (percent)
Volatiles	8240/CLP[b]	PQL	CLP[b]	CLP[b]	90
Semivolatiles	8270/CLP[b]	PQL	CLP[b]	CLP[b]	90
Metals	6010/7000/CLP[b]	PQL	CLP[b]	CLP[b]	90
Sulfide	9030[c]	PQL	75 to 125	±25	90
Purgeable Aromatics (BTEX)	8020[c]	0.5 µg/l	75 to 125	±25	90
Sulfate	300.0[d]	5 mg/l	75 to 125	±25	90
Alkalinity as $CaCO_3$	310.1[d]	2 to 20 mg/l	NA	±25	90
Carbonate/bicarbonate	310.1[d]	2 to 20 mg/l	NA	±25	90
Nitrate	352.1[d] or 300.0[d]	0.1 mg/l	75 to 125	±25	90
Total Kjeldahl Nitrogen	351[d]	1-1 mg/l	75 to 125	±25	90
Total Dissolved Solids	160.1[d]	3 mg/l	NA	±10	90
Total Organic Carbon	415.1[d]	2 mg/l	75 to 125	±25	90
Phosphorus (total and ortho)	365[c]	0.01 mg/l	75 to 125	±25	90
Chloride	325.2[d]	5 mg/l	75 to 125	±25	90
Hexavalent Chromium	7197[f]/218.4[d]	PQL	75-125	±25	90
Methane	TO-3[g]	20 ppmv	75 to 125	±25	90
Dissolved Oxygen	Field manual	NA	NA	±25	90
pH	Field manual	NA	NA	±25	90

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Table 3-2
Quality Assurance Objectives for Groundwater Analyses

Parameter	Method	Target Detection Limit[a]	Accuracy (percent recovery)	Precision (relative percent deviation)	Completeness (percent)
Temperature	Field manual	NA	NA	±25	90
Electrical Conductivity	Field manual	NA	NA	±25	90

[a]These are target values; actual limits depend on nature of specific matrix and were reported in the individual sample result reports. PQL = Practical Quantitation Limit per U.S. EPA SW-846.
[b]These parameters were analyzed by U.S. EPA SW-846 methods (*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*) and QA/QC equivalent to U.S. EPA Contract Laboratory Program (CLP) QA/QC as described in EPA 1990 or later CLP Statement of Work.
[c]U.S. EPA SW-846 methods (see above).
[d]U.S. EPA. *Methods for Chemical Analysis of Water and Wastes.* EPA-600/4-79-020, 1979, revised 1983.
[e]American Public Health Association. *Standard Methods for the Examination of Water and Wastewater*, 16th edition, 1985.
[f]U.S. EPA SW-846 methods (see above); the QA/QC is equivalent to other non-CLP parameters in Appendix G in the RFI Workplan.
[g]U.S. EPA. *Compendium of Methods for the Determination of Toxic Compounds in Ambient Air*, 1984.
NA = Not applicable.

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Monsanto Company 104(e) Response

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Table 3-3
Seep Field Duplicates–Detected Results

Analyte	Units	02-SP (Original)	08-SP (Duplicate)	RPD
Conventional Parameters				
Alkalinity (as $CaCO_3$)	mg/l	960	1,000	4.1%
Bicarbonate (from alkalinity)	mg/l	960	1,000	4.1%
Chloride	mg/l	4,600	4,000	14.0%
Nitrate Nitrogen	mg/l	0.21	0.23	9.1%
Nitrite Nitrogen	mg/l	0.07	0.09	25.0%
Nitrogen, Kjeldahl	mg/l	2.6	1.5	53.7%
Phosphorus	mg/l	1.6	1.6	0.0%
Sulfate	mg/l	570	500	13.1%
Total Dissolved Solids	mg/l	8,600	9,000	4.5%
Total Organic Carbon	mg/l	180	140	25.0%
Inorganics				
Aluminum, Total	µg/l	64,700	54,400	17.3%
Arsenic, Total	µg/l	29.5	32.5	9.7%
Barium, Total	µg/l	187B	160B	15.6%
Beryllium, Total	µg/l	0.84B	0.94B	11.2%
Cadmium, Total	µg/l	12.6	10.6	17.2%
Calcium, Total	µg/l	110,000	98,900	10.6%
Chromium, Total	µg/l	211	192	9.4%
Cobalt, Total	µg/l	59.1	51.9	13.0%
Copper, Total	µg/l	209	196	6.4%
Lead, Total	µg/L	47.8	40.3	17.0%
Magnesium, Total	µg/l	281,000	255,000	9.7%
Nickel, Total	µg/l	75.9	64.1	16.9%
Potassium, Total	µg/l	128,000	122,000	4.8%
Sodium, Total	µg/l	2,850,000	2,700,000	5.4%
Vanadium, Total	µg/l	419	381	9.5%
Zinc, Total	µg/l	242	203	17.5%
Semivolatiles				
Bis(2-ethylhexyl)phthalate	µg/l	15.3	38.6	**86.5%**

B = Below Contract-Required Detection Limit.

$$\text{RPD} = \text{Relative Percent Deviation} = \frac{(\text{Original} - \text{Duplicate})}{(\text{Original} + \text{Duplicate})/2} \times 100$$

RPD percentages in bold are those RPDs that did not meet the quality assurance objective for precision.

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Table 3-4
Quality Assurance Objectives for Seep Analyses

Parameter	Method	Target Detection Limit[a]	Accuracy (percent recovery)	Precision (relative percent deviation)	Completeness (percent)
Volatiles	8240/CLP[b]	PQL	CLP[b]	CLP[b]	90
Semivolatiles	8270/CLP[b]	PQL	CLP[b]	CLP[b]	90
Pesticides/PCBs	8080/CLP[b]	PQL	CLP[b]	CLP[b]	90
Metals	6010/7000/CLP[b]	PQL	CLP[b]	CLP[b]	90
Sulfide	9030[c]	PQL	75-125	±25	90
Herbicides	8150[c]	PQL	75-125	±25	90
Organophosphorus pesticides	8140[c]	PQL	75-125	±25	90
Formaldehyde	8315[c]	PQL	57-114	±50	90
Sulfate	300.0[d]	5 mg/l	75 to 125	±25	90
Alkalinity as $CaCO_3$	310.1[e]	2 to 20 mg/l	NA	±25	90
Carbonate/bicarbonate	310.1[e]	2 to 20 mg/l	NA	±25	90
Nitrate	353.2[d]	0.1 mg/l	75 to 125	±25	90
Total Kjeldahl nitrogen	351[d]	1-1 mg/l	75 to 125	±25	90
Total dissolved solids	160.1[d]	3 mg/l	NA	±10	90
Total organic carbon	415.1[d]	2 mg/l	75-125	±25	90
Phosphorus (total and ortho)	365[e]	0.01 mg/l	75 to 125	±25	90
Chloride	325.2[d]	5 mg/l	75 to 125	±25	90
Hexavalent Chromium	7197[f]	PQL	75 to 125	±25	90

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Table 3-4
Quality Assurance Objectives for Seep Analyses

Parameter	Method	Target Detection Limit[a]	Accuracy (percent recovery)	Precision (relative percent deviation)	Completeness (percent)
Guaiacol, Vanillin, and Resin Acids	NCASI Method RA/FA-85.01M	10 µg/l	75 to 125	±25	90

[a]These are target values; actual limits depend on nature of specific matrix and were reported in the individual sample result reports. PQL = Practical Quantitation Limit per U.S. EPA SW-846.
[b]These parameters were analyzed by U.S. EPA SW-846 methods (*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*) and QA/QC equivalent to U.S. EPA Contract Laboratory Program (CLP) QA/QC as described in EPA 1990 or later CLP Statement of Work.
[c]U.S. EPA SW-846 methods (see above).
[d]U.S. EPA. *Methods for Chemical Analysis of Water and Wastes.* EPA-600/4-79-020, 1979, revised 1983.
[e]American Public Health Association. *Standard Methods for the Examination of Water and Wastewater*, 16th edition, 1985.
[f]U.S. EPA SW-846 methods (see above); the QA/QC is equivalent to other non-CLP parameters in Appendix G of the RFI Workplan.
[g]National Council of the Paper Industry for Air and Stream Improvement Technical Bulletin #510, August 1985, Method Resin Acids/Fatty Acids-85.01M. The QA/QC is equivalent to other non-CLP parameters in Appendix G of the RFI Workplan.

Monsanto Company 104(e) Response

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Table 3-5
Sewer Sediment Field Duplicates–Detected Results

	Units	014-SEW (Original)	838-SEW (Duplicate)	RPD	07-SWO (Original)	08-SWO (Duplicate)	RPD
BTEX							
Ethylbenzene	µg/kg	ND	18	NC	8		
Toluene	µg/kg	33,000	120,000D	**113.7%**	8	9	11.8%
Xylene (Total)	µg/kg	ND	28	NC			
Conventional Parameters							
Total Organic Carbon	mg/kg	193,000	92,700	**70.2%**	55,700	29,700	**60.9%**
pH (lab)	-log+H				8.4	8.4	0.0%
Inorganics							
Arsenic, Total	mg/kg	49.5	47.1	5.0%	59.8	35.3	**51.5%**
Cadmium, Total	mg/kg	23.1	24.5	5.9%	27	18.1	**39.5%**
Chromium, Total	mg/kg	75.6	76.5	1.2%	65.6	43.4	40.7%
Copper, Total	mg/kg	10,900	10,200	6.6%	1,650	1,600	3.1%
Lead, Total	mg/kg	283	329	15.0%	128	131	2.3%
Silver, Total	mg/kg	4.5B	4.1B	9.3%	3.9	2.9	**29.4%**
Zinc, Total	mg/kg	3,590	3,720	3.6%	4,570	3,290	**32.6%**
PCBs							
Aroclor 1254	µg/kg	ND	1,910D	NC	9,960D	11,000D	9.9%
Semivolatiles							
2-methylnaphthalene	µg/kg	1,100	1,000	9.5%			
4-methylphenol	µg/kg	910	930	2.2%			
Acenaphthene	µg/kg				1,200	430	**94.5%**
Acenaphthylene	µg/kg	1,500	1,200	22.2%			
Anthracene	µg/kg	6,500	4,500	**36.4%**	3,800	750	**134.1%**
Benzo(a)anthracene	µg/kg	2,900	4,400	**41.1%**	10,000	3,200	**103.0%**
Benzo(a)pyrene	µg/kg	6,300	5,300	17.2%	8,700	2,800	**102.6%**
Benzo(b)fluoranthene	µg/kg	7,200	7,200	0.0%	14,000	3,700	**116.4%**
Benzo(ghi)perylene	µg/kg				5,300	ND	NC
Benzo(k)fluoranthene	µg/kg	6,100	6,500	6.3%	11,000	2,800	**118.8%**
Benzyl Butyl Phthalate	µg/kg	2,400	4,800	**66.7%**			

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Table 3-5
Sewer Sediment Field Duplicates–Detected Results

	Units	014-SEW (Original)	838-SEW (Duplicate)	RPD	07-SWO (Original)	08-SWO (Duplicate)	RPD
Bis(2-ethylhexyl)phthalate	µg/kg	17,000D	10,000	**51.9%**	2,300	900	**87.5%**
Carbazole	µg/kg	6,200	5,400	13.8%	1,500	630	**81.7%**
Chrysene	µg/kg	12,000	8,900	**29.7%**	10,000	4,300	**79.7%**
Di-N-Butyl Phthalate	µg/kg	5,000	3,100	**46.9%**			
Di-N-Octyl Phthalate	µg/kg	4,500	5,500	20.0%	72,000D	60,000D	18.2%
Dibenzo(a,h)anthracene	µg/kg				2,300	540	**123.9%**
Dibenzofuran	µg/kg	2,300	2,000	14.0%	690	270J	**87.5%**
Dimethyl Phthalate	µg/kg	ND	490J	NC			
Fluoranthene	µg/kg	28,000	25,000	11.3%	30,000D	9,000	**107.7%**
Fluorene	µg/kg	3,200	2,600	20.7%	1,500	450	**107.7%**
Indeno(1,2,3-cd)pyrene	µg/kg	ND	2,200	NC			
Naphthalene	µg/kg	710	850	17.9%			
Phenanthrene	µg/kg	25,000	20,000	22.2%	15,000	4,700	**104.6%**
Phenol	µg/kg	880	1,100	22.2%			
Pyrene	µg/kg	18,000	16,000	11.8%	21,000D	6,800	**102.2%**

B = Below Contract-Required Detection Limit.
D = Found in diluted run.
J = Estimated value.
NC = Not calculable.
ND = Not detected.

$$\text{RPD} = \text{Relative Percent Deviation} = \frac{(\text{Original} - \text{Duplicate})}{(\text{Original} + \text{Duplicate})/2} \times 100$$

RPD percentages in bold are those RPDs that did not meet the quality assurance objectives for precision.

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Table 3-6
Quality Assurance Objectives for Sewer Sediment Analyses

Parameter	Method	Target Detection Limit[a]	Accuracy (percent recovery)	Precision (relative percent deviation)	Completeness (percent)
Volatiles	8240/CLP[b]/PSEP[c]	10 ppb	CLP[b]	CLP[b]	90
Semivolatiles	8270/CLP[b]/PSEP[c]	20-200 ppb	CLP[b]	CLP[b]	90
Pesticides/PCBs	8081/CLP[b]/PSEP[c]	2-10 ppb	CLP[b]	CLP[b]	90
Metals (As, Cd, Cr, Cu, Pb, Ag and Zn)	6010/CLP[b]/PSEP[c]	0.1-10 ppm	CLP[b]	CLP[b]	90
Grain Size	ASTM D422[d]/PSEP[c]	NA	NA	NA	90
Specific Gravity	ASTM D-854[d]	NA	NA	NA	90
Total Organic Carbon	5310B[e]/PSEP[c]	200 ppm	75-125	± 20	90
pH	150.1[e]	NA	NA	NA	90

[a]These are target values; actual limits depend on nature of specific matrix and were reported in the individual sample result reports. PQL = Practical Quantitation Limit per U.S. EPA SW-846.
[b]These parameters were analyzed by U.S. EPA SW-846 methods (*Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*) and QA/QC equivalent to U.S. EPA Contract Laboratory Program (CLP) QA/QC as described in EPA 1990 or later CLP Statement of Work.
[c]Puget Sound Estuary Program.
[d]American Society for Testing and Materials.
[e]U.S. EPA. *Methods for Chemical Analysis of Water and Wastes.* EP-600/4-79-020, 1979, revised 1983.
NA = Not applicable.

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Table 3-7
Levels of Data Validation, Round 3

Sample Delivery Group (SDG)	Maximum Number of Samples	Matrix	Level of Validation
V3153	10	Groundwater	Full data validation[a]
V3160	16	Groundwater	QC summary data review[b]
V4003	14	Groundwater	QC summary data review[b]
V4063	12	Seeps	QC summary data review[b]
5227	9	Sewer Sediments	None

[a]Full data validation is performed based on the U.S. EPA Contract Laboratory Program (CLP) *National Functional Guidelines for Organic Data Review*, June 1991, and *Functional Guidelines for Evaluating Inorganic Analysis*, July 1988. Quality control summary forms and raw data are both reviewed.
[b]Quality Control (QC) summary data review includes review of QC summary forms and noting any QC limit exceedances. Review is performed based on U.S. EPA *Functional Guidelines*.

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Table 4-1
Statistical Summary of Round 3 Groundwater Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level [a, b]	No. of Non-Background Samples Above Action Level	No. of Background Samples Above Action Level [c]
CONVENTIONALS										
ALKALINITY (AS CACO3)	mg/l	14	14	100%	58	3,300				
AMMONIA	mg/l	10	14	71%	0.35	17				
BICARBONATE (FROM ALKALINITY)	mg/l	14	14	100%	58	3,300				
CARBONATE (FROM ALKALINITY)	mg/l		14							
CHLORIDE	µg/l	14	14	100%	2,200	130,000	250,000	GW ST SMCL (µg/l)		
DISSOLVED OXYGEN	mg/l	34	34	100%	0.05	6.5				
METHANE	ppmv	7	9	78%	73	4,100				
NITRATE NITROGEN	µg/l	8	14	57%	50	7,000	10,000	GW FED MCL (µg/l)		
NITRITE NITROGEN	µg/l	6	14	43%	55	1,100	1,000	GW FED MCL (µg/l)	1	
NITROGEN, KJELDAHL	mg/l	12	14	86%	0.92	30				
PHOSPHATE, ORTHO	mg/l	14	14	100%	0.09	25				
PHOSPHORUS	mg/l	12	14	86%	1.1	26				
SPECIFIC CONDUCTANCE (LAB)	umhos/cm	14	14	100%	140	5,100				
SULFATE	µg/l	14	14	100%	560	200,000	250,000	GW GWQS (µg/l)		
SULFIDE AS S	mg/l	6	14	43%	0.1	1.4				
TOTAL DISSOLVED SOLIDS	µg/l	13	14	93%	90,000	5,300,000	500,000	GW GWQS (µg/l)	9	
TOTAL HARDNESS, CACO3	mg/l	14	14	100%	21	780				
TOTAL ORGANIC CARBON	mg/l	14	14	100%	5.5	3,200				
pH (lab)	-log+H	14	14	100%	5.9	7.6	6.5 - 8.5	GW GWQS (µg/l)	2	
INORGANICS										
ALUMINUM, TOTAL	µg/l	28	34	82%	197	23,000				
ANTIMONY, TOTAL	µg/l		34				6	GW FED MCL (µg/l)		
ARSENIC, TOTAL	µg/l	17	34	50%	3.3	94.1	0.05	GW MTCA B (µg/l)	17	
BARIUM, TOTAL	µg/l	31	34	91%	6.7	262	1,000	GW GWQS (µg/l)		
BERYLLIUM, TOTAL	µg/l		34				0.02	GW MTCA B (µg/l)		
BORON, TOTAL	µg/l	34	34	100%	38.553	2,130				
CADMIUM, TOTAL	µg/l	4	34	12%	1.2	11.1	0.3 - 2.9	SW FWC FED & SW FWA ST (µg/l)	3	
CALCIUM, TOTAL	µg/l	34	34	100%	2,620	112,000				
CHROMIUM VI	µg/l		34				11	SW FWC FED & SW FWC ST (µg/l)		
CHROMIUM, TOTAL	µg/l	31	34	91%	2.3	302	50	GW GWQS (µg/l)	8	
COBALT, TOTAL	µg/l	18	34	53%	2.5	35.3				
COPPER, TOTAL	µg/l	27	34	79%	4.2	343.12	2.5	SW MWA ST (µg/l)	25	2
IRON, TOTAL	µg/l	34	34	100%	689	75,800	300	GW ST SMCL (µg/l)	32	2

Table 4-1
Statistical Summary of Round 3 Groundwater Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level [a,b]	No. of Non-Background Samples Above Action Level	No. of Background Samples Above Action Level [c]
LEAD, TOTAL	µg/l	16	34	47%	0.82	18.4	0.3 - 3.2	SW FWC & MWC FED (µg/l)	9	
MAGNESIUM, TOTAL	µg/l	34	34	100%	2,330	43,300				
MANGANESE, TOTAL	µg/l	34	34	100%	34.4	7,700	50	GW ST SMCL (µg/l)	31	2
MERCURY, TOTAL	µg/l	3	34	9%	0.15	0.67	0.012	SW FWC FED (µg/l)	3	
NICKEL, TOTAL	µg/l	15	34	44%	2.22	104	7.9	SW MWC ST (µg/l)	8	
POTASSIUM, TOTAL	µg/l	34	34	100%	1,650	44,700				
SELENIUM, TOTAL	µg/l	7	34	21%	2.6	22.8	5	SW FWC FED (µg/l)	5	
SILVER, TOTAL	µg/l		34				0.16 - 1.2	SW FWA ST & SW MWA ST (µg/l)		
SODIUM, TOTAL	µg/l	33	34	97%	11,183.43	3,200,000				
THALLIUM, TOTAL	µg/l	1	34	3%	3	3	2	GW FED MCL (µg/l)	1	
VANADIUM, TOTAL	µg/l	34	34	100%	2	2,360	112	GW MTCA B (µg/l)	11	
ZINC, TOTAL	µg/l	26	34	76%	8	216	26.4 - 76.6	SW FWC ST & SW MWC ST (µg/l)	4	
SEMIVOLATILES										
1,2,4-TRICHLOROBENZENE	µg/l		5				70	GW FED MCL (µg/l)		
1,2-DICHLOROBENZENE	µg/l		5				10	GW FED SMCL (µg/l)		
1,3-DICHLOROBENZENE	µg/l		5				2,600	SW HH FED FISH (µg/l)		
1,4-DICHLOROBENZENE	µg/l		5				1.82	GW MTCA B (µg/l)		
2,2'-OXYBIS(1-CHLOROPROPANE)	µg/l		5							
2,4,5-TRICHLOROPHENOL	µg/l		5				1,600	GW MTCA B (µg/l)		
2,4,6-TRICHLOROPHENOL	µg/l		5				4	GW GWQS (µg/l)		
2,4-DICHLOROPHENOL	µg/l		5				48	GW MTCA B (µg/l)		
2,4-DIMETHYLPHENOL	µg/l		5				110	SW MWC FED (µg/l)		
2,4-DINITROPHENOL	µg/l		5				32	GW MTCA B (µg/l)		
2,4-DINITROTOLUENE	µg/l		5				0.1	GW GWQS (µg/l)		
2,6-DINITROTOLUENE	µg/l		5				0.1	GW GWQS (µg/l)		
2-CHLORONAPHTHALENE	µg/l		5							
2-CHLOROPHENOL	µg/l		5				80	GW MTCA B (µg/l)		
2-METHYLNAPHTHALENE	µg/l	1	5	20%	0.4	0.4				
2-METHYLPHENOL	µg/l	3	5	60%	75	3,900	800	GW MTCA B (µg/l)	1	
2-NITROANILINE	µg/l		5							
2-NITROPHENOL	µg/l		5							
3,3'-DICHLOROBENZIDINE	µg/l		5				0.077	SW HH FED FISH (µg/l)		
3-NITROANILINE	µg/l		5							
4,6-DINITRO-2-METHYLPHENOL	µg/l		5							
4-BROMOPHENYL PHENYL ETHER	µg/l		5							

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Table 4-1
Statistical Summary of Round 3 Groundwater Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level [a, b]	No. of Non-Background Samples Above Action Level	No. of Background Samples Above Action Level [c]
4-CHLORO-3-METHYLPHENOL	µg/l		5							
4-CHLOROANILINE	µg/l		5				64	GW MTCA B (µg/l)		
4-CHLOROPHENYL PHENYL ETHER	µg/l		5							
4-METHYLPHENOL	µg/l	3	5	60%	110	1,900	80	GW MTCA B (µg/l)	3	
4-NITROANILINE	µg/l		5							
4-NITROPHENOL	µg/l		5							
ACENAPHTHENE	µg/l	1	5	20%	3	3	960	GW MTCA B (µg/l)		
ACENAPHTHYLENE	µg/l		5							
ANTHRACENE	µg/l	1	5	20%	0.4	0.4	4,800	GW MTCA B (µg/l)		
BENZO(A)ANTHRACENE	µg/l		5				0.012	GW MTCA B (µg/l)		
BENZO(A)PYRENE	µg/l		5				0.008	GW GWQS (µg/l)		
BENZO(B)FLUORANTHENE	µg/l		5				0.012	GW MTCA B (µg/l)		
BENZO(GHI)PERYLENE	µg/l		5							
BENZO(K)FLUORANTHENE	µg/l		5				0.012	GW MTCA B (µg/l)		
BENZYL BUTYL PHTHALATE	µg/l		5				3,131.15	SW MTCA C (µg/l)		
BIS(2-CHLOROETHOXY) METHANE	µg/l		5							
BIS(2-CHLOROETHYL)ETHER	µg/l	1	5	20%	5.5	5.5	0.04	GW MTCA B (µg/l)	1	
BIS(2-ETHYLHEXYL)PHTHALATE	µg/l	1	5	20%	45	45	5.9	SW HH FED FISH (µg/l)	1	
CARBAZOLE	µg/l		5				4.375	GW MTCA B (µg/l)		
DI-N-BUTYL PHTHALATE	µg/l	1	5	20%	1	1	1,600	GW MTCA B (µg/l)		
DI-N-OCTYL PHTHALATE	µg/l	1	5	20%	230	230	320	GW MTCA B (µg/l)		
DIBENZO(A,H)ANTHRACENE	µg/l		5				0.012	GW MTCA B (µg/l)		
DIBENZOFURAN	µg/l	1	5	20%	0.8	0.8				
DIETHYL PHTHALATE	µg/l	1	5	20%	48	48	12,800	GW MTCA B (µg/l)		
DIMETHYL PHTHALATE	µg/l		5				16,000	GW MTCA B (µg/l)		
FLUORANTHENE	µg/l		5				225.44	SW MTCA C (µg/l)		
FLUORENE	µg/l	1	5	20%	1	1	640	GW MTCA B (µg/l)		
HEXACHLOROBENZENE	µg/l		5				0.00077	SW HH FED FISH (µg/l)		
HEXACHLOROBUTADIENE	µg/l		5				0.56	GW MTCA B (µg/l)		
HEXACHLOROCYCLOPENTADIENE	µg/l		5				50	GW FED MCL (µg/l)		
HEXACHLOROETHANE	µg/l		5				6.25	GW MTCA B (µg/l)		
INDENO(1,2,3-CD)PYRENE	µg/l		5				0.012	GW MTCA B (µg/l)		
ISOPHORONE	µg/l		5				92.1	GW MTCA B (µg/l)		
N-NITROSO-DI-N-PROPYLAMINE	µg/l		5				0.01	GW GWQS (µg/l)		
N-NITROSODIPHENYLAMINE	µg/l		5				16	SW HH FED FISH (µg/l)		

Table 4-1
Statistical Summary of Round 3 Groundwater Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level [a, b]	No. of Non-Background Samples Above Action Level	No. of Background Samples Above Action Level [c]
NAPHTHALENE	µg/l		5				32	GW MTCA B (µg/l)		
NITROBENZENE	µg/l		5				8	GW MTCA B (µg/l)		
PENTACHLOROPHENOL	µg/l		5				0.73	GW MTCA B (µg/l)		
PHENANTHRENE	µg/l	1	5	20%	0.8	0.8				
PHENOL	µg/l	1	5	20%	1,700	1,700	9,600	GW MTCA B (µg/l)		
PYRENE	µg/l	1	5	20%	0.6	0.6	480	GW MTCA B (µg/l)		
VOLATILES										
1,1,1-TRICHLOROETHANE	µg/l	1	4	25%	16	16	200	GW FED MCL (µg/l)		
1,1,2,2-TETRACHLOROETHANE	µg/l		4				0.22	GW MTCA B (µg/l)		
1,1,2-TRICHLOROETHANE	µg/l		4				0.77	GW MTCA B (µg/l)		
1,1-DICHLOROETHANE	µg/l	1	4	25%	0.6	0.6	1	GW GWQS (µg/l)		
1,1-DICHLOROETHENE	µg/l		4				0.07	GW MTCA B (µg/l)		
1,2-DICHLOROETHANE	µg/l		4				0.48	GW MTCA B (µg/l)		
1,2-DICHLOROETHENE (TOTAL)	µg/l	1	4	25%	0.3	0.3	70.0	GW FED MCL (µg/l) [d]		
1,2-DICHLOROPROPANE	µg/l		4				0.6	GW GWQS (µg/l)		
2-BUTANONE	µg/l		4				4,800	GW MTCA B (µg/l)		
2-HEXANONE	µg/l		4							
4-METHYL-2-PENTANONE	µg/l		4				400	GW MTCA B (µg/l)		
ACETONE	µg/l	2	27	7%	200	11,000	800	GW MTCA B (µg/l)	1	
BENZENE	µg/l	5	27	19%	2	600	1	GW GWQS (µg/l)	5	
BROMODICHLOROMETHANE	µg/l		4				0.3	GW GWQS (µg/l)		
BROMOFORM	µg/l		4				5	GW GWQS (µg/l)		
BROMOMETHANE	µg/l		4				11.2	GW MTCA B (µg/l)		
CARBON DISULFIDE	µg/l	2	4	50%	1	900	800	GW MTCA B (µg/l)	1	
CARBON TETRACHLORIDE	µg/l		4				0.3	GW GWQS (µg/l)		
CHLOROBENZENE	µg/l		4				100	GW FED MCL (µg/l)		
CHLOROETHANE	µg/l		4							
CHLOROFORM	µg/l		4				7	GW GWQS (µg/l)		
CHLOROMETHANE	µg/l		4				3.36	GW MTCA B (µg/l)		
CIS-1,3-DICHLOROPROPENE	µg/l		4							
DIBROMOCHLOROMETHANE	µg/l		4				0.5	GW GWQS (µg/l)		
ETHYLBENZENE	µg/l	2	27	7%	9	33	700	GW FED MCL (µg/l)		
METHYLENE CHLORIDE	µg/l	2	4	50%	15	8,300	5	GW FED MCL (µg/l)	2	
STYRENE	µg/l		4				1.46	GW MTCA B (µg/l)		
TETRACHLOROETHENE	µg/l		4				0.8	GW GWQS (µg/l)		

Table 4-1
Statistical Summary of Round 3 Groundwater Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level [a, b]	No. of Non-Background Samples Above Action Level	No. of Background Samples Above Action Level [c]
TOLUENE	µg/l	11	27	41%	0.4	670,000	1,000	GW FED MCL (µg/l)	6	
TRANS-1,3-DICHLOROPROPENE	µg/l		4							
TRICHLOROETHENE	µg/l		4				3	GW GWQS (µg/l)		
VINYL CHLORIDE	µg/l		4				0.02	GW GWQS (µg/l)		
XYLENE (TOTAL)	µg/l	5	27	19%	0.7	400	10,000	GW FED MCL (µg/l)		

[a] Source of the most stringent action level:

GW FED MCL	Federal Maximum Contaminant Levels (MCLs) for Drinking Water (40 CFR 141 and 142)
GW ST SMCL	Washington State Secondary Maximum Contaminant Levels (State MCLs) for Drinking Water (WAC 246-290)
GW GWQS	Washington Groundwater Quality Standards (WAC 173-200)
GW MTCA B	Washington State Model Toxic Control Act Cleanup Level Method B for Groundwater (WAC 173-340)
SW MTCA C	Washington State Model Toxic Control Act Cleanup Level Method C for Surface Water (WAC 173-340)
SW MWC ST	Washington Water Quality Standards for Marine Water Chronic (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Chronic (WAC 173-201A)
SW MWA ST	Washington Water Quality Standards for Marine Water Acute (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Acute (WAC 173-201A)
SW FWC FED	Federal Freshwater Chronic - Federal Water Quality Criteria for Surface Water, Freshwater Chronic (40 CFR 131)
SW MWC FED	Federal Marine Chronic - Federal Water Quality Criteria for Surface Water, Marine Chronic (40 CFR 131)
SW FWA FED	Federal Water Quality Criteria for Surface Water, Freshwater Acute (40 CFR 131)
SW FMA FED	Federal Water Quality Criteria for Surface Water, Marine Acute (40 CFR 131)
SW HH FED FISH	Federal Water Quality Criteria for the Consumption of Organisms Only (40 CFR 131)

[b] Background area samples collected from upgradient monitoring wells DM-1A and E3.

[c] Sample-specific hardness may be used to calculate the most stringent action level. Thus, for a given analyte, the most stringent action level may be different for each sample.

[d] The action level is for cis-1,2-dichloroethene.

Table 4-2
Constituents Detected Above Action Levels in Groundwater in Round 3

Area	Monitoring Well	Chemical Grouping	Parameter	Result	Units	Most Stringent Action Level	Source of Most Stringent Action Level [a]
A1	A2	IORG	ARSENIC, TOTAL	41.25	µg/l	0.05	GW MTCA B (µg/l)
A1	A2	IORG	COPPER, TOTAL	12.55 B	µg/l	2.5	SW MWA ST (µg/l)
A1	A2	IORG	IRON, TOTAL	15,150	µg/l	300	GW ST SMCL (µg/l)
A1	A2	IORG	MANGANESE, TOTAL	687	µg/l	50	GW ST SMCL (µg/l)
A1	A2	IORG	VANADIUM, TOTAL	213.5	µg/l	112	GW MTCA B (µg/l)
A1	A2	SVO	BIS(2-CHLOROETHYL)ETHER	5.5 J	µg/l	0.0398	GW MTCA B (µg/l)
A1	A9	IORG	ARSENIC, TOTAL	3.7 B	µg/l	0.05	GW MTCA B (µg/l)
A1	A9	IORG	COPPER, TOTAL	17.7 B	µg/l	2.5	SW MWA ST (µg/l)
A1	A9	IORG	IRON, TOTAL	10,200	µg/l	300	GW ST SMCL (µg/l)
A1	A9	IORG	MANGANESE, TOTAL	826	µg/l	50	GW ST SMCL (µg/l)
A1	DM-3A	IORG	IRON, TOTAL	2,770	µg/l	300	GW ST SMCL (µg/l)
A1	DM-3A	IORG	MANGANESE, TOTAL	338	µg/l	50	GW ST SMCL (µg/l)
A2	B2	IORG	CHROMIUM, TOTAL	73.2	µg/l	50	GW GWQS (µg/l)
A2	B2	IORG	COPPER, TOTAL	181	µg/l	2.5	SW MWA ST (µg/l)
A2	B2	IORG	IRON, TOTAL	29,300	µg/l	300	GW ST SMCL (µg/l)
A2	B2	IORG	LEAD, TOTAL	15 J	µg/l	3.2	SW MWC FED (µg/l)
A2	B2	IORG	MANGANESE, TOTAL	962	µg/l	50	GW ST SMCL (µg/l)
A2	B2	IORG	MERCURY, TOTAL	0.15 B	µg/l	0.012	SW FWC FED (µg/l)
A2	B2	IORG	NICKEL, TOTAL	8.4 B	µg/l	7.9	SW MWC ST (µg/l)
A2	B2	IORG	VANADIUM, TOTAL	387	µg/l	112	GW MTCA B (µg/l)
A2	B2	IORG	ZINC, TOTAL	112	µg/l	76.6	SW MWC ST (µg/l)
A2	B4	IORG	COPPER, TOTAL	11.9 B	µg/l	2.5	SW MWA ST (µg/l)
A2	B4	IORG	IRON, TOTAL	2,260	µg/l	300	GW ST SMCL (µg/l)
A2	B4	IORG	MANGANESE, TOTAL	87.5	µg/l	50	GW ST SMCL (µg/l)
A2	B5	IORG	ARSENIC, TOTAL	3.3 B	µg/l	0.05	GW MTCA B (µg/l)
A2	B5	IORG	IRON, TOTAL	8,040	µg/l	300	GW ST SMCL (µg/l)

Monsanto Company 104(e) Response

Monsanto 2A000961

Table 4-2
Constituents Detected Above Action Levels in Groundwater in Round 3

Area	Monitoring Well	Chemical Grouping	Parameter	Result	Units	Most Stringent Action Level	Source of Most Stringent Action Level [a]
A2	B5	IORG	MANGANESE, TOTAL	299	µg/l	50	GW ST SMCL (µg/l)
A2	B5	VOC	BENZENE	2	µg/l	1	GW GWQS (µg/l)
A2	B6	IORG	COPPER, TOTAL	42.3	µg/l	2.5	SW MWA ST (µg/l)
A2	B6	IORG	IRON, TOTAL	11,900	µg/l	300	GW ST SMCL (µg/l)
A2	B6	IORG	MANGANESE, TOTAL	310	µg/l	50	GW ST SMCL (µg/l)
A2	DM-4	IORG	COPPER, TOTAL	5.1 B	µg/l	2.5	SW MWA ST (µg/l)
A2	DM-4	IORG	IRON, TOTAL	17,400	µg/l	300	GW ST SMCL (µg/l)
A2	DM-4	IORG	MANGANESE, TOTAL	822	µg/l	50	GW ST SMCL (µg/l)
A2	DM-5	CONV	NITRITE NITROGEN	1,100	µg/l	1,000	GW FED MCL (µg/l)
A2	DM-5	CONV	TOTAL DISSOLVED SOLIDS	5,300,000	µg/l	500,000	GW GWQS (µg/l)
A2	DM-5	IORG	ARSENIC, TOTAL	51.4	µg/l	0.05	GW MTCA B (µg/l)
A2	DM-5	IORG	CHROMIUM, TOTAL	301	µg/l	50	GW GWQS (µg/l)
A2	DM-5	IORG	COPPER, TOTAL	28	µg/l	2.5	SW MWA ST (µg/l)
A2	DM-5	IORG	IRON, TOTAL	31,300	µg/l	300	GW ST SMCL (µg/l)
A2	DM-5	IORG	MANGANESE, TOTAL	624	µg/l	50	GW ST SMCL (µg/l)
A2	DM-5	IORG	NICKEL, TOTAL	12.8 B	µg/l	7.9	SW MWC ST (µg/l)
A2	DM-5	IORG	VANADIUM, TOTAL	1,410	µg/l	112	GW MTCA B (µg/l)
A2	DM-5	IORG	ZINC, TOTAL	216	µg/l	76.6	SW MWC ST (µg/l)
A2	MW-20	CONV	pH (LAB)	5.9	-log+H	6.5	GW GWQS (µg/l)
A2	MW-20	IORG	CADMIUM, TOTAL	1.2 B	µg/l	0.6	SW FWC ST (µg/l)
A2	MW-20	IORG	IRON, TOTAL	1,980	µg/l	300	GW ST SMCL (µg/l)
A2	MW-20	IORG	LEAD, TOTAL	18.4	µg/l	0.9	SW FWC ST (µg/l)
A2	MW-20	IORG	MANGANESE, TOTAL	100	µg/l	50	GW ST SMCL (µg/l)
A3	C1	IORG	IRON, TOTAL	11,800	µg/l	300	GW ST SMCL (µg/l)
A3	C1	IORG	MANGANESE, TOTAL	328	µg/l	50	GW ST SMCL (µg/l)
A4	H1	IORG	COPPER, TOTAL	11.1 B	µg/l	2.5	SW MWA ST (µg/l)

Monsanto Company 104(e) Response

Monsanto 2A000962

Table 4-2
Constituents Detected Above Action Levels in Groundwater in Round 3

Area	Monitoring Well	Chemical Grouping	Parameter	Result	Units	Most Stringent Action Level	Source of Most Stringent Action Level [a]
A4	H1	IORG	IRON, TOTAL	3,350	µg/l	300	GW ST SMCL (µg/l)
A4	H1	IORG	MANGANESE, TOTAL	130	µg/l	50	GW ST SMCL (µg/l)
A4	H1	IORG	NICKEL, TOTAL	8.8 B	µg/l	7.9	SW MWC ST (µg/l)
A4	H10	IORG	ARSENIC, TOTAL	18	µg/l	0.05	GW MTCA B (µg/l)
A4	H10	IORG	COPPER, TOTAL	14.9 B	µg/l	2.5	SW MWA ST (µg/l)
A4	H10	IORG	IRON, TOTAL	20,500	µg/l	300	GW ST SMCL (µg/l)
A4	H10	IORG	MANGANESE, TOTAL	1,280	µg/l	50	GW ST SMCL (µg/l)
A4	H10	SVO	4-METHYLPHENOL	180	µg/l	80	GW MTCA B (µg/l)
A4	H10	SVO	BIS(2-ETHYLHEXYL)PHTHALATE	45 J	µg/l	5.9	SW HH FED FISH (µg/l)
A4	H10	VOC	ACETONE	11,000 J	µg/l	800	GW MTCA B (µg/l)
A4	H10	VOC	BENZENE	600 J	µg/l	1	GW GWQS (µg/l)
A4	H10	VOC	CARBON DISULFIDE	900 J	µg/l	800	GW MTCA B (µg/l)
A4	H10	VOC	METHYLENE CHLORIDE	8,300 J	µg/l	5	GW FED MCL (µg/l)
A4	H10	VOC	TOLUENE	380,000 J	µg/l	1,000	GW FED MCL (µg/l)
A4	H11	IORG	ARSENIC, TOTAL	62.8	µg/l	0.05	GW MTCA B (µg/l)
A4	H11	IORG	CHROMIUM, TOTAL	146	µg/l	50	GW GWQS (µg/l)
A4	H11	IORG	COPPER, TOTAL	71.2	µg/l	2.5	SW MWA ST (µg/l)
A4	H11	IORG	IRON, TOTAL	74,900	µg/l	300	GW ST SMCL (µg/l)
A4	H11	IORG	LEAD, TOTAL	7	µg/l	2.4	SW FWC ST (µg/l)
A4	H11	IORG	MANGANESE, TOTAL	3,870	µg/l	50	GW ST SMCL (µg/l)
A4	H11	IORG	VANADIUM, TOTAL	1,660	µg/l	112	GW MTCA B (µg/l)
A4	H11	SVO	2-METHYLPHENOL	3,900	µg/l	800	GW MTCA B (µg/l)
A4	H11	SVO	4-METHYLPHENOL	1,900	µg/l	80	GW MTCA B (µg/l)
A4	H11	VOC	BENZENE	73 J	µg/l	1	GW GWQS (µg/l)
A4	H11	VOC	METHYLENE CHLORIDE	15 J	µg/l	5	GW FED MCL (µg/l)
A4	H11	VOC	TOLUENE	670,000 J	µg/l	1,000	GW FED MCL (µg/l)
A4	MW-12	CONV	pH (LAB)	6.3	-log+H	6.5	GW GWQS (µg/l)
A4	MW-12	CONV	TOTAL DISSOLVED SOLIDS	920,000	µg/l	500,000	GW GWQS (µg/l)
A4	MW-12	IORG	ARSENIC, TOTAL	26.9	µg/l	0.05	GW MTCA B (µg/l)

Table 4-2
Constituents Detected Above Action Levels in Groundwater in Round 3

Area	Monitoring Well	Chemical Grouping	Parameter	Result	Units	Most Stringent Action Level	Source of Most Stringent Action Level [a]
A4	MW-12	IORG	COPPER, TOTAL	45.1	µg/l	2.5	SW MWA ST (µg/l)
A4	MW-12	IORG	IRON, TOTAL	75,800	µg/l	300	GW ST SMCL (µg/l)
A4	MW-12	IORG	LEAD, TOTAL	4.3	µg/l	1.4	SW FWC ST (µg/l)
A4	MW-12	IORG	MANGANESE, TOTAL	3,130	µg/l	50	GW ST SMCL (µg/l)
A4	MW-12	IORG	NICKEL, TOTAL	10.5 B	µg/l	7.9	SW MWC ST (µg/l)
A4	MW-12	SVO	4-METHYLPHENOL	110	µg/l	80	GW MTCA B (µg/l)
A4	MW-12	VOC	BENZENE	5	µg/l	1	GW GWQS (µg/l)
A4	MW-13	IORG	COPPER, TOTAL	8.8 B	µg/l	2.5	SW MWA ST (µg/l)
A4	MW-13	IORG	IRON, TOTAL	2,790	µg/l	300	GW ST SMCL (µg/l)
A4	MW-13	IORG	MANGANESE, TOTAL	147	µg/l	50	GW ST SMCL (µg/l)
A4	MW-13	IORG	THALLIUM, TOTAL	3 B	µg/l	2	GW FED MCL (µg/l)
A4	MW-14	CONV	TOTAL DISSOLVED SOLIDS	1,200,000	µg/l	500,000	GW GWQS (µg/l)
A4	MW-14	IORG	ARSENIC, TOTAL	42.3	µg/l	0.05	GW MTCA B (µg/l)
A4	MW-14	IORG	COPPER, TOTAL	27.3	µg/l	2.5	SW MWA ST (µg/l)
A4	MW-14	IORG	IRON, TOTAL	65,200	µg/l	300	GW ST SMCL (µg/l)
A4	MW-14	IORG	MANGANESE, TOTAL	4,250	µg/l	50	GW ST SMCL (µg/l)
A4	MW-14	IORG	SELENIUM, TOTAL	7.9	µg/l	5	SW FWC FED (µg/l)
A4	MW-14	IORG	VANADIUM, TOTAL	297	µg/l	112	GW MTCA B (µg/l)
A4	MW-18	IORG	ARSENIC, TOTAL	33.9	µg/l	0.05	GW MTCA B (µg/l)
A4	MW-18	IORG	COPPER, TOTAL	27.8	µg/l	2.5	SW MWA ST (µg/l)
A4	MW-18	IORG	IRON, TOTAL	45,600	µg/l	300	GW ST SMCL (µg/l)
A4	MW-18	IORG	MANGANESE, TOTAL	4,260	µg/l	50	GW ST SMCL (µg/l)
A4	MW-18	VOC	TOLUENE	360,000	µg/l	1,000	GW FED MCL (µg/l)
A4	MW-19	IORG	COPPER, TOTAL	16.4 B	µg/l	2.5	SW MWA ST (µg/l)
A4	MW-19	IORG	IRON, TOTAL	12,900	µg/l	300	GW ST SMCL (µg/l)
A4	MW-19	IORG	MANGANESE, TOTAL	782	µg/l	50	GW ST SMCL (µg/l)
A4	MW-19	VOC	TOLUENE	1,400	µg/l	1,000	GW FED MCL (µg/l)

Monsanto Company 104(e) Response

Monsanto 2A000964

Table 4-2
Constituents Detected Above Action Levels in Groundwater in Round 3

Area	Monitoring Well	Chemical Grouping	Parameter	Result	Units	Most Stringent Action Level	Source of Most Stringent Action Level [a]
A5	DM-2A	CONV	TOTAL DISSOLVED SOLIDS	1,600,000	µg/l	500,000	GW GWQS (µg/l)
A5	DM-2A	IORG	CHROMIUM, TOTAL	56.67	µg/l	50	GW GWQS (µg/l)
A5	DM-2A	IORG	COPPER, TOTAL	343.12	µg/l	2.5	SW MWA ST (µg/l)
A5	DM-2A	IORG	IRON, TOTAL	10,284.1	µg/l	300	GW ST SMCL (µg/l)
A5	DM-2A	IORG	LEAD, TOTAL	6.98 J	µg/l	3.2	SW MWC FED (µg/l)
A5	DM-2A	IORG	MANGANESE, TOTAL	247.3	µg/l	50	GW ST SMCL (µg/l)
A5	DM-2A	IORG	NICKEL, TOTAL	20.16 B	µg/l	7.9	SW MWC ST (µg/l)
A5	DM-2A	IORG	VANADIUM, TOTAL	252.9	µg/l	112	GW MTCA B (µg/l)
A5	DM-8	CONV	TOTAL DISSOLVED SOLIDS	3,000,000	µg/l	500,000	GW GWQS (µg/l)
A5	DM-8	IORG	ARSENIC, TOTAL	28.7	µg/l	0.05	GW MTCA B (µg/l)
A5	DM-8	IORG	CHROMIUM, TOTAL	146	µg/l	50	GW GWQS (µg/l)
A5	DM-8	IORG	COPPER, TOTAL	44.8	µg/l	2.5	SW MWA ST (µg/l)
A5	DM-8	IORG	IRON, TOTAL	57,500	µg/l	300	GW ST SMCL (µg/l)
A5	DM-8	IORG	MANGANESE, TOTAL	5,690	µg/l	50	GW ST SMCL (µg/l)
A5	DM-8	IORG	VANADIUM, TOTAL	1,410	µg/l	112	GW MTCA B (µg/l)
A5	H6	IORG	CHROMIUM, TOTAL	77.4	µg/l	50	GW GWQS (µg/l)
A5	H6	IORG	COPPER, TOTAL	167	µg/l	2.5	SW MWA ST (µg/l)
A5	H6	IORG	IRON, TOTAL	13,700	µg/l	300	GW ST SMCL (µg/l)
A5	H6	IORG	LEAD, TOTAL	7 J	µg/l	1.4	SW FWC ST (µg/l)
A5	H6	IORG	MANGANESE, TOTAL	197	µg/l	50	GW ST SMCL (µg/l)
A5	H6	IORG	MERCURY, TOTAL	0.36	µg/l	0.012	SW FWC FED (µg/l)
A5	H6	IORG	NICKEL, TOTAL	9.9 B	µg/l	7.9	SW MWC ST (µg/l)
A5	MW-15	CONV	TOTAL DISSOLVED SOLIDS	930,000	µg/l	500,000	GW GWQS (µg/l)
A5	MW-15	IORG	ARSENIC, TOTAL	13.522	µg/l	0.05	GW MTCA B (µg/l)
A5	MW-15	IORG	COPPER, TOTAL	38.92	µg/l	2.5	SW MWA ST (µg/l)
A5	MW-15	IORG	IRON, TOTAL	23,629.1	µg/l	300	GW ST SMCL (µg/l)
A5	MW-15	IORG	LEAD, TOTAL	9.60	µg/l	1.3	SW FWC ST (µg/l)
A5	MW-15	IORG	MANGANESE, TOTAL	1,177.1	µg/l	50	GW ST SMCL (µg/l)
A5	MW-15	IORG	VANADIUM, TOTAL	261.9	µg/l	112	GW MTCA B (µg/l)

Table 4-2
Constituents Detected Above Action Levels in Groundwater in Round 3

Area	Monitoring Well	Chemical Grouping	Parameter	Result	Units	Most Stringent Action Level	Source of Most Stringent Action Level [a]
A5	MW-15	VOC	TOLUENE	120,000	µg/l	1,000	GW FED MCL (µg/l)
A5	MW-16	IORG	ARSENIC, TOTAL	94.1	µg/l	0.05	GW MTCA B (µg/l)
A5	MW-16	IORG	CADMIUM, TOTAL	2 B	µg/l	0.7	SW FWC ST (µg/l)
A5	MW-16	IORG	CHROMIUM, TOTAL	302	µg/l	50	GW GWQS (µg/l)
A5	MW-16	IORG	COPPER, TOTAL	262	µg/l	2.5	SW MWA ST (µg/l)
A5	MW-16	IORG	IRON, TOTAL	12,200	µg/l	300	GW ST SMCL (µg/l)
A5	MW-16	IORG	MANGANESE, TOTAL	305	µg/l	50	GW ST SMCL (µg/l)
A5	MW-16	IORG	NICKEL, TOTAL	104	µg/l	7.9	SW MWC ST (µg/l)
A5	MW-16	IORG	SELENIUM, TOTAL	22.8	µg/l	5	SW FWC FED (µg/l)
A5	MW-16	IORG	VANADIUM, TOTAL	2,360	µg/l	112	GW MTCA B (µg/l)
A5	MW-17	CONV	TOTAL DISSOLVED SOLIDS	3,500,000	µg/l	500,000	GW GWQS (µg/l)
A5	MW-17	IORG	ARSENIC, TOTAL	49.6	µg/l	0.05	GW MTCA B (µg/l)
A5	MW-17	IORG	CHROMIUM, TOTAL	130	µg/l	50	GW GWQS (µg/l)
A5	MW-17	IORG	COPPER, TOTAL	39.2	µg/l	2.5	SW MWA ST (µg/l)
A5	MW-17	IORG	IRON, TOTAL	34,300	µg/l	300	GW ST SMCL (µg/l)
A5	MW-17	IORG	MANGANESE, TOTAL	7,700	µg/l	50	GW ST SMCL (µg/l)
A5	MW-17	IORG	SELENIUM, TOTAL	10.8	µg/l	5	SW FWC FED (µg/l)
A5	MW-17	IORG	VANADIUM, TOTAL	1,290	µg/l	112	GW MTCA B (µg/l)
A5	MW-17	VOC	TOLUENE	120,000	µg/l	1,000	GW FED MCL (µg/l)
A6	DM-7	CONV	TOTAL DISSOLVED SOLIDS	830,000	µg/l	500,000	GW GWQS (µg/l)
A6	DM-7	IORG	IRON, TOTAL	28,150	µg/l	300	GW ST SMCL (µg/l)
A6	DM-7	IORG	MANGANESE, TOTAL	3,545	µg/l	50	GW ST SMCL (µg/l)
A6	DM-7	VOC	BENZENE	3	µg/l	1	GW GWQS (µg/l)
A6	G3	IORG	ARSENIC, TOTAL	10	µg/l	0.05	GW MTCA B (µg/l)
A6	G3	IORG	COPPER, TOTAL	15.4 B	µg/l	2.5	SW MWA ST (µg/l)
A6	G3	IORG	IRON, TOTAL	4,410	µg/l	300	GW ST SMCL (µg/l)
A6	G3	IORG	MANGANESE, TOTAL	435	µg/l	50	GW ST SMCL (µg/l)

Monsanto Company 104(e) Response

Monsanto 2A000966

Table 4-2
Constituents Detected Above Action Levels in Groundwater in Round 3

Area	Monitoring Well	Chemical Grouping	Parameter	Result	Units	Most Stringent Action Level	Source of Most Stringent Action Level [a]
A6	H9	CONV	TOTAL DISSOLVED SOLIDS	620,000	µg/l	500,000	GW GWQS (µg/l)
A6	H9	IORG	CADMIUM, TOTAL	11.1	µg/l	1.7	SW FWC ST (µg/l)
A6	H9	IORG	COPPER, TOTAL	281	µg/l	2.5	SW MWA ST (µg/l)
A6	H9	IORG	IRON, TOTAL	14,800	µg/l	300	GW ST SMCL (µg/l)
A6	H9	IORG	LEAD, TOTAL	9.5 J	µg/l	3.2	SW MWC FED (µg/l)
A6	H9	IORG	MANGANESE, TOTAL	887	µg/l	50	GW ST SMCL (µg/l)
A6	H9	IORG	MERCURY, TOTAL	0.67	µg/l	0.012	SW FWC FED (µg/l)
A6	H9	IORG	NICKEL, TOTAL	24.3 B	µg/l	7.9	SW MWC ST (µg/l)
A6	H9	IORG	VANADIUM, TOTAL	121	µg/l	112	GW MTCA B (µg/l)
A6	H9	IORG	ZINC, TOTAL	186	µg/l	76.6	SW MWC ST (µg/l)
A7	G1	IORG	ARSENIC, TOTAL	29.5	µg/l	0.05	GW MTCA B (µg/l)
A7	G1	IORG	COPPER, TOTAL	17.3 B	µg/l	2.5	SW MWA ST (µg/l)
A7	G1	IORG	IRON, TOTAL	71,600	µg/l	300	GW ST SMCL (µg/l)
A7	G1	IORG	LEAD, TOTAL	7.1	µg/l	3.2	SW MWC FED (µg/l)
A7	G1	IORG	MANGANESE, TOTAL	1,000	µg/l	50	GW ST SMCL (µg/l)
A7	G1	IORG	SELENIUM, TOTAL	6.9	µg/l	5	SW FWC FED (µg/l)
A7	G1	IORG	ZINC, TOTAL	129 J	µg/l	76.6	SW MWC ST (µg/l)
A9	A4	IORG	IRON, TOTAL	23,900	µg/l	300	GW ST SMCL (µg/l)
A9	A4	IORG	MANGANESE, TOTAL	1,260	µg/l	50	GW ST SMCL (µg/l)
A9	A4	IORG	SELENIUM, TOTAL	5.5	µg/l	5	SW FWC FED (µg/l)
A9	B1A	IORG	ARSENIC, TOTAL	5.2 B	µg/l	0.05	GW MTCA B (µg/l)
A9	B1A	IORG	IRON, TOTAL	10,700	µg/l	300	GW ST SMCL (µg/l)
A9	B1A	IORG	MANGANESE, TOTAL	386	µg/l	50	GW ST SMCL (µg/l)
A9	B1B	IORG	ARSENIC, TOTAL	3.3 B	µg/l	0.05	GW MTCA B (µg/l)
A9	B1B	IORG	COPPER, TOTAL	19.5 B	µg/l	2.5	SW MWA ST (µg/l)
A9	B1B	IORG	IRON, TOTAL	689	µg/l	300	GW ST SMCL (µg/l)
BG	DM-1A	IORG	COPPER, TOTAL	4.42 B	µg/l	2.5	SW MWA ST (µg/l)

Monsanto Company 104(e) Response

Monsanto 2A000967

Table 4-2
Constituents Detected Above Action Levels in Groundwater in Round 3

Area	Monitoring Well	Chemical Grouping	Parameter	Result	Units	Most Stringent Action Level	Source of Most Stringent Action Level [a]
BG	DM-1A	IORG	IRON, TOTAL	4,779.1 J	µg/l	300	GW ST SMCL (µg/l)
BG	DM-1A	IORG	MANGANESE, TOTAL	52.4 J	µg/l	50	GW ST SMCL (µg/l)
BG	E3	IORG	COPPER, TOTAL	4.2 B	µg/l	2.5	SW MWA ST (µg/l)
BG	E3	IORG	IRON, TOTAL	15,400	µg/l	300	GW ST SMCL (µg/l)
BG	E3	IORG	MANGANESE, TOTAL	239	µg/l	50	GW ST SMCL (µg/l)

[a] Source of the most stringent action level:

GW FED MCL	Federal Maximum Contaminant Levels (MCLs) for Drinking Water (40 CFR 141 and 142)
GW ST SMCL	Washington State Secondary Maximum Contaminant Levels (State MCLs) for Drinking Water (WAC 246-290)
GW GWQS	Washington Groundwater Quality Standards (WAC 173-200)
GW MTCA B	Washington State Model Toxic Control Act Cleanup Level Method B for Groundwater (WAC 173-340)
SW MTCA C	Washington State Model Toxic Control Act Cleanup Level Method C for Surface Water (WAC 173-340)
SW MWC ST	Washington Water Quality Standards for Marine Water Chronic (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Chronic (WAC 173-201A)
SW MWA ST	Washington Water Quality Standards for Marine Water Acute (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Acute (WAC 173-201A)
SW FWC FED	Federal Freshwater Chronic - Federal Water Quality Criteria for Surface Water, Freshwater Chronic (40 CFR 131)
SW MWC FED	Federal Marine Chronic - Federal Water Quality Criteria for Surface Water, Marine Chronic (40 CFR 131)
SW FWA FED	Federal Water Quality Criteria for Surface Water, Freshwater Acute (40 CFR 131)
SW FMA FED	Federal Water Quality Criteria for Surface Water, Marine Acute (40 CFR 131)
SW HH FED FISH	Federal Water Quality Criteria for the Consumption of Organisms Only (40 CFR 131)

B = Reported value is below Contract-Required Detection Limit, but greater than the instrument detection limit.
D = Compound identified in an analysis at a secondary dilution factor.
J = Estimated value.

CONV = Conventional parameters
IORG = Inorganic chemicals
SVO = Semivolatile organic compounds
VOC = Volatile organic compounds

Monsanto Company 104(e) Response

Monsanto 2A000968

Table 4-3

Action Level Exceedances for Inorganic Constituents in Groundwater in Rounds 1, 2, or 3

Well No.	Parameter	Units	Round 1 Total	Round 1 Dissolved	Round 2 Total	Round 3 Total	AL Exceedances in Round 3	New AL Exceedances in Round 3	Most Stringent Action Level	Source of Most Stringent Action Level [a]
E3	ANTIMONY	µg/l	69.3	ND	25.5 BJ	ND			6	GW FED MCL (µg/l)
A2	ARSENIC	µg/l	43	49.9	-----	41.25	X		0.05	GW MTCA B (µg/l)
A4	ARSENIC	µg/l	10.1	2.3 B	-----	ND			0.05	GW MTCA B (µg/l)
A9	ARSENIC	µg/l	13.6	ND	-----	3.7 B	X		0.05	GW MTCA B (µg/l)
B1A	ARSENIC	µg/l	3.2 B	ND	-----	5.2 B	X		0.05	GW MTCA B (µg/l)
B1B	ARSENIC	µg/l	ND	ND	-----	3.3 B	X	X	0.05	GW MTCA B (µg/l)
B2	ARSENIC	µg/l	13.6	4.5 B	-----	ND			0.05	GW MTCA B (µg/l)
B4	ARSENIC	µg/l	2.4 B	ND	-----	ND			0.05	GW MTCA B (µg/l)
B5	ARSENIC	µg/l	12.45	2.75 B	-----	3.3 B	X		0.05	GW MTCA B (µg/l)
B6	ARSENIC	µg/l	5.6 B	ND	-----	ND			0.05	GW MTCA B (µg/l)
C1	ARSENIC	µg/l	22.1	13.5	-----	ND			0.05	GW MTCA B (µg/l)
DM-1A	ARSENIC	µg/l	31.6 B	2 B	-----	ND			0.05	GW MTCA B (µg/l)
DM-1B	ARSENIC	µg/l	22	23.85	-----	-----			0.05	GW MTCA B (µg/l)
DM-2A	ARSENIC	µg/l	26.1	22.4	-----	ND			0.05	GW MTCA B (µg/l)
DM-2B	ARSENIC	µg/l	15.2	16.9	-----	-----			0.05	GW MTCA B (µg/l)
DM-3A	ARSENIC	µg/l	16.8	4 B	-----	ND			0.05	GW MTCA B (µg/l)
DM-3B	ARSENIC	µg/l	13.2	13.9	-----	-----			0.05	GW MTCA B (µg/l)
DM-4	ARSENIC	µg/l	2.1 B	ND	-----	ND			0.05	GW MTCA B (µg/l)
DM-5	ARSENIC	µg/l	56.8	31.6	-----	51.4	X		0.05	GW MTCA B (µg/l)
DM-6	ARSENIC	µg/l	21.7	20.3	-----	-----			0.05	GW MTCA B (µg/l)
DM-7	ARSENIC	µg/l	17.9	10.6	-----	ND			0.05	GW MTCA B (µg/l)
DM-8	ARSENIC	µg/l	43.4	42.9	-----	28.7	X		0.05	GW MTCA B (µg/l)
E3	ARSENIC	µg/l	131	2.2 B	-----	ND			0.05	GW MTCA B (µg/l)
G1	ARSENIC	µg/l	32.05	5.15 B	-----	29.5	X		0.05	GW MTCA B (µg/l)
G3	ARSENIC	µg/l	56.5	18.3 B	-----	10	X		0.05	GW MTCA B (µg/l)
H1	ARSENIC	µg/l	6.1 B	ND	-----	ND			0.05	GW MTCA B (µg/l)
H6	ARSENIC	µg/l	26.3	9.3 B	-----	ND			0.05	GW MTCA B (µg/l)
H9	ARSENIC	µg/l	68.9	52.4	-----	ND			0.05	GW MTCA B (µg/l)
H10	ARSENIC	µg/l	11.2	9.6 B	-----	18	X		0.05	GW MTCA B (µg/l)
H11	ARSENIC	µg/l	56.4	43.3 B	-----	62.8	X		0.05	GW MTCA B (µg/l)
MW-12	ARSENIC	µg/l	24.5	33.4	-----	26.9	X		0.05	GW MTCA B (µg/l)
MW-14	ARSENIC	µg/l	-----	-----	-----	42.3	X	X	0.05	GW MTCA B (µg/l)
MW-15	ARSENIC	µg/l	-----	-----	-----	13.52	X	X	0.05	GW MTCA B (µg/l)
MW-16	ARSENIC	µg/l	-----	-----	-----	94.1	X	X	0.05	GW MTCA B (µg/l)
MW-17	ARSENIC	µg/l	-----	-----	-----	49.6	X	X	0.05	GW MTCA B (µg/l)
MW-18	ARSENIC	µg/l	-----	-----	-----	33.9	X	X	0.05	GW MTCA B (µg/l)
B2	BERYLLIUM	µg/l	2.4 B	ND	-----	ND			0.02	GW MTCA B (µg/l)
DM-2A	BERYLLIUM	µg/l	5.9	5.9	-----	ND			0.02	GW MTCA B (µg/l)
DM-5	BERYLLIUM	µg/l	9.9	9.9	-----	ND			0.02	GW MTCA B (µg/l)
DM-8	BERYLLIUM	µg/l	6.2	6.2	-----	ND			0.02	GW MTCA B (µg/l)

Monsanto Company 104(e) Response

Monsanto 2A000969

Table 4-3

Action Level Exceedances for Inorganic Constituents in Groundwater in Rounds 1, 2, or 3

Well No.	Parameter	Units	Round 1 Total	Round 1 Dissolved	Round 2 Total	Round 3 Total	AL Exceedances in Round 3	New AL Exceedances in Round 3	Most Stringent Action Level	Source of Most Stringent Action Level *
E3	BERYLLIUM	µg/l	7.4	ND	ND	ND			0.02	GW MTCA B (µg/l)
G3	BERYLLIUM	µg/l	4.3 B	ND	-----	ND			0.02	GW MTCA B (µg/l)
H9	BERYLLIUM	µg/l	3.7 B	2.5 B	-----	ND			0.02	GW MTCA B (µg/l)
H11	BERYLLIUM	µg/l	3.8 B	2.5 B	-----	ND			0.02	GW MTCA B (µg/l)
E3	CADMIUM	µg/l	8.1	ND	-----	ND			*1.2, **2.9	SW FWC ST (*R1 Dissolved, **R1&3 Total)(µg/l)
H9	CADMIUM	µg/l	ND	ND	-----	11.1	X	X	*0.8, **1.7	SW FWC ST (*R1 Dissolved, **R1&3 Total)(µg/l)
MW-16	CADMIUM	µg/l	-----	-----	-----	2 B	X	X	0.7	SW FWC ST (µg/l)
MW-20	CADMIUM	µg/l	-----	-----	-----	1.2 B	X	X	0.6	SW FWC ST (µg/l)
B2	CHROMIUM	µg/l	105.5	29.7	-----	73.2	X		50	GW GWQS (µg/l)
DM-2A	CHROMIUM	µg/l	148	149	-----	56.7	X		50	GW GWQS (µg/l)
DM-5	CHROMIUM	µg/l	353	365	-----	301	X		50	GW GWQS (µg/l)
DM-8	CHROMIUM	µg/l	144	153	-----	146	X		50	GW GWQS (µg/l)
E3	CHROMIUM	µg/l	240	ND	-----	ND			50	GW GWQS (µg/l)
G3	CHROMIUM	µg/l	135	15.3	-----	12.4			50	GW GWQS (µg/l)
H6	CHROMIUM	µg/l	98	35.6	-----	77.4	X		50	GW GWQS (µg/l)
H9	CHROMIUM	µg/l	154	62.3	-----	36.1			50	GW GWQS (µg/l)
H11	CHROMIUM	µg/l	88.9	95.1	-----	146	X		50	GW GWQS (µg/l)
MW-16	CHROMIUM	µg/l	-----	-----	-----	302	X	X	50	GW GWQS (µg/l)
MW-17	CHROMIUM	µg/l	-----	-----	-----	130	X	X	50	GW GWQS (µg/l)
A2	COPPER	µg/l	37.5	ND	-----	12.6 B	X		2.5	SW MWA ST (µg/l)
A4	COPPER	µg/l	50	ND	-----	ND			2.5	SW MWA ST (µg/l)
A9	COPPER	µg/l	119	ND	-----	17.7 B	X		2.5	SW MWA ST (µg/l)
B1A	COPPER	µg/l	21.9 B	ND	-----	ND			2.5	SW MWA ST (µg/l)
B1B	COPPER	µg/l	22.5 B	19.3 B	-----	19.5 B	X		2.5	SW MWA ST (µg/l)
B2	COPPER	µg/l	4290	8.4 B	-----	181	X		2.5	SW MWA ST (µg/l)
B4	COPPER	µg/l	11.7 B	6.4 B	-----	11.9 B	X		2.5	SW MWA ST (µg/l)
B5	COPPER	µg/l	96.6	ND	-----	ND			2.5	SW MWA ST (µg/l)
B6	COPPER	µg/l	304	ND	-----	42.3	X		2.5	SW MWA ST (µg/l)
C1	COPPER	µg/l	66.9	ND	-----	ND			2.5	SW MWA ST (µg/l)
DM-1A	COPPER	µg/l	52.5	ND	-----	4.4 B	X		2.5	SW MWA ST (µg/l)
DM-2A	COPPER	µg/l	226	58	-----	343.1	X		2.5	SW MWA ST (µg/l)
DM-3A	COPPER	µg/l	94.4	ND	-----	ND			2.5	SW MWA ST (µg/l)
DM-4	COPPER	µg/l	11.3 B	ND	-----	5.1 B	X		2.5	SW MWA ST (µg/l)
DM-5	COPPER	µg/l	47.3	49.9	-----	28	X		2.5	SW MWA ST (µg/l)
DM-6	COPPER	µg/l	54.7	9.6 B	-----	-----			2.5	SW MWA ST (µg/l)
DM-8	COPPER	µg/l	43.7	34.8	-----	44.8	X		2.5	SW MWA ST (µg/l)
E3	COPPER	µg/l	459	ND	-----	4.2 B	X		2.5	SW MWA ST (µg/l)
G1	COPPER	µg/l	92.6	5.9 B	-----	17.3 B	X		2.5	SW MWA ST (µg/l)
G3	COPPER	µg/l	224	5.4 B	-----	15.4 B	X		2.5	SW MWA ST (µg/l)
H1	COPPER	µg/l	39.9	11 B	-----	11.1 B	X		2.5	SW MWA ST (µg/l)

Monsanto Company 104(e) Response

Monsanto 2A000970

Table 4-3

Action Level Exceedances for Inorganic Constituents in Groundwater in Rounds 1, 2, or 3

Well No.	Parameter	Units	Round 1 Total	Round 1 Dissolved	Round 2 Total	Round 3 Total	AL Exceedances in Round 3	New AL Exceedances in Round 3	Most Stringent Action Level	Source of Most Stringent Action Level *
H6	COPPER	µg/l	179	20.8 B	-----	167	X		2.5	SW MWA ST (µg/l)
H9	COPPER	µg/l	306	15.3 B	-----	281	X		2.5	SW MWA ST (µg/l)
H10	COPPER	µg/l	26.3	ND	-----	14.9 B	X		2.5	SW MWA ST (µg/l)
H11	COPPER	µg/l	22.7 B	9.5 B	-----	71.2	X		2.5	SW MWA ST (µg/l)
MW-12	COPPER	µg/l	84.1	ND	-----	45.1	X		2.5	SW MWA ST (µg/l)
MW-13	COPPER	µg/l	-----	-----	-----	8.8 B	X	X	2.5	SW MWA ST (µg/l)
MW-14	COPPER	µg/l	-----	-----	-----	27.3	X	X	2.5	SW MWA ST (µg/l)
MW-15	COPPER	µg/l	-----	-----	-----	38.9	X	X	2.5	SW MWA ST (µg/l)
MW-16	COPPER	µg/l	-----	-----	-----	262	X	X	2.5	SW MWA ST (µg/l)
MW-17	COPPER	µg/l	-----	-----	-----	39.2	X	X	2.5	SW MWA ST (µg/l)
MW-18	COPPER	µg/l	-----	-----	-----	27.8	X	X	2.5	SW MWA ST (µg/l)
MW-19	COPPER	µg/l	-----	-----	-----	16.4 B	X	X	2.5	SW MWA ST (µg/l)
A2	IRON	µg/l	47,800	37,400	-----	15,150	X		300	GW ST SMCL (µg/l)
A4	IRON	µg/l	56,000	45,200	-----	23,900	X		300	GW ST SMCL (µg/l)
A9	IRON	µg/l	69,300	930	-----	10,200	X		300	GW ST SMCL (µg/l)
B1A	IRON	µg/l	13,600	1,530	-----	10,700	X		300	GW ST SMCL (µg/l)
B1B	IRON	µg/l	907	507	-----	689	X		300	GW ST SMCL (µg/l)
B2	IRON	µg/l	61,000	14,800	-----	29,300	X		300	GW ST SMCL (µg/l)
B4	IRON	µg/l	4,480	240	-----	2,260	X		300	GW ST SMCL (µg/l)
B5	IRON	µg/l	37,400	4,950	-----	8,040	X		300	GW ST SMCL (µg/l)
B6	IRON	µg/l	25,800	9,750	-----	11,900	X		300	GW ST SMCL (µg/l)
C1	IRON	µg/l	46,700	11,100	-----	11,800	X		300	GW ST SMCL (µg/l)
DM-1A	IRON	µg/l	75,400	185	-----	4,779 J	X		300	GW ST SMCL (µg/l)
DM-1B	IRON	µg/l	1,270	516	-----	-----			300	GW ST SMCL (µg/l)
DM-2A	IRON	µg/l	8,570	8,050	-----	10,284	X		300	GW ST SMCL (µg/l)
DM-2B	IRON	µg/l	471	277	-----	-----			300	GW ST SMCL (µg/l)
DM-3A	IRON	µg/l	36,700	1,860	-----	2,770	X		300	GW ST SMCL (µg/l)
DM-3B	IRON	µg/l	1,060	618	-----	-----			300	GW ST SMCL (µg/l)
DM-4	IRON	µg/l	25,300	24,200	-----	17,400	X		300	GW ST SMCL (µg/l)
DM-5	IRON	µg/l	53,500	53,900	-----	31,300	X		300	GW ST SMCL (µg/l)
DM-6	IRON	µg/l	13,700	7,490	-----	-----			300	GW ST SMCL (µg/l)
DM-7	IRON	µg/l	48,550	40,300	-----	28,150	X		300	GW ST SMCL (µg/l)
DM-8	IRON	µg/l	80,900	79,400	-----	57,500	X		300	GW ST SMCL (µg/l)
E3	IRON	µg/l	409,000	17,700	-----	15,400	X		300	GW ST SMCL (µg/l)
G1	IRON	µg/l	73,650	43,050	-----	71,600	X		300	GW ST SMCL (µg/l)
G3	IRON	µg/l	104,000	6,720	-----	4,410	X		300	GW ST SMCL (µg/l)
H1	IRON	µg/l	19,900	2,710	-----	3,350	X		300	GW ST SMCL (µg/l)
H6	IRON	µg/l	43,400	8,560	-----	13,700	X		300	GW ST SMCL (µg/l)
H9	IRON	µg/l	80,600	9,380	-----	14,800	X		300	GW ST SMCL (µg/l)
H10	IRON	µg/l	13,600	8,990	-----	20,500	X		300	GW ST SMCL (µg/l)

Monsanto Company 104(e) Response

Monsanto 2A000971

Table 4-3

Action Level Exceedances for Inorganic Constituents in Groundwater in Rounds 1, 2, or 3

Well No.	Parameter	Units	Round 1 Total	Round 1 Dissolved	Round 2 Total	Round 3 Total	AL Exceedances in Round 3	New AL Exceedances in Round 3	Most Stringent Action Level	Source of Most Stringent Action Level *
H11	IRON	µg/l	92,400	82,100	-----	74,900	X		300	GW ST SMCL (µg/l)
MW-12	IRON	µg/l	69,000	63,200	-----	75,800	X		300	GW ST SMCL (µg/l)
MW-13	IRON	µg/l	-----	-----	-----	2,790	X	X	300	GW ST SMCL (µg/l)
MW-14	IRON	µg/l	-----	-----	-----	65,200	X	X	300	GW ST SMCL (µg/l)
MW-15	IRON	µg/l	-----	-----	-----	23,629	X	X	300	GW ST SMCL (µg/l)
MW-16	IRON	µg/l	-----	-----	-----	12,200	X	X	300	GW ST SMCL (µg/l)
MW-17	IRON	µg/l	-----	-----	-----	34,300	X	X	300	GW ST SMCL (µg/l)
MW-18	IRON	µg/l	-----	-----	-----	45,600	X	X	300	GW ST SMCL (µg/l)
MW-19	IRON	µg/l	-----	-----	-----	12,900	X	X	300	GW ST SMCL (µg/l)
MW-20	IRON	µg/l	-----	-----	-----	1,980	X	X	300	GW ST SMCL (µg/l)
A2	LEAD	µg/l	7.3	ND	-----	ND			*1.8, **2.2	SW FWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
A4	LEAD	µg/l	9.8	ND	-----	ND			3.2	SW MWC FED (µg/l)
A9	LEAD	µg/l	23.8	ND	-----	1.4 B			*0.8, **2.1	SW FWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
B1A	LEAD	µg/l	4.5	ND	-----	ND			*2.6, **3.2	*SW FWC ST (R1 Dissolved), **SW MWC FED (R1&3 Total) (µg/l)
B1B	LEAD	µg/l	24	8.9	-----	ND			0.3	SW FWC ST (µg/l)
B2	LEAD	µg/l	174.5	ND	-----	15 J	X		*1.6, **3.2	*SW FWC ST (R1 Dissolved), **SW MWC FED (R1&3 Total) (µg/l)
B4	LEAD	µg/l	3.4	ND	-----	ND			*0.8, **0.9	SW FWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
B5	LEAD	µg/l	16.65	ND	-----	ND			*0.1, **1.8, ***1.9	SW FWC ST (*R1 Dissolved, **R1 Total, ***R3 Total) (µg/l)
B6	LEAD	µg/l	7.8	ND	-----	ND			*0.6, **1.2	SW FWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
C1	LEAD	µg/l	13.4	ND	-----	1 B			*1.8, **3.2	*SW FWC ST (R1 Dissolved), **SW MWC FED (R1&3 Total) (µg/l)
DM-1A	LEAD	µg/l	46.8	ND	-----	1.65 B			*1.2, **3.2	*SW FWC ST (R1 Dissolved), **SW MWC FED (R1&3 Total) (µg/l)
DM-1B	LEAD	µg/l	2.75 B	2.3 B	-----	-----			*0.2, **0.3	SW FWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
DM-2A	LEAD	µg/l	ND	3.1	-----	6.98 J	X	X	3.2	SW MWC FED (µg/l)
DM-3A	LEAD	µg/l	31.1	ND	-----	ND			*0.6, **1.8	SW FWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
DM-3B	LEAD	µg/l	3.6	2 B	-----	-----			0.8	SW FWC ST (µg/l)
DM-8	LEAD	µg/l	4.8	4.7	-----	2.5 BJ			3.2	SW MWC FED (µg/l)
E3	LEAD	µg/l	84.7	ND	-----	ND			3.2	R1 Dissolved = SW FWC ST, R1&3 Total = SW MWC FED (µg/l)
G1	LEAD	µg/l	27.95	ND	-----	7.1	X		3.2	SW MWC FED (µg/l)
G3	LEAD	µg/l	29.7	ND	-----	ND			*1.2, **3.2	*SW FWC ST (R1 Dissolved), **SW MWC FED (R1&3 Total) (µg/l)
H1	LEAD	µg/l	7.4	ND	-----	1.4 BJ			*1, **1.9	SW FWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
H6	LEAD	µg/l	9	ND	-----	7 J	X		*0.8, **1.4	SW FWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
H9	LEAD	µg/l	28.8	ND	-----	9.5 J	X		*1.7, **3.2	*SW FWC ST (R1 Dissolved), **SW MWC FED (R1&3 Total) (µg/l)
H10	LEAD	µg/l	3.6	ND	-----	ND			*2.7, **3.1	SW FWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
H11	LEAD	µg/l	4.2	2.6 B	-----	7	X		*2.7, **2.4	SW FWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
MW-12	LEAD	µg/l	7.1	2.7 B	-----	4.3	X		*1.5, **1.4	SW FWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
MW-15	LEAD	µg/l	-----	-----	-----	9.6	X	X	1.3	SW FWC ST (µg/l)
MW-20	LEAD	µg/l	-----	-----	-----	18.4	X	X	0.9	SW FWC ST (µg/l)
A2	MANGANESE	µg/l	1,500	1,390	-----	687	X		50	GW ST SMCL (µg/l)
A4	MANGANESE	µg/l	1,700	1,660	-----	1,260	X		50	GW ST SMCL (µg/l)
A9	MANGANESE	µg/l	1,960	419	-----	826	X		50	GW ST SMCL (µg/l)

TABLE4-3.MN
T4-3 - THORG

Table 4-3

Action Level Exceedances for Inorganic Constituents in Groundwater in Rounds 1, 2, or 3

Well No.	Parameter	Units	Round 1 Total	Round 1 Dissolved	Round 2 Total	Round 3 Total	AL Exceedances in Round 3	New AL Exceedances in Round 3	Most Stringent Action Level	Source of Most Stringent Action Level *
B1A	MANGANESE	µg/l	518	415	-----	386	X		50	GW ST SMCL (µg/l)
B1B	MANGANESE	µg/l	51	42	-----	34			50	GW ST SMCL (µg/l)
B2	MANGANESE	µg/l	1,010	532	-----	962	X		50	GW ST SMCL (µg/l)
B4	MANGANESE	µg/l	98	77	-----	88	X		50	GW ST SMCL (µg/l)
B5	MANGANESE	µg/l	337	146	-----	299	X		50	GW ST SMCL (µg/l)
B6	MANGANESE	µg/l	431	274	-----	310	X		50	GW ST SMCL (µg/l)
C1	MANGANESE	µg/l	573	297	-----	328	X		50	GW ST SMCL (µg/l)
DM-1A	MANGANESE	µg/l	405	61	-----	52 J	X		50	GW ST SMCL (µg/l)
DM-2A	MANGANESE	µg/l	348	340	-----	247	X		50	GW ST SMCL (µg/l)
DM-2B	MANGANESE	µg/l	68	67	-----	-----			50	GW ST SMCL (µg/l)
DM-3A	MANGANESE	µg/l	694	246	-----	338	X		50	GW ST SMCL (µg/l)
DM-4	MANGANESE	µg/l	782	814	-----	822	X		50	GW ST SMCL (µg/l)
DM-5	MANGANESE	µg/l	717	734	-----	624	X		50	GW ST SMCL (µg/l)
DM-6	MANGANESE	µg/l	417	283	-----	-----			50	GW ST SMCL (µg/l)
DM-7	MANGANESE	µg/l	3,125	2,895	-----	3,545	X		50	GW ST SMCL (µg/l)
DM-8	MANGANESE	µg/l	6,280	6,250	-----	5,690	X		50	GW ST SMCL (µg/l)
E3	MANGANESE	µg/l	3,140	238	-----	239	X		50	GW ST SMCL (µg/l)
G1	MANGANESE	µg/l	1,140	993	-----	1,000	X		50	GW ST SMCL (µg/l)
G3	MANGANESE	µg/l	1,990	673	-----	435	X		50	GW ST SMCL (µg/l)
H1	MANGANESE	µg/l	261	105	-----	130	X		50	GW ST SMCL (µg/l)
H6	MANGANESE	µg/l	561	245	-----	197	X		50	GW ST SMCL (µg/l)
H9	MANGANESE	µg/l	1,190	497	-----	887	X		50	GW ST SMCL (µg/l)
H10	MANGANESE	µg/l	1,120	1,030	-----	1,280	X		50	GW ST SMCL (µg/l)
H11	MANGANESE	µg/l	4,050	3,730	-----	3,870	X		50	GW ST SMCL (µg/l)
MW-12	MANGANESE	µg/l	2,400	2,330	-----	3,130	X		50	GW ST SMCL (µg/l)
MW-13	MANGANESE	µg/l	-----	-----	-----	147	X	X	50	GW ST SMCL (µg/l)
MW-14	MANGANESE	µg/l	-----	-----	-----	4,250	X	X	50	GW ST SMCL (µg/l)
MW-15	MANGANESE	µg/l	-----	-----	-----	1,177	X	X	50	GW ST SMCL (µg/l)
MW-16	MANGANESE	µg/l	-----	-----	-----	305	X	X	50	GW ST SMCL (µg/l)
MW-17	MANGANESE	µg/l	-----	-----	-----	7,700	X	X	50	GW ST SMCL (µg/l)
MW-18	MANGANESE	µg/l	-----	-----	-----	4,260	X	X	50	GW ST SMCL (µg/l)
MW-19	MANGANESE	µg/l	-----	-----	-----	782	X	X	50	GW ST SMCL (µg/l)
MW-20	MANGANESE	µg/l	-----	-----	-----	100	X	X	50	GW ST SMCL (µg/l)
A9	MERCURY	µg/l	0.22	ND	-----	ND			0.012	SW FWC FED (µg/l)
B2	MERCURY	µg/l	4.7	ND	-----	0.15 B	X		0.012	SW FWC FED (µg/l)
DM-1A	MERCURY	µg/l	0.21	ND	-----	ND			0.012	SW FWC FED (µg/l)
DM-2A	MERCURY	µg/l	0.2	ND	-----	ND			0.012	SW FWC FED (µg/l)
E3	MERCURY	µg/l	0.5	ND	-----	ND			0.012	SW FWC FED (µg/l)
G3	MERCURY	µg/l	0.49	ND	-----	ND			0.012	SW FWC FED (µg/l)
H6	MERCURY	µg/l	0.45	ND	-----	0.36	X		0.012	SW FWC FED (µg/l)

TABLES.XLS
T4-3 - INORG

Monsanto Company 104(e) Response

Table 4-3

Action Level Exceedances for Inorganic Constituents in Groundwater in Rounds 1, 2, or 3

Well No.	Parameter	Units	Round 1 Total	Round 1 Dissolved	Round 2 Total	Round 3 Total	AL Exceedances in Round 3	New AL Exceedances in Round 3	Most Stringent Action Level	Source of Most Stringent Action Level *
H9	MERCURY	µg/l	0.87	ND	-----	0.67	X		0.012	SW FWC FED (µg/l)
A2	NICKEL	µg/l	24.9 B	ND	-----	ND			7.9	SW MWC ST (µg/l)
A4	NICKEL	µg/l	37.2 B	ND	-----	ND			7.9	SW MWC ST (µg/l)
A9	NICKEL	µg/l	48.7	ND	-----	6.7 B			7.9	SW MWC ST (µg/l)
B1A	NICKEL	µg/l	20.7 B	ND	-----	ND			7.9	SW MWC ST (µg/l)
B2	NICKEL	µg/l	85.95	ND	-----	8.4 B	X		7.9	SW MWC ST (µg/l)
B5	NICKEL	µg/l	42.4	ND	-----	ND			7.9	SW MWC ST (µg/l)
B6	NICKEL	µg/l	26.6 B	ND	-----	ND			7.9	SW MWC ST (µg/l)
C1	NICKEL	µg/l	55	ND	-----	ND			7.9	SW MWC ST (µg/l)
DM-1A	NICKEL	µg/l	67.9	ND	-----	2.2 B			7.9	SW MWC ST (µg/l)
DM-2A	NICKEL	µg/l	ND	ND	-----	20.2 B	X	X	7.9	SW MWC ST (µg/l)
DM-3A	NICKEL	µg/l	64.3	ND	-----	ND			7.9	SW MWC ST (µg/l)
DM-5	NICKEL	µg/l	40.4	43.2	-----	12.8 B	X		7.9	SW MWC ST (µg/l)
E3	NICKEL	µg/l	358	ND	-----	ND			7.9	SW MWC ST (µg/l)
G1	NICKEL	µg/l	64.7	31.1 B	-----	ND			7.9	SW MWC ST (µg/l)
G3	NICKEL	µg/l	93.7	ND	-----	ND			7.9	SW MWC ST (µg/l)
H1	NICKEL	µg/l	ND	ND	-----	8.8 B	X	X	7.9	SW MWC ST (µg/l)
H6	NICKEL	µg/l	34.6 B	ND	-----	9.9 B	X		7.9	SW MWC ST (µg/l)
H9	NICKEL	µg/l	74.7	ND	-----	24.3 B	X		7.9	SW MWC ST (µg/l)
MW-12	NICKEL	µg/l	37.1 B	32 B	-----	10.5 B	X		7.9	SW MWC ST (µg/l)
MW-16	NICKEL	µg/l	-----	-----	-----	104	X	X	7.9	SW MWC ST (µg/l)
A4	SELENIUM	µg/l	ND	ND	-----	5.5	X	X	5	SW FWC FED (µg/l)
G1	SELENIUM	µg/l	ND	ND	-----	6.9	X	X	5	SW FWC FED (µg/l)
MW-14	SELENIUM	µg/l	-----	-----	-----	7.9	X	X	5	SW FWC FED (µg/l)
MW-16	SELENIUM	µg/l	-----	-----	-----	22.8	X	X	5	SW FWC FED (µg/l)
MW-17	SELENIUM	µg/l	-----	-----	-----	10.8	X	X	5	SW FWC FED (µg/l)
DM-5	SILVER	µg/l	21.5	23.5	-----	ND			1.2	SW MWA ST (µg/l)
MW-13	THALLIUM	µg/l	-----	-----	-----	3 B	X	X	2	GW FED MCL (µg/l)
A2	VANADIUM	µg/l	134	82.3	-----	213.5	X		112	GW MTCA B (µg/l)
A9	VANADIUM	µg/l	161	ND	-----	23.7 B			112	GW MTCA B (µg/l)
B2	VANADIUM	µg/l	267.5	157	-----	387	X		112	GW MTCA B (µg/l)
B5	VANADIUM	µg/l	207.5	102	-----	72			112	GW MTCA B (µg/l)
C1	VANADIUM	µg/l	152	22.7 B	-----	27.7 B			112	GW MTCA B (µg/l)
DM-1A	VANADIUM	µg/l	224	ND	-----	14.3			112	GW MTCA B (µg/l)
DM-2A	VANADIUM	µg/l	1,330	1,300	-----	252.9	X		112	GW MTCA B (µg/l)
DM-3A	VANADIUM	µg/l	119	ND	-----	4.3 B			112	GW MTCA B (µg/l)
DM-5	VANADIUM	µg/l	1,630	1,670	-----	1,410	X		112	GW MTCA B (µg/l)
DM-8	VANADIUM	µg/l	1,340	1,390	-----	1,410	X		112	GW MTCA B (µg/l)
E3	VANADIUM	µg/l	860	12.7 B	13.3 BJ	9.9 B			112	GW MTCA B (µg/l)
G3	VANADIUM	µg/l	545	104	-----	72.2			112	GW MTCA B (µg/l)

TABLES3.XLS
T4-3 - TIORG

Monsanto Company 104(e) Response

Table 4-3

Action Level Exceedances for Inorganic Constituents in Groundwater in Rounds 1, 2, or 3

Well No.	Parameter	Units	Round 1 Total	Round 1 Dissolved	Round 2 Total	Round 3 Total	AL Exceedances in Round 3	New AL Exceedances in Round 3	Most Stringent Action Level	Source of Most Stringent Action Level *
H6	VANADIUM	µg/l	132	62.2	-----	45.8 B			112	GW MTCA B (µg/l)
H9	VANADIUM	µg/l	717	469	-----	121	X		112	GW MTCA B (µg/l)
H11	VANADIUM	µg/l	901	945	-----	1,660	X		112	GW MTCA B (µg/l)
MW-14	VANADIUM	µg/l	-----	-----	-----	297	X	X	112	GW MTCA B (µg/l)
MW-15	VANADIUM	µg/l	-----	-----	-----	262	X	X	112	GW MTCA B (µg/l)
MW-16	VANADIUM	µg/l	-----	-----	-----	2,360	X	X	112	GW MTCA B (µg/l)
MW-17	VANADIUM	µg/l	-----	-----	-----	1,290	X	X	112	GW MTCA B (µg/l)
A9	ZINC	µg/l	102	ND	-----	16.7 B			*46.5, **76.6	SW MWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
B2	ZINC	µg/l	1,605	13.9 B	-----	112	X		76.6	SW MWC ST (µg/l)
C1	ZINC	µg/l	95.9	ND	-----	23.4			76.6	SW MWC ST (µg/l)
DM-1A	ZINC	µg/l	94.8	ND	-----	11.0 B			*62.4, **76.6	*SW FWC ST (R1 Dissolved), **SW MWC ST (R1&3 Total) (µg/l)
DM-3A	ZINC	µg/l	98.8	ND	-----	15.2 B			*39.7, **76.6	SW MWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
DM-5	ZINC	µg/l	18.8 B	20	-----	216	X	X	76.6	SW MWC ST (µg/l)
E3	ZINC	µg/l	487	ND	-----	12.2 B			76.6	SW MWC ST (µg/l)
G1	ZINC	µg/l	847.5	70.55	-----	129 J	X		76.6	SW MWC ST (µg/l)
G3	ZINC	µg/l	209	ND	-----	ND			*62.1, **76.6	*SW FWC ST (R1 Dissolved), **SW MWC ST (R1&3 Total) (µg/l)
H6	ZINC	µg/l	73	19 B	-----	31.5			*47.1, **70.8	SW MWC ST (*R1 Dissolved, **R1&3 Total) (µg/l)
H9	ZINC	µg/l	194	80.7	-----	186	X		76.6	SW MWC ST (µg/l)

ND = Compound analyzed for but not detected.

'--- = Compound not analyzed for in this round.

B = Reported value is less than Contract Required Detection Limit or estimated quantitation limit but greater than the instrument detection limit.

J = Reported value is an estimated quantity because quality control criteria were not met.

* Source of the most stringent action level:

GW FED MCL	Federal Maximum Contaminant Levels (MCLs) for Drinking Water (40 CFR 141 and 142)
GW ST SMCL	Washington State Secondary Maximum Contaminant Levels (State MCLs) for Drinking Water (WAC 246-290)
GW GWQS	Washington Groundwater Quality Standards (WAC 173-200)
GW MTCA B	Washington State Model Toxic Control Act Cleanup Level Method B for Groundwater (WAC 173-340)
SW MTCA C	Washington State Model Toxic Control Act Cleanup Level Method C for Surface Water (WAC 173-340)
SW MWC ST	Washington Water Quality Standards for Marine Water Chronic (WAC 173-21A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Chronic (WAC 173-21A)
SW MWA ST	Washington Water Quality Standards for Marine Water Acute (WAC 173-21A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Acute (WAC 173-21A)
SW FWC FED	Federal Freshwater Chronic - Federal Water Quality Criteria for Surface Water, Freshwater Chronic (40 CFR 131)
SW MWC FED	Federal Marine Chronic - Federal Water Quality Criteria for Surface Water, Marine Chronic (40 CFR 131)
SW FWA FED	Federal Water Quality Criteria for Surface Water, Freshwater Acute (40 CFR 131)
SW FMA FED	Federal Water Quality Criteria for Surface Water, Marine Acute (40 CFR 131)
SW HH FED FIS	Federal Water Quality Criteria for the Consumption of Organisms Only (40 CFR 131)

Monsanto Company 104(e) Response

Monsanto 2A000975

Table 4-4

Other Action Level Exceedances in Groundwater in Rounds 1, 2, or 3 [a]

Sample No.	Parameter	Units	Round 1	Round 2	Round 3	Most Stringent Action Level	Source of Most Stringent Action Level [b]
CONVENTIONALS							
DM-5	NITRITE NITROGEN	µg/l	ND	-----	1,100	1,000	GW FED MCL (µg/l)
FORMALDEHYDE							
A2	FORMALDEHYDE	µg/l	450	-----	-----	1.46	GW MTCA B (µg/l)
A4	FORMALDEHYDE	µg/l	73	-----	-----	1.46	GW MTCA B (µg/l)
A9	FORMALDEHYDE	µg/l	290	-----	-----	1.46	GW MTCA B (µg/l)
B4	FORMALDEHYDE	µg/l	32	-----	-----	1.46	GW MTCA B (µg/l)
B6	FORMALDEHYDE	µg/l	160	-----	-----	1.46	GW MTCA B (µg/l)
DM-1A	FORMALDEHYDE	µg/l	37	-----	-----	1.46	GW MTCA B (µg/l)
DM-1B	FORMALDEHYDE	µg/l	51.5	-----	-----	1.46	GW MTCA B (µg/l)
DM-4	FORMALDEHYDE	µg/l	350	-----	-----	1.46	GW MTCA B (µg/l)
DM-7	FORMALDEHYDE	µg/l	210	-----	-----	1.46	GW MTCA B (µg/l)
DM-8	FORMALDEHYDE	µg/l	52	-----	-----	1.46	GW MTCA B (µg/l)
E3	FORMALDEHYDE	µg/l	47	-----	-----	1.46	GW MTCA B (µg/l)
G3	FORMALDEHYDE	µg/l	200	-----	-----	1.46	GW MTCA B (µg/l)
H9	FORMALDEHYDE	µg/l	64	-----	-----	1.46	GW MTCA B (µg/l)
H10	FORMALDEHYDE	µg/l	270	-----	-----	1.46	GW MTCA B (µg/l)
H11	FORMALDEHYDE	µg/l	69	-----	-----	1.46	GW MTCA B (µg/l)
MW-12	FORMALDEHYDE	µg/l	230	-----	-----	1.46	GW MTCA B (µg/l)
PESTICIDES							
MW-12	4,4'-DDD	µg/l	0.07 J	-----	-----	0.00084	SW HH FED FISH (µg/l)
MW-12	ENDOSULFAN I	µg/l	0.04 J	-----	-----	0.0087	SW MWC ST (µg/l)
MW-12	ENDOSULFAN SULFATE	µg/l	0.06 J	-----	-----	0.056	SW FWC ST (µg/l)
SEMIVOLATILES							
H11	2-METHYLPHENOL	µg/l	1,900 D	1,800	3,900	800	GW MTCA B (µg/l)
MW-12	2-METHYLPHENOL	µg/l	1,100 D	Detection	Detection	800	GW MTCA B (µg/l)
H10	4-METHYLPHENOL	µg/l	130 D	-----	180	80	GW MTCA B (µg/l)
H11	4-METHYLPHENOL	µg/l	1,600 D	1,100	1,900	80	GW MTCA B (µg/l)

Monsanto Company 104(e) Response

Monsanto 2A000976

Table 4-4

Other Action Level Exceedances in Groundwater in Rounds 1, 2, or 3 [a]

Sample No.	Parameter	Units	Round 1	Round 2	Round 3	Most Stringent Action Level	Source of Most Stringent Action Level [b]
MW-12	4-METHYLPHENOL	µg/l	760 D	Detection	110	80	GW MTCA B (µg/l)
DM-2A [c]	BENZO(A)PYRENE	µg/l	1 J	-----	-----	0.008	GW GWQS (µg/l)
DM-5 [c]	BENZO(A)PYRENE	µg/l	6 J	-----	-----	0.008	GW GWQS (µg/l)
G3 [c]	BENZO(A)PYRENE	µg/l	2 J	-----	-----	0.008	GW GWQS (µg/l)
H11	BENZO(A)PYRENE	µg/l	7 J	ND	ND	0.008	GW GWQS (µg/l)
A2 [c]	BIS(2-CHLOROETHYL)ETHER	µg/l	2 J	5 J	1 J	0.0398	GW MTCA B (µg/l)
B1B [c]	BIS(2-ETHYLHEXYL)PHTHALATE	µg/l	6 J	-----	-----	5.9	SW HH FED FISH (µg/l)
H10	BIS(2-ETHYLHEXYL)PHTHALATE	µg/l	16	-----	45 J	5.9	SW HH FED FISH (µg/l)
H11	BIS(2-ETHYLHEXYL)PHTHALATE	µg/l	53 DJ	ND	ND	5.9	SW HH FED FISH (µg/l)
MW-12	BIS(2-ETHYLHEXYL)PHTHALATE	µg/l	ND	32	ND	5.9	SW HH FED FISH (µg/l)
H10	PENTACHLOROPHENOL	µg/l	5 J	-----	ND	0.7292	GW MTCA B (µg/l)
VOLATILES							
A2 [c]	1,1-DICHLOROETHANE	µg/l	2	-----	Detection	1	GW GWQS (µg/l)
H10	ACETONE	µg/l	ND	-----	11,000 J	800	GW MTCA B (µg/l)
H11	ACETONE	µg/l	56,000 JD	ND	Detection	800	GW MTCA B (µg/l)
B5	BENZENE	µg/l	5	-----	2	1	GW GWQS (µg/l)
DM-7	BENZENE	µg/l	2	1	3	1	GW GWQS (µg/l)
H10	BENZENE	µg/l	36 J	ND	600 J	1	GW GWQS (µg/l)
H11	BENZENE	µg/l	230	ND	73 J	1	GW GWQS (µg/l)
MW-12	BENZENE	µg/l	ND	ND	5	1	GW GWQS (µg/l)
H10	CARBON DISULFIDE	µg/l	ND	-----	900 J	800	GW MTCA B (µg/l)
H10	METHYLENE CHLORIDE	µg/l	ND	-----	8,300 J	5	GW FED MCL (µg/l)
H11	METHYLENE CHLORIDE	µg/l	57	ND	15 J	5	GW FED MCL (µg/l)
H1	TOLUENE	µg/l	ND	1,200	ND	1,000	GW FED MCL (µg/l)
H10	TOLUENE	µg/l	300,000 D	240,000	380,000 J	1,000	GW FED MCL (µg/l)
H11	TOLUENE	µg/l	600,000 D	340,000 J	670,000 J	1,000	GW FED MCL (µg/l)
MW-12	TOLUENE	µg/l	84,000 D	4,000	Detection	1,000	GW FED MCL (µg/l)
MW-14	TOLUENE	µg/l	-----	3,400	Detection	1,000	GW FED MCL (µg/l)

Table 4-4

Other Action Level Exceedances in Groundwater in Rounds 1, 2, or 3 [a]

Sample No.	Parameter	Units	Round 1	Round 2	Round 3	Most Stringent Action Level	Source of Most Stringent Action Level [b]
MW-15	TOLUENE	µg/l	-----	99,000	120,000	1,000	GW FED MCL (µg/l)
MW-16	TOLUENE	µg/l	-----	1,100	Detection	1,000	GW FED MCL (µg/l)
MW-17	TOLUENE	µg/l	-----	120,000	120,000	1,000	GW FED MCL (µg/l)
MW-18	TOLUENE	µg/l	-----	56,000	360,000	1,000	GW FED MCL (µg/l)
MW-19	TOLUENE	µg/l	-----	9,400	1,400	1,000	GW FED MCL (µg/l)

ND = Compound analyzed for but not detected.
--- = Compound not analyzed for in this round
Detection = Compound detected at concentration below the action level.
D = Compound identified in an analysis at a secondary dilution factor.
J = Estimated value.

[a] Does not include exceedances of naturally occurring parameters that are expected in this type of environment (i.e., chloride, TDS, and pH), as discussed in the RFI Report.

[b] Source of the most stringent action level:

GW FED MCL	Federal Maximum Contaminant Levels (MCLs) for Drinking Water (40 CFR 141 and 142)
GW ST SMCL	Washington State Secondary Maximum Contaminant Levels (State MCLs) for Drinking Water (WAC 246-290)
GW GWQS	Washington Groundwater Quality Standards (WAC 173-200)
GW MTCA B	Washington State Model Toxic Control Act Cleanup Level Method B for Groundwater (WAC 173-340)
SW MTCA C	Washington State Model Toxic Control Act Cleanup Level Method C for Surface Water (WAC 173-340)
SW MWC ST	Washington Water Quality Standards for Marine Water Chronic (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Chronic (WAC 173-201A)
SW MWA ST	Washington Water Quality Standards for Marine Water Acute (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Acute (WAC 173-201A)
SW FWC FED	Federal Freshwater Chronic - Federal Water Quality Criteria for Surface Water, Freshwater Chronic (40 CFR 131)
SW MWC FED	Federal Marine Chronic - Federal Water Quality Criteria for Surface Water, Marine Chronic (40 CFR 131)
SW FWA FED	Federal Water Quality Criteria for Surface Water, Freshwater Acute (40 CFR 131)
SW FMA FED	Federal Water Quality Criteria for Surface Water, Marine Acute (40 CFR 131)
SW HH FED FISH	Federal Water Quality Criteria for the Consumption of Organisms Only (40 CFR 131)

[c] Outside the toluene plume area. All other exceedances are within the toluene plume area.

Monsanto Company 104(e) Response

Monsanto 2A000978

Table 4-5
Volatile and Semivolatile Organic Compounds Detected in Groundwater Below Action Levels in Round 3

Parameter	Units	Monitoring Well	Round 3 Result	Standard Qualifier	Project Qualifier	Most Stringent Action Level	Source of Most Stringent Action Level [a]
SEMIVOLATILES							
2-METHYLNAPHTHALENE	µg/l	B6	0.4	J	D	NAL	NAL
2-METHYLPHENOL	µg/l	MW-12	75		D	800	GW MTCA B (µg/l)
2-METHYLPHENOL	µg/l	H10	520		D	800	GW MTCA B (µg/l)
ACENAPHTHENE	µg/l	B6	3	J	D	960	GW MTCA B (µg/l)
ANTHRACENE	µg/l	B6	0.4	J	D	4,800	GW MTCA B (µg/l)
DI-N-BUTYL PHTHALATE	µg/l	MW-12	1	J	D	1,600	GW MTCA B (µg/l)
DI-N-OCTYL PHTHALATE	µg/l	H10	230		D	320	GW MTCA B (µg/l)
DIBENZOFURAN	µg/l	B6	0.8	J	D	NAL	NAL
DIETHYL PHTHALATE	µg/l	H10	48	J	D	12,800	GW MTCA B (µg/l)
FLUORENE	µg/l	B6	1	J	D	640	GW MTCA B (µg/l)
PHENANTHRENE	µg/l	B6	0.8	J	D	NAL	NAL
PHENOL	µg/l	H11	1700		D	9,600	GW MTCA B (µg/l)
PYRENE	µg/l	B6	0.6	J	D	480	GW MTCA B (µg/l)
VOLATILES							
1,1,1-TRICHLOROETHANE	µg/l	H11	16	J	D	200	GW FED MCL (µg/l)
1,1-DICHLOROETHANE	µg/l	A2	0.6	J	D	1	GW GWQS (µg/l)
1,2-DICHLOROETHENE (TOTAL)	µg/l	A2	0.3	J	D	70	GW FED MCL (µg/l)
ACETONE	µg/l	H11	200	J	D	800	GW MTCA B (µg/l)
CARBON DISULFIDE	µg/l	H11	1	J	D	800	GW MTCA B (µg/l)
ETHYLBENZENE	µg/l	MW-12	9		D	700	GW FED MCL (µg/l)
ETHYLBENZENE	µg/l	H11	33	J	D	700	GW FED MCL (µg/l)
TOLUENE	µg/l	DM-3B	0.4	J	D	1,000	GW FED MCL (µg/l)
TOLUENE	µg/l	MW-12	45		D	1,000	GW FED MCL (µg/l)
TOLUENE	µg/l	MW-14	4		D	1,000	GW FED MCL (µg/l)
TOLUENE	µg/l	MW-16	690		D	1,000	GW FED MCL (µg/l)
TOLUENE	µg/l	B5	15		D	1,000	GW FED MCL (µg/l)
XYLENE (TOTAL)	µg/l	MW-12	17		D	10,000	GW FED MCL (µg/l)
XYLENE (TOTAL)	µg/l	MW-14	0.7		D	10,000	GW FED MCL (µg/l)
XYLENE (TOTAL)	µg/l	MW-20	0.9		D	10,000	GW FED MCL (µg/l)
XYLENE (TOTAL)	µg/l	H10	400	J	D	10,000	GW FED MCL (µg/l)
XYLENE (TOTAL)	µg/l	H11	56	J	D	10,000	GW FED MCL (µg/l)

[a] Source of the most stringent action level:

GW FED MCL	Federal Maximum Contaminant Levels (MCLs) for Drinking Water (40 CFR 141 and 142)
GW ST SMCL	Washington State Secondary Maximum Contaminant Levels (State MCLs) for Drinking Water (WAC 246-290)
GW GWQS	Washington Groundwater Quality Standards (WAC 173-200)
GW MTCA B	Washington State Model Toxic Control Act Cleanup Level Method B for Groundwater (WAC 173-340)
SW MTCA C	Washington State Model Toxic Control Act Cleanup Level Method C for Surface Water (WAC 173-340)
SW MWC ST	Washington Water Quality Standards for Marine Water Chronic (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Chronic (WAC 173-201A)
SW MWA ST	Washington Water Quality Standards for Marine Water Acute (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Acute (WAC 173-201A)
SW FWC FED	Federal Freshwater Chronic - Federal Water Quality Criteria for Surface Water, Freshwater Chronic (40 CFR 131)
SW MWC FED	Federal Marine Chronic - Federal Water Quality Criteria for Surface Water, Marine Chronic (40 CFR 131)
SW FWA FED	Federal Water Quality Criteria for Surface Water, Freshwater Acute (40 CFR 131)
SW FMA FED	Federal Water Quality Criteria for Surface Water, Marine Acute (40 CFR 131)
SW HH FED FISH	Federal Water Quality Criteria for the Consumption of Organisms Only (40 CFR 131)

NAL = No action level.
D = Compound identified in an analysis at a secondary dilution factor.
J = Estimated value.

Table 4-6
Comparison of Toluene Concentrations in Wells MW-12, MW-14, MW-18, and MW-19

Monitoring Well[a]	Toluene Concentration (µg/l)		
	Round 1	Round 2	Round 3
MW-12	84,000	4,000	45
MW-18	Not installed	56,000	360,000
MW-14	Not installed	3,400	4
MW-19	Not installed	9,400	1,400

[a]The wells shown in this table are screened in the upper portion of the Upper Aquifer.

Table 4-7
Comparison of Toluene Concentrations in Wells H1, MW-13, and MW-16

Monitoring Well[a]	Toluene Concentration (µg/l)		
	Round 1	Round 2	Round 3
H1	Not detected	1,200	not detected
MW-13	Not installed	630	not detected
MW-16	Not installed	1,100	690

[a]The wells shown in this table are screened in the lower portion of the Upper Aquifer.

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Table 4-8
Statistical Summary of Seep Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level [a]	No. of Samples Above Action Level
GUAIACOLS/RESIN ACIDS									
4,5,6-TRICHLOROGUAIACOL	µg/l		7						
4,5-DICHLOROGUAIACOL	µg/l		7						
4-CHLOROGUAIACOL	µg/l		7						
9,10-DICHLOROSTEARIC ACID	µg/l		7						
ABIETIC ACID	µg/l		7						
DEHYDROABIETIC ACID	µg/l		7						
DICHLORODEHYDROABIETIC ACID	µg/l		7						
GUAIACOL	µg/l		7						
ISOPIMARIC ACID	µg/l		7						
LINOLEIC ACID	µg/l		7						
OLEIC ACID/LINOLENIC ACID	µg/l		7						
PALUSTRIC ACID	µg/l		7						
SANDRACOPIMARIC ACID	µg/l		7						
TETRACHLOROGUAIACOL	µg/l		7						
TRICHLOROSYRINGOL	µg/l		7						
VANILLIN	µg/l		7						
CONVENTIONALS									
ALKALINITY (AS CACO3)	mg/l	7	7	100%	68	980			
BICARBONATE (FROM ALKALINITY)	mg/l	7	7	100%	68	980			
CARBONATE (FROM ALKALINITY)	mg/l		7						
CHLORIDE	mg/l	7	7	100%	2,900	9,100			
NITRATE NITROGEN	mg/l	7	7	100%	0.1	0.47			
NITRITE NITROGEN	mg/l	1	7	14%	0.08	0.08			
NITROGEN, KJELDAHL	mg/l	6	7	86%	0.14	2.2			
PHOSPHORUS	mg/l	5	7	71%	0.21	1.6			
SULFATE	mg/l	7	7	100%	130	1,200			
SULFIDE AS S	mg/l		7						
TOTAL DISSOLVED SOLIDS	mg/l	7	7	100%	1,900	17,000			
TOTAL ORGANIC CARBON	mg/l	7	7	100%	1.6	160			
FORMALDEHYDE									
FORMALDEHYDE	µg/l	1	7	14%	24	24			
HERBICIDES [b]									
2,4,5-TRICHLOROPHENOXYACETIC ACID	µg/l		3						
2,4-DICHLOROPHENOXYACETIC ACID	µg/l		3						
INORGANICS									
ALUMINUM, TOTAL	µg/l	7	7	100%	361	59,550			
ANTIMONY, TOTAL	µg/l		7				2,592.590	SW MTCA C (µg/l)	
ARSENIC, TOTAL	µg/l	1	7	14%	31	31	0.14	SW HH FED FISH (µg/l)	1

Table 4-8
Statistical Summary of Seep Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level [a]	No. of Samples Above Action Level
BARIUM, TOTAL	µg/l	7	7	100%	4.5448	174			
BERYLLIUM, TOTAL	µg/l	1	7	14%	0.89	0.89	1.98	SW MTCA C (µg/l)	
CADMIUM, TOTAL	µg/l	2	7	29%	2.1	11.6	1.9 - 8	SW FWC ST & SW MWC ST (µg/l)	1
CALCIUM, TOTAL [b]	µg/l	5	5	100%	15,011.816	168,000			
CHROMIUM VI [c]	µg/l		9				11	SW FWC FED (µg/l)	
CHROMIUM, TOTAL	µg/l	1	7	14%	201.5	201.5	408.5 - 405,000	SW FWC ST & SW MTCA C (µg/l)	1
COBALT, TOTAL	µg/l	2	7	29%	2.9	55.5			
COPPER, TOTAL	µg/l	1	7	14%	202.5	202.5	2.5	SW MWA ST (µg/l)	1
LEAD, TOTAL	µg/l	1	7	14%	44.05	44.05	3.2	SW MWC FED (µg/l)	1
MAGNESIUM, TOTAL [b]	µg/l	5	5	100%	46,585.412	541,000			
MERCURY, TOTAL	µg/l	1	7	14%	0.65	0.65	0.012	SW FWC FED (µg/l)	1
NICKEL, TOTAL	µg/l	1	7	14%	70	70	7.9	SW MWC ST (µg/l)	1
POTASSIUM, TOTAL [b]	µg/l	5	5	100%	30,611.465	211,000			
SELENIUM, TOTAL	µg/l		7				5	SW FWC FED (µg/l)	
SILVER, TOTAL	µg/l		7				1.2	SW MWA ST (µg/l)	
SODIUM, TOTAL [b]	µg/l	5	5	100%	693,175.965	5,190,000			
THALLIUM, TOTAL	µg/l		7				6.3	SW HH FED FISH (µg/l)	
TIN, TOTAL	µg/l		7						
VANADIUM, TOTAL	µg/l	7	7	100%	2.8	400			
ZINC, TOTAL	µg/l	1	7	14%	222.5	222.5	76.6	SW MWC ST (µg/l)	1
PESTICIDES/PCBs [b]									
DIMETHOATE	µg/l		3						
DISULFOTON	µg/l		3						
ETHYL PARATHION	µg/l		3				0.013	SW FWC ST (µg/l)	
FAMPHUR	µg/l		3						
METHYL PARATHION	µg/l		3						
O,O,O-TRIETHYLPHOSPHOROTHIOATE	µg/l		3						
PHORATE	µg/l		3						
TETRAETHYL DITHIOPYROPHOSPHATE	µg/l		3						
THIONAZIN	µg/l		3						
AROCLOR-1016	µg/l		3				0.000045	SW HH FED FISH (µg/l)	
AROCLOR-1221	µg/l		3						
AROCLOR-1232	µg/l		3						
AROCLOR-1242	µg/l		3						
AROCLOR-1248	µg/l		3				0.000045	SW HH FED FISH (µg/l)	
AROCLOR-1254	µg/l		3						
AROCLOR-1260	µg/l		3						
4,4'-DDD	µg/l		3				0.00084	SW HH FED FISH (µg/l)	
4,4'-DDE	µg/l		3				0.00059	SW HH FED FISH (µg/l)	

Table 4-8
Statistical Summary of Seep Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level [a]	No. of Samples Above Action Level
4,4'-DDT	µg/l		3				0.00059	SW HH FED FISH (µg/l)	
ALDRIN	µg/l		3				0.00014	SW HH FED FISH (µg/l)	
ALPHA-CHLORDANE	µg/l		3				0.00059	SW HH FED FISH (µg/l)	
BHC-ALPHA	µg/l		3				0.013	SW HH FED FISH (µg/l)	
BHC-BETA	µg/l		3				0.046	SW HH FED FISH (µg/l)	
BHC-DELTA	µg/l		3						
BHC-GAMMA(LINDANE)	µg/l		3				0.063	SW HH FED FISH (µg/l)	
CHLOROBENZILATE	µg/l		3						
DIALLATE	µg/l		3						
DIELDRIN	µg/l		3				0.00014	SW HH FED FISH (µg/l)	
ENDOSULFAN I	µg/l		3				0.0087	SW MWC ST (µg/l)	
ENDOSULFAN II	µg/l		3						
ENDOSULFAN SULFATE	µg/l		3				0.056	SW FWC ST (µg/l)	
ENDRIN	µg/l		3				0.0023	SW FWC FED (µg/l)	
ENDRIN ALDEHYDE	µg/l		3				0.0023	SW FWC FED (µg/l)	
GAMMA-CHLORDANE	µg/l		3				0.00059	SW HH FED FISH (µg/l)	
HEPTACHLOR	µg/l		3				0.00021	SW HH FED FISH (µg/l)	
HEPTACHLOR EPOXIDE	µg/l		3				0.00011	SW HH FED FISH (µg/l)	
ISODRIN	µg/l		3						
KEPONE	µg/l		3						
METHOXYCHLOR	µg/l		3				20.91	SW MTCA C (µg/l)	
TOXAPHENE	µg/l		3				0.0002	SW FWC FED (µg/l)	
SEMIVOLATILES									
1,2,4,5-TETRACHLOROBENZENE	µg/l		7						
1,2,4-TRICHLOROBENZENE	µg/l		7				568.55	SW MTCA C (µg/l)	
1,2-DICHLOROBENZENE	µg/l		7				10,491.61	SW MTCA C (µg/l)	
1,3-DICHLOROBENZENE	µg/l		7				2600	SW HH FED FISH (µg/l)	
1,3-DINITROBENZENE	µg/l		7						
1,4-DICHLOROBENZENE	µg/l		7				121.43	SW MTCA C (µg/l)	
1,4-NAPHTHOQUINONE	µg/l		7						
1,4-PHENYLENEDIAMINE	µg/l		7						
1-NAPHTHYLAMINE	µg/l		7						
2,2'-OXYBIS(1-CHLOROPROPANE)	µg/l		7						
2,3,4,6-TETRACHLOROPHENOL	µg/l		7						
2,4,5-TRICHLOROPHENOL	µg/l		7						
2,4,6-TRICHLOROPHENOL	µg/l		7				6.5	SW HH FED FISH (µg/l)	
2,4-DICHLOROPHENOL	µg/l		7				477.75	SW MTCA C (µg/l)	
2,4-DIMETHYLPHENOL	µg/l		7				110	SW MWC FED (µg/l)	
2,4-DINITROPHENOL	µg/l		7				8,641.97	SW MTCA C (µg/l)	
2,4-DINITROTOLUENE	µg/l		7				9.1	SW HH FED FISH (µg/l)	

Table 4-8
Statistical Summary of Seep Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level *	No. of Samples Above Action Level
2,6-DICHLOROPHENOL	µg/l		7						
2,6-DINITROTOLUENE	µg/l		7						
2-ACETYLAMINOFLUORENE	µg/l		7						
2-CHLORONAPHTHALENE	µg/l		7						
2-CHLOROPHENOL	µg/l		7				241.85	SW MTCA C (µg/l)	
2-METHYLNAPHTHALENE	µg/l		7						
2-METHYLPHENOL	µg/l		7						
2-NAPHTHYLAMINE	µg/l		7						
2-NITROANILINE	µg/l		7						
2-NITROPHENOL	µg/l		7						
2-PICOLINE	µg/l		7						
2SEC-BUTYL-4,6-DINITROPHENOL	µg/l		7						
3,3'-DICHLOROBENZIDINE	µg/l		7				0.077	SW HH FED FISH (µg/l)	
3,3'-DIMETHYLBENZIDINE	µg/l		7						
3-METHYLCHOLANTHRENE	µg/l		7						
3-METHYLPHENOL	µg/l		7						
3-NITROANILINE	µg/l		7						
4,6-DINITRO-2-METHYLPHENOL	µg/l		7						
4-AMINOBIPHENYL	µg/l		7						
4-BROMOPHENYL PHENYL ETHER	µg/l		7						
4-CHLORO-3-METHYLPHENOL	µg/l		7						
4-CHLOROANILINE	µg/l		7						
4-CHLOROPHENYL PHENYL ETHER	µg/l		7						
4-METHYLPHENOL	µg/l		7						
4-NITROANILINE	µg/l		7						
4-NITROPHENOL	µg/l		7						
4-NITROQUINOLINE-1-OXIDE	µg/l		7						
5-NITRO-O-TOLUIDINE	µg/l		7						
7,12-DIMETHYLBENZ(A)ANTHRACENE	µg/l		7						
A,A-DIMETHYLPHENETHYLAMINE	µg/l		7						
ACENAPHTHENE	µg/l		7				1,606.98	SW MTCA C (µg/l)	
ACENAPHTHYLENE	µg/l		7						
ACETOPHENONE	µg/l		7						
ANILINE	µg/l		7				14	SW FWC FED (µg/l)	
ANTHRACENE	µg/l		7				64,814.81	SW MTCA C (µg/l)	
ARAMITE	µg/l		7						
BENZO(A)ANTHRACENE	µg/l		7				0.031	SW HH FED FISH (µg/l)	
BENZO(A)PYRENE	µg/l		7				0.031	SW HH FED FISH (µg/l)	
BENZO(B)FLUORANTHENE	µg/l		7				0.031	SW HH FED FISH (µg/l)	
BENZO(GHI)PERYLENE	µg/l		7						

Table 4-8
Statistical Summary of Seep Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level [a]	No. of Samples Above Action Level
BENZO(K)FLUORANTHENE	µg/l		7				0.031	SW HH FED FISH (µg/l)	
BENZYL ALCOHOL	µg/l		7						
BENZYL BUTYL PHTHALATE	µg/l		7				3,131.15	SW MTCA C (µg/l)	
BIS(2-CHLOROETHOXY) METHANE	µg/l		7						
BIS(2-CHLOROETHYL)ETHER	µg/l		7				1.4	SW HH FED FISH (µg/l)	
BIS(2-ETHYLHEXYL)PHTHALATE	µg/l	3	7	43%	13.8	26.95	5.9	SW HH FED FISH (µg/l)	3
CHRYSENE	µg/l		7				0.031	SW HH FED FISH (µg/l)	
DI-N-BUTYL PHTHALATE	µg/l		7				7,282.56	SW MTCA C (µg/l)	
DI-N-OCTYL PHTHALATE	µg/l		7						
DIBENZO(A,H)ANTHRACENE	µg/l		7				0.031	SW HH FED FISH (µg/l)	
DIBENZOFURAN	µg/l		7						
DIETHYL PHTHALATE	µg/l		7				71,029.93	SW MTCA C (µg/l)	
DIMETHYL PHTHALATE	µg/l		7				180,000	SW MTCA C (µg/l)	
DIPHENYLAMINE	µg/l		7						
ETHYL METHACRYLATE	µg/l		7						
ETHYL METHANESULFONATE	µg/l		7						
FLUORANTHENE	µg/l		7				225.44	SW MTCA C (µg/l)	
FLUORENE	µg/l		7				8,641.97	SW MTCA C (µg/l)	
HEXACHLOROBENZENE	µg/l		7				0.00077	SW HH FED FISH (µg/l)	
HEXACHLOROBUTADIENE	µg/l		7				50	SW HH FED FISH (µg/l)	
HEXACHLOROCYCLOPENTADIENE	µg/l		7				10,454	SW MTCA C (µg/l)	
HEXACHLOROETHANE	µg/l		7				8.9	SW HH FED FISH (µg/l)	
HEXACHLOROPHENE	µg/l		7						
HEXACHLOROPROPENE	µg/l		7						
INDENO(1,2,3-CD)PYRENE	µg/l		7				0.031	SW HH FED FISH (µg/l)	
ISOPHORONE	µg/l		7				600	SW HH FED FISH (µg/l)	
ISOSAFROLE	µg/l		7						
METHAPYRILENE	µg/l		7						
METHYL METHACRYLATE	µg/l		7						
METHYL METHANESULFONATE	µg/l		7						
N-NITROSO-DI-N-PROPYLAMINE	µg/l		7				20.5	SW MTCA C (µg/l)	
N-NITROSODI-N-BUTYLAMINE	µg/l		7						
N-NITROSODIETHYLAMINE	µg/l		7						
N-NITROSODIMETHYLAMINE	µg/l		7				8.1	SW HH FED FISH (µg/l)	
N-NITROSODIPHENYLAMINE	µg/l		7				16	SW HH FED FISH (µg/l)	
N-NITROSOMETHYLETHYLAMINE	µg/l		7						
N-NITROSOMORPHOLINE	µg/l		7						
N-NITROSOPIPERIDINE	µg/l		7						
N-NITROSOPYRROLIDINE	µg/l		7						
NAPHTHALENE	µg/l		7				2,470	SW MTCA C (µg/l)	

Table 4-8
Statistical Summary of Seep Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level [a]	No. of Samples Above Action Level
NITROBENZENE	µg/l		7				1,121.36	SW MTCA C (µg/l)	
O-TOLUIDINE	µg/l		7						
P-(DIMETHYLAMINO)AZOBENZENE	µg/l		7						
PENTACHLOROBENZENE	µg/l		7						
PENTACHLOROETHANE	µg/l		7						
PENTACHLORONITROBENZENE	µg/l		7						
PENTACHLOROPHENOL	µg/l		7				5.02	SW FWC ST (µg/l)	
PHENACETIN	µg/l		7						
PHENANTHRENE	µg/l		7						
PHENOL	µg/l		7				2,777,777.78	SW MTCA C (µg/l)	
PRONAMIDE	µg/l		7						
PYRENE	µg/l		7				6,481.48	SW MTCA C (µg/l)	
PYRIDINE	µg/l		7						
SAFROLE	µg/l		7						
SYM-TRINITROBENZENE	µg/l		7						
VOLATILES									
1,1,1,2-TETRACHLOROETHANE	µg/l		7						
1,1,1-TRICHLOROETHANE	µg/l		7				1,040,000	SW MTCA C (µg/l)	
1,1,2,2-TETRACHLOROETHANE	µg/l		7				11	SW HH FED FISH (µg/l)	
1,1,2-TRICHLOROETHANE	µg/l		7				42	SW HH FED FISH (µg/l)	
1,1-DICHLOROETHANE	µg/l		7						
1,1-DICHLOROETHENE	µg/l		7				3.2	SW HH FED FISH (µg/l)	
1,2,3-TRICHLOROPROPANE	µg/l		7						
1,2-DIBROMO-3-CHLOROPROPANE	µg/l		7						
1,2-DIBROMOETHANE	µg/l		7						
1,2-DICHLOROETHANE	µg/l		7				99	SW HH FED FISH (µg/l)	
1,2-DICHLOROPROPANE	µg/l		7				580	SW MTCA C (µg/l)	
1,4-DIXOANE	µg/l		7						
2-BUTANONE	µg/l		7						
2-HEXANONE	µg/l		7						
4-METHYL-2-PENTANONE	µg/l		7						
ACETONE	µg/l	1	7	14%	10.2	10.2			
ACETONITRILE	µg/l		7						
ACROLEIN	µg/l		7				780	SW HH FED FISH (µg/l)	
ACRYLONITRILE	µg/l		7				0.66	SW HH FED FISH (µg/l)	
ALLYL CHLORIDE	µg/l		7						
BENZENE	µg/l		7				71	SW HH FED FISH (µg/l)	
BROMODICHLOROMETHANE	µg/l		7				22	SW HH FED FISH (µg/l)	
BROMOFORM	µg/l		7				360	SW HH FED FISH (µg/l)	
BROMOMETHANE	µg/l		7				2,420	SW MTCA C (µg/l)	

Table 4-8
Statistical Summary of Seep Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	Most Stringent Action Level	Source of Most Stringent Action Level [a]	No. of Samples Above Action Level
CARBON DISULFIDE	µg/l		7						
CARBON TETRACHLORIDE	µg/l		7				4.4	SW HH FED FISH (µg/l)	
CHLOROBENZENE	µg/l		7				12,585.40	SW MTCA C (µg/l)	
CHLOROETHANE	µg/l		7						
CHLOROFORM	µg/l		7				470	SW HH FED FISH (µg/l)	
CHLOROMETHANE	µg/l		7				3,323.84	SW MTCA C (µg/l)	
CHLOROPRENE	µg/l		7						
CIS-1,3-DICHLOROPROPENE	µg/l		7						
DIBROMOCHLOROMETHANE	µg/l		7				34	SW HH FED FISH (µg/l)	
DIBROMOMETHANE	µg/l		7						
DICHLORODIFLUOROMETHANE	µg/l		7						
ETHYLBENZENE	µg/l		7				17,283.95	SW MTCA C (µg/l)	
IODOMETHANE	µg/l		7						
ISOBUTYL ALCOHOL	µg/l		7						
METHACRYLONITRILE	µg/l		7						
METHYLENE CHLORIDE	µg/l	1	7	14%	12.7	12.7	1,600	SW HH FED FISH (µg/l)	
PROPIONITRILE	µg/l		7						
STYRENE	µg/l		7						
TETRACHLOROETHENE	µg/l		7				8.85	SW HH FED FISH (µg/l)	
TOLUENE	µg/l		7				121,149.19	SW MTCA C (µg/l)	
TRANS-1,2-DICHLOROETHENE	µg/l		7				82,044.07	SW MTCA C (µg/l)	
TRANS-1,3-DICHLOROPROPENE	µg/l		7						
TRANS-1,4-DICHLORO-2-BUTENE	µg/l		7						
TRICHLOROETHENE	µg/l		7				81	SW HH FED FISH (µg/l)	
TRICHLOROFLUOROMETHANE (FREON 11)	µg/l		7						
VINYL ACETATE	µg/l		7						
VINYL CHLORIDE	µg/l		7				72.89	SW MTCA C (µg/l)	
XYLENE (TOTAL)	µg/l		7						

[a] Source of the most stringent action level:

- SW MWC ST — Washington Water Quality Standards for Marine Water Chronic (WAC 173-201A)
- SW FWC ST — Washington Water Quality Standards for Freshwater, Chronic (WAC 173-201A)
- SW MWA ST — Washington Water Quality Standards for Marine Water Acute (WAC 173-201A)
- SW FWC ST — Washington Water Quality Standards for Freshwater, Acute (WAC 173-201A)
- SW FWC FED — Federal Freshwater Chronic - Federal Water Quality Criteria for Surface Water, Freshwater Chronic (40 CFR 131)
- SW MWC FED — Federal Marine Chronic - Federal Water Quality Criteria for Surface Water, Marine Chronic (40 CFR 131)
- SW HH FED FIS — Federal Water Quality Criteria for the Consumption of Organisms Only (40 CFR 131)

[b] Seeps 1 and 3 were not analyzed for calcium, magnesium, potassium, and sodium. Seeps 1 and 3 were also analyzed for herbicides, organophosphate pesticides, and pesticides/PCBs.

[c] Two of the nine hexavalent chromium samples are surface water samples from the Duwamish Waterway. One is upgradient and one is downgradient of the site.

Table 4-9
Constituents Detected Above Action Levels in Seep Samples

Sample ID	Chemical Grouping	Parameter	Result	Units	Most Stringent Action Level	Source of Most Stringent Action Level [a]
02-SP	IORG	ARSENIC, TOTAL	31	µg/l	0.14	SW HH FED FISH (µg/l)
02-SP	IORG	CADMIUM, TOTAL	11.6	µg/l	7.6	SW FWC ST (µg/l)
02-SP	IORG	COPPER, TOTAL	202.5	µg/l	2.5	SW MWA ST (µg/l)
02-SP	IORG	LEAD, TOTAL	44.05	µg/l	3.2	SW MWC FED (µg/l)
02-SP	IORG	NICKEL, TOTAL	70	µg/l	7.9	SW MWC ST (µg/l)
02-SP	IORG	ZINC, TOTAL	222.5	µg/l	76.6	SW MWC ST (µg/l)
02-SP	SVO	BIS(2-ETHYLHEXYL)PHTHALATE	26.95	µg/l	5.9	SW HH FED FISH (µg/l)
05-SP	IORG	MERCURY, TOTAL	0.65	µg/l	0.012	SW FWC FED (µg/l)
07-SP	SVO	BIS(2-ETHYLHEXYL)PHTHALATE	13.8	µg/l	5.9	SW HH FED FISH (µg/l)

[a] Source of the most stringent action level:

SW MWC ST	Washington Water Quality Standards for Marine Water Chronic (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Chronic (WAC 173-201A)
SW MWA ST	Washington Water Quality Standards for Marine Water Acute (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Acute (WAC 173-201A)
SW FWC FED	Federal Freshwater Chronic - Federal Water Quality Criteria for Surface Water, Freshwater Chronic (40 CFR 131)
SW MWC FED	Federal Marine Chronic - Federal Water Quality Criteria for Surface Water, Marine Chronic (40 CFR 131)
SW HH FED FISH	Federal Water Quality Criteria for the Consumption of Organisms Only (40 CFR 131)

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Table 4-10
General Chemistry Parameters for Seep, Groundwater, and Surface Water Samples

Page 1 of 2

	TDS (mg/l)	Chloride (mg/l)	DO (Field) (mg/l)	Sp. Cond. (µmhos/cm)	pH	Total Sodium (mg/l)
Seeps (sampled 4/17-19/95)						
01-SP	15,000 saline	8,100	2.6	14,200	6.4	--
02-SP	8,600 brackish	4,600	2.6	8,800	7.2	2,770
03-SP	12,000 saline	6,900	8.0	12,200	6.8	--
04-SP	17,000 saline	8,400	7.8	14,000	7.8	5,190
05-SP	6,200 brackish	2,900	9.9	5,000	6.9	1,580
06-SP	11,000 saline	6,200	8.6	10,400	6.9	3,380
07-SP	1,900 brackish	9,100[a]	8.4	2,450	7.5	693
Groundwater (sampled 3/29-31/95)						
DM-1A	--	--	6.5	112	6.6	11
DM-2A	1,600	19	1.35	1,957 (1,900 lab)	7.3 (7.5 lab)	617
DM-7	860	52	1.55	1,066 (1,400)	6.7 (6.5)	245
H6	400	3.6	2.4	451 (380)	7.6 (7.5)	81.4
H9	620	5.4	2.7	7.12[h] (700)	7.2 (7.1)	184
B6	500	15	3.8	722 (730)	6.8 (6.6)	125
E3	--	--	1.95	546	6.5	31.4
G1	--	--	1.75	945	6.7	74.8
G3	<4	4.4	2.55	450 (460)	7.25 (7.1)	66.8

Table 4-10
General Chemistry Parameters for Seep, Groundwater, and Surface Water Samples

	TDS (mg/l)	Chloride (mg/l)	DO (Field) (mg/l)	Sp. Cond. (µmhos/cm)	pH	Total Sodium (mg/l)
Surface Water (sampled 4/19/95)						
01-SW	--	--	10.6	600	6.6	--
02-SW	--	--	11.8	5,100	7.0	--

"--" indicates no sample was collected for the parameter.
TDS = Total dissolved solids.
DO = Dissolved oxygen.
Sp. Cond. = Specific conductance.
Note: Laboratory specific conductance and pH values are shown in parentheses.
[a]Chloride concentration of 9,100 mg/l is suspect; this concentration is not possible, based on the low TDS.
[b]The field-specific conductance result of 7.12 µmhos/cm is considered erroneous; a scale error of 100x is suspected (the true value is probably 712 µmhos/cm).

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Table 4-11
Estimated Sediment Concentrations Based on Seep Concentrations

Chemical	Seep Concentration (µg/l)	Sediment Concentrations[a]			Washington State Marine Sediment Management Standards	
		Kd in Literature				
		Min[b] (mg/kg)	Max[b] (mg/kg)	Kd for Soil at pH=7.56[c] (mg/kg)	SQS (mg/kg)	CSL/MCUL (mg/kg)
Arsenic	31	0.19	0.61	0.94	57	93
Cadmium	12.6	0.02	**197**	**17**	5.1	6.7
Copper	201.5	0.32	68	**5038**	260	270
Chromium	202.5	0.28	**729**	3.18	390	390
Lead	44.05	0.21	337	0.01	450	530
Mercury	0.65	0.21	**3.43**	0.12	0.41	0.59
Zinc	222.5	0.07	**1780**	**1246**	410	960
Bis(2-ethylhexyl) phthalate	26.95	**270**[d]	**2695**[d]		47	78

Kd = Distribution coefficient.
SQS = Sediment Quality Standard.
CSL/MCUL = Cleanup Screening Level and Minimum Cleanup Level.
Note: These calculations are based on maximum seep concentrations.
[a]Concentrations are calculated assuming equilibrium conditions. Numbers in bold exceed one or more of the sediment standards.
[b]The maximum and minimum values are calculated from soil distribution coefficients reported in the literature for a range of pH, organic carbon, and soil types. The Facility sediments are not likely to reach the maximum concentrations, with a pH of 7.56.
[c]Concentrations are estimated based on pH of 7.56 (site-specific), but other input parameters such as organic carbon content are from previous EPA soil-modeling results.
[d]Normalized to organic carbon content.
Seep/Sediment Calculations:
1. Equation for metals

$$C_{sed} = C_{seep}\left(K_d + \frac{\theta_w}{\rho_b}\right)$$

where:
θ_w = water-filled porosity
ρ_b = bulk density
K_d = soil-water distribution coefficient

2. Equation for bis(2-ethylhexyl)phthalate

$$C_{sed} = C_{seep}\left(K_{oc}\, f_{oc} + \frac{\theta_w}{\rho_b}\right)$$

where:
F_{oc} = fraction organic carbon
K_{oc} = organic carbon partition coefficient

Parameters:
C_{seep} - used maximum concentrations
*K_d - used minimum and maximum reported in the literature
θ_w, ρ_b - assumed typical values: θ_w = 0.3; P_b = 1.5 kg/l
f_{oc} - average for sediment samples
For bis(2-ethylhexyl)phthalate, sediment concentration was normalized to organic carbon content.
* When K_d's were reported as a function of pH, the average pH for sediment samples = 7.56 was used to select the K_d values.

Table 4-12
Statistical Summary of Outfall Sewer Sediment Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	SMS SQS	No. of Samples Above SQS	SMS CSL/MCUL	No. of Samples Above CSL/MCUL
BTEX										
BENZENE	µg/kg	1	7	14%	6	6				
ETHYLBENZENE	µg/kg	1	7	14%	15	15				
TOLUENE	µg/kg	4	7	57%	8.5	76,000				
XYLENE (TOTAL)	µg/kg	1	7	14%	89	89				
CONVENTIONALS										
TOTAL ORGANIC CARBON	mg/kg	7	7	100%	15,300	175,000				
pH (lab)	(s.u.)	6	6	100%	7.3	8.9				
INORGANICS										
ARSENIC, TOTAL	mg/kg	7	7	100%	14.3	156	57	3	93	1
CADMIUM, TOTAL	mg/kg	7	7	100%	3.6	22.55	5.1	5	6.7	5
CHROMIUM, TOTAL	mg/kg	7	7	100%	15.2	202	260		270	
COPPER, TOTAL	mg/kg	7	7	100%	888	31,200	390	7	390	7
LEAD, TOTAL	mg/kg	7	7	100%	16.1	427	450		530	
SILVER, TOTAL	mg/kg	4	7	57%	2.4	4.2	6.1		6.1	
ZINC, TOTAL	mg/kg	7	7	100%	417	3930	410	7	960	4
PCBs										
AROCLOR-1016	µg/kg		7							
AROCLOR-1221	µg/kg		7							
AROCLOR-1232	µg/kg		7							
AROCLOR-1242	µg/kg		7							
AROCLOR-1248	µg/kg		7							
AROCLOR-1254	µg/kg	3	7	43%	4,100	526,000				
AROCLOR-1260	µg/kg		7							
TOTAL PCB	ppm	3	7	43%	0.2445	343.8384	12	1	65	1
SEMIVOLATILES										
1,2,4-TRICHLOROBENZENE	ppm		7				0.81		1.8	
1,2-DICHLOROBENZENE	ppm		7				2.3		2.3	
1,3-DICHLOROBENZENE	µg/kg		7							
1,4-DICHLOROBENZENE	ppm		7				3.1		9	
2,2'-OXYBIS(1-CHLOROPROPANE)	µg/kg		7							
2,4,5-TRICHLOROPHENOL	µg/kg		7							
2,4,6-TRICHLOROPHENOL	µg/kg		7							
2,4-DICHLOROPHENOL	µg/kg		7							
2,4-DIMETHYLPHENOL	µg/kg		7				29		29	
2,4-DINITROPHENOL	µg/kg		7							
2,4-DINITROTOLUENE	µg/kg		7							
2,6-DINITROTOLUENE	µg/kg		7							
2-CHLORONAPHTHALENE	µg/kg		7							
2-CHLOROPHENOL	µg/kg		7							
2-METHYLNAPHTHALENE	ppm	2	7	29%	0.0410	0.3544	38		64	

Table 4-12
Statistical Summary of Outfall Sewer Sediment Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	SMS SQS	No. of Samples Above SQS	SMS CSL/MCUL	No. of Samples Above CSL/MCUL
2-METHYLPHENOL	µg/kg	1	7	14%	330	330	63	1	63	1
2-NITROANILINE	µg/kg		7							
2-NITROPHENOL	µg/kg		7							
3,3'-DICHLOROBENZIDINE	µg/kg		7							
3-NITROANILINE	µg/kg		7							
4,6-DINITRO-2-METHYLPHENOL	µg/kg		7							
4-BROMOPHENYL PHENYL ETHER	µg/kg		7							
4-CHLORO-3-METHYLPHENOL	µg/kg		7							
4-CHLOROANILINE	µg/kg		7							
4-CHLOROPHENYL PHENYL ETHER	µg/kg		7							
4-METHYLPHENOL	µg/kg	1	7	14%	31,000	31,000	670	1	670	1
4-NITROANILINE	µg/kg		7							
4-NITROPHENOL	µg/kg		7							
ACENAPHTHENE	ppm	5	7	71%	0.0330	5.204872647	16		57	
ACENAPHTHYLENE	ppm	1	7	14%	0.0320	0.03202847	66		66	
ANTHRACENE	ppm	4	7	57%	0.0914	6.533776301	220		1,200	
BENZO(A)ANTHRACENE	ppm	4	7	57%	0.6286	15.50387597	110		270	
BENZO(A)PYRENE	ppm	4	7	57%	0.9714	14.39645626	99		210	
BENZO(B)FLUORANTHENE	µg/kg	4	7	57%	8,850	150,000				
BENZO(GHI)PERYLENE	ppm	2	7	29%	0.6546	2.6578	31		78	
BENZO(K)FLUORANTHENE	µg/kg	5	7	71%	150	84,000				
BENZOIC ACID	µg/kg		7				650		650	
BENZYL ALCOHOL	µg/kg		7				57		73	
BENZYL BUTYL PHTHALATE	ppm	3	7	43%	0.0303	0.4430	4.9		64	
BIS(2-CHLOROETHOXY) METHANE	µg/kg		7							
BIS(2-CHLOROETHYL)ETHER	µg/kg		7							
BIS(2-ETHYLHEXYL)PHTHALATE	ppm	6	7	86%	0.0304	8.1949	47		78	
CARBAZOLE	µg/kg	4	7	57%	1,065	54,000				
CHRYSENE	ppm	5	7	71%	0.1176	21.0410	110		460	
DI-N-BUTYL PHTHALATE	ppm		7				220		1,700	
DI-N-OCTYL PHTHALATE	ppm	5	7	71%	0.5086	50.0000	58		4,500	
DIBENZO(A,H)ANTHRACENE	ppm	3	7	43%	0.2800	3.5437	12		33	
DIBENZOFURAN	ppm	5	7	71%	0.0320	2.2148	15		58	
DIETHYL PHTHALATE	ppm		7				61		110	
DIMETHYL PHTHALATE	ppm	1	7	14%	0.0537	0.0537	53		53	
FLUORANTHENE	ppm	6	7	86%	0.0660	44.2968	160		1,200	
FLUORENE	ppm	4	7	57%	0.0497	5.2049	23		79	
HEXACHLOROBENZENE	ppm		7				0.38		2.3	
HEXACHLOROBUTADIENE	ppm		7				3.9		6.2	
HEXACHLOROCYCLOPENTADIENE	µg/kg		7							
HEXACHLOROETHANE	µg/kg		7							
HPAH	ppm	6	7	86%	0.3810	178.4053	960		5,300	

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Table 4-12
Statistical Summary of Outfall Sewer Sediment Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	SMS SQS	No. of Samples Above SQS	SMS CSL/MCUL	No. of Samples Above CSL/MCUL
INDENO(1,2,3-C,D)PYRENE	ppm	2	7	29%	0.1511	8.9701	34		88	
ISOPHORONE	µg/kg		7							
LPAH	ppm	5	7	71%	0.3350	56.0410	370		780	
N-NITROSO-DI-N-PROPYLAMINE	µg/kg		7							
N-NITROSODIPHENYLAMINE	ppm		7				11		11	
NAPHTHALENE	ppm	3	7	43%	0.0302	1.0410	99		170	
NITROBENZENE	µg/kg		7							
PENTACHLOROPHENOL	µg/kg	1	7	14%	480	480	360	1	690	
PHENANTHRENE	ppm	5	7	71%	0.11	37.6523	100		480	
PHENOL	µg/kg	2	7	29%	250	7,600	420	1	1,200	1
PYRENE	ppm	5	7	71%	0.1307	42.0819	1,000		1,400	
TOTAL BENZOFLUORANTHENES	ppm	5	7	71%	0.2353	25.9136	230		460	

SMS = Sediment Management Standards (WAC 173-204).
SQS = Sediment Quality Standards (WAC 173-204-320).
CSL/MCUL = Sediment Cleanup Screening Levels and Minimum Cleanup Levels (WAC 173-204-520).

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Table 4-13
Constituents Detected Above Action Levels in Outfall Sewer Sediments

Sample No.	Chemical Grouping	Parameter	Result	Units	TOC%	Action Levels: TOC Normalized Value (ppm-TOC)	Action Levels: SMS SQS	Action Levels: SMS CSL/ MCULs	Action Levels: Units
01-SWO	IORG	ARSENIC, TOTAL	156	mg/kg			57	93	mg/kg
01-SWO	IORG	COPPER, TOTAL	1,010	mg/kg			390	390	mg/kg
01-SWO	IORG	ZINC, TOTAL	886	mg/kg			410	960	mg/kg
02-SWO	IORG	ARSENIC, TOTAL	78	mg/kg			57	93	mg/kg
02-SWO	IORG	COPPER, TOTAL	24,200	mg/kg			390	390	mg/kg
02-SWO	IORG	ZINC, TOTAL	704	mg/kg			410	960	mg/kg
02-SWO	PCB	PCB, TOTAL	526	mg/kg	1.53	344	12	65	ppm TOC
02-SWO-B	PCB	PCB, TOTAL	64	mg/kg	1.53	42	12	65	ppm TOC
02-SWO-C	PCB	PCB, TOTAL	13,800	mg/kg	1.53	9,020	12	65	ppm TOC
03-SWO	IORG	CADMIUM, TOTAL	10	mg/kg			5	6.7	mg/kg
03-SWO	IORG	COPPER, TOTAL	31,200	mg/kg			390	390	mg/kg
03-SWO	IORG	ZINC, TOTAL	1,790	mg/kg			410	960	mg/kg
04-SWO	IORG	CADMIUM, TOTAL	16	mg/kg			5	6.7	mg/kg
04-SWO	IORG	COPPER, TOTAL	6,710	mg/kg			390	390	mg/kg
04-SWO	IORG	ZINC, TOTAL	417	mg/kg			410	960	mg/kg
04-SWO	SVO	2-METHYLPHENOL	330 J	µg/kg			63	63	µg/kg
04-SWO	SVO	4-METHYLPHENOL	31,000 D	µg/kg			670	670	µg/kg
04-SWO	SVO	PHENOL	7,600	µg/kg			420	1,200	µg/kg
05-SWO	IORG	CADMIUM, TOTAL	8	mg/kg			5	6.7	mg/kg
05-SWO	IORG	COPPER, TOTAL	888	mg/kg			390	390	mg/kg
05-SWO	IORG	ZINC, TOTAL	1,650	mg/kg			410	960	mg/kg
05-SWO	SVO	PENTACHLOROPHENOL	480 J	µg/kg			360	690	µg/kg
06-SWO	IORG	ARSENIC, TOTAL	67	mg/kg			57	93	mg/kg
06-SWO	IORG	CADMIUM, TOTAL	15	mg/kg			5	6.7	mg/kg
06-SWO	IORG	COPPER, TOTAL	1,480	mg/kg			390	390	mg/kg
06-SWO	IORG	ZINC, TOTAL	1,940	mg/kg			410	960	mg/kg
07-SWO	IORG	ARSENIC, TOTAL	60	mg/kg			57	93	mg/kg
07-SWO	IORG	CADMIUM, TOTAL	27	mg/kg			5	6.7	mg/kg
07-SWO	IORG	COPPER, TOTAL	1,650	mg/kg			390	390	mg/kg
07-SWO	IORG	ZINC, TOTAL	4,570	mg/kg			410	960	mg/kg
07-SWO(FD)	IORG	CADMIUM, TOTAL	18	mg/kg			5	6.7	mg/kg
07-SWO(FD)	IORG	COPPER, TOTAL	1,600	mg/kg			390	390	mg/kg
07-SWO(FD)	IORG	ZINC, TOTAL	3,290	mg/kg			410	960	mg/kg

07-SW0 (FD) = Field Duplicate of 07-SW0.
D = Diluted.
J = Estimated Result.
SMS = Sediment Management Standards (WAC 173-204).
SQS = Sediment Quality Standards (WAC 173-204-320).
CSL/MCUL = Sediment Cleanup Screening Levels and Minimum Cleanup Levels (WAC 173-204-520).

TABLES4.XLS
T4-13 - WS5HIT

Table 4-14
Grain Size Distribution of Outfall Sewer Sediments

Outfall No.	Sieve Size (mm) and Percent Passing (%)				% Recovery
	4.75 mm	2 mm	0.425 mm	0.075 mm	
01-SWO	88.9%	75.8%	31.9%	4.3%	99.4%
01-SWO-REP	91.2%	76.2%	30.2%	3.2%	99.4%
02-SWO	95.5%	90.3%	65.6%	16.7%	99.6%
03-SWO	NA	NA	NA	NA	NA
04-SWO	70.6%	39.2%	13.0%	2.0%	99.4%
05-SWO	76.6%	51.7%	12.0%	0.2%	99.6%
06-SWO	70.6%	53.6%	21.1%	3.4%	99.6%
07-SWO	97.0%	83.2%	32.6%	2.7%	99.6%
07-SWO-REP	93.5%	77.5%	32.9%	2.9%	99.6%
08-SWO (07-SWO Dup)	97.8%	86.0%	33.4%	2.0%	99.7%

REP = Laboratory replicate sample.
Dup = Field duplicate sample.
NA = not analyzed

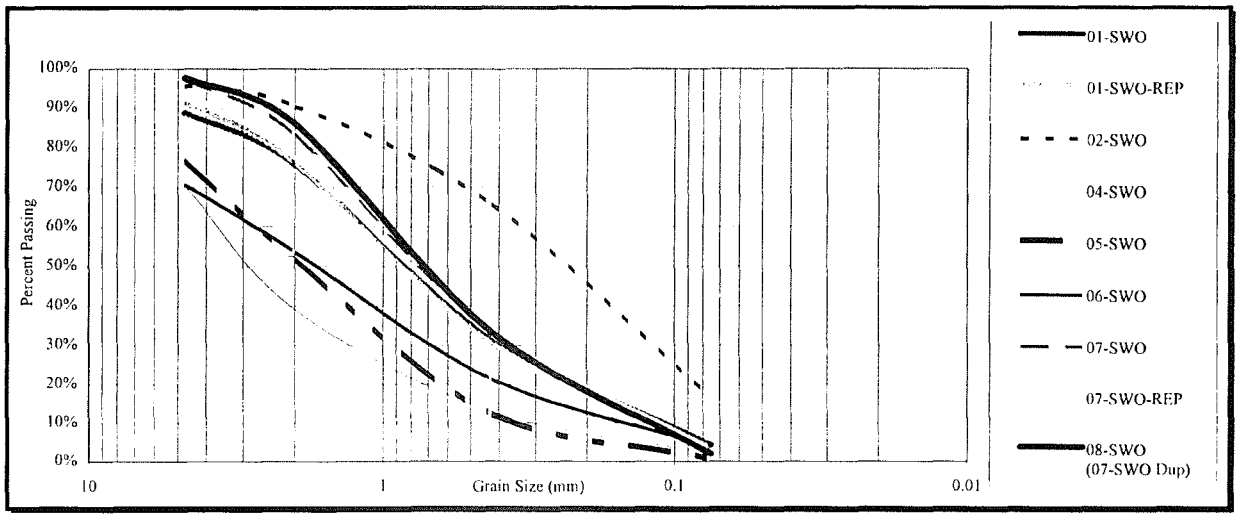

Table 4-15
Statistical Summary of Other Sewer Sediment Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	SMS SQS	No. of Samples Above SQS	SMS CSL/MCUL	No. of Samples Above CSL/MCUL
BTEX										
BENZENE	µg/kg		13							
ETHYLBENZENE	µg/kg	6	13	0.462	6	24				
TOLUENE	µg/kg	9	13	0.692	4	33,000				
XYLENE (TOTAL)	µg/kg	5	13	0.385	14	110				
CONVENTIONALS										
TOTAL ORGANIC CARBON	mg/kg	13	13	1	28,100	237,000				
INORGANICS										
ARSENIC, TOTAL	mg/kg	13	13	1	7.2	400	57	3	93	1
CADMIUM, TOTAL	mg/kg	13	13	1	3.2	46	5.1	10	6.7	9
CHROMIUM, TOTAL	mg/kg	13	13	1	23.3	220	260		270	
COPPER, TOTAL	mg/kg	13	13	1	320	41,300	390	12	390	12
LEAD, TOTAL	mg/kg	13	13	1	20.6	2,920	450	4	530	3
SILVER, TOTAL	mg/kg	8	13	0.615	1.9	318	6.1	3	6.1	3
ZINC, TOTAL	mg/kg	13	13	1	267	4,410	410	12	960	6
PCBs										
AROCLOR-1016	µg/kg		13							
AROCLOR-1221	µg/kg		13							
AROCLOR-1232	µg/kg		13							
AROCLOR-1242	µg/kg		13							
AROCLOR-1248	µg/kg		13							
AROCLOR-1254	µg/kg	4	13	0.308	378	9,300				
AROCLOR-1260	µg/kg	1	13	0.077	240	240				
TOTAL PCB	ppm	5	13	0.385	0.066	0.475	12		65	
SEMIVOLATILES										
1,2,4-TRICHLOROBENZENE	ppm		13				0.81		1.8	
1,2-DICHLOROBENZENE	ppm		13				2.3		2.3	
1,3-DICHLOROBENZENE	µg/kg		13							
1,4-DICHLOROBENZENE	ppm		13				3.1		9	
2,2'-OXYBIS(1-CHLOROPROPANE)	µg/kg		13							
2,4,5-TRICHLOROPHENOL	µg/kg		13							
2,4,6-TRICHLOROPHENOL	µg/kg		13							
2,4-DICHLOROPHENOL	µg/kg		13							
2,4-DIMETHYLPHENOL	µg/kg		13				29		29	
2,4-DINITROPHENOL	µg/kg		13							
2,4-DINITROTOLUENE	µg/kg		13							
2,6-DINITROTOLUENE	µg/kg		13							
2-CHLORONAPHTHALENE	µg/kg		13							
2-CHLOROPHENOL	µg/kg		13							
2-METHYLNAPHTHALENE	ppm	3	13	0.231	0.057	0.152	38		64	
2-METHYLPHENOL	µg/kg		13				63		63	
2-NITROANILINE	µg/kg		13							
2-NITROPHENOL	µg/kg		13							
3,3'-DICHLOROBENZIDINE	µg/kg		13							
3-NITROANILINE	µg/kg		13							
4,6-DINITRO-2-METHYLPHENOL	µg/kg		13							
4-BROMOPHENYL PHENYL ETHER	µg/kg		13							
4-CHLORO-3-METHYLPHENOL	µg/kg		13							
4-CHLOROANILINE	µg/kg		13							
4-CHLOROPHENYL PHENYL ETHER	µg/kg		13							
4-METHYLPHENOL	µg/kg	3	13	0.231	630	8,500	670	2	670	2
4-NITROANILINE	µg/kg		13							
4-NITROPHENOL	µg/kg		13							
ACENAPHTHENE	ppm	4	13	0.308	0.037	1.450	16		57	
ACENAPHTHYLENE	ppm	3	13	0.231	0.022	0.078	66		66	
ANTHRACENE	ppm	10	13	0.769	0.063	1.794	220		1,200	
BENZO(A)ANTHRACENE	ppm	10	13	0.769	0.057	5.534	110		270	
BENZO(A)PYRENE	ppm	9	13	0.692	0.326	2.609	99		210	
BENZO(B)FLUORANTHENE	µg/kg	11	13	0.846	350	40,000				
BENZO(GHI)PERYLENE	ppm	6	13	0.462	0.096	2.863	31		78	
BENZO(K)FLUORANTHENE	µg/kg	11	13	0.846	560	35,000				
BENZOIC ACID	µg/kg		13				650		650	
BENZYL ALCOHOL	µg/kg	1	13	0.077	2,500	2,500	57	1	73	1
BENZYL BUTYL PHTHALATE	ppm	5	13	0.385	0.053	2.481	5		64	
BIS(2-CHLOROETHOXY) METHANE	µg/kg		13							
BIS(2-CHLOROETHYL)ETHER	µg/kg		13							
BIS(2-ETHYLHEXYL)PHTHALATE	ppm	11	13	0.846	0.106	1,120	47	1	78	1
CARBAZOLE	µg/kg	7	13	0.538	740	15,000				
CHRYSENE	ppm	11	13	0.846	0.125	3.053	110		460	
DI-N-BUTYL PHTHALATE	ppm	5	13	0.385	0.114	1.317	220		1,700	

TABLES4.XLS
T4-15 - SSSUMSED

Table 4-15
Statistical Summary of Other Sewer Sediment Data

Parameter	Units	Number of Detections	Number of Samples	Frequency of Detection	Minimum Detected Value	Maximum Detected Value	SMS SQS	No. of Samples Above SQS	SMS CSL/MCUL	No. of Samples Above CSL/MCUL
DI-N-OCTYL PHTHALATE	ppm	12	13	0.923	0.045	112	58	1	4,500	
DIBENZO(A,H)ANTHRACENE	ppm	7	13	0.538	0.157	1.250	12		33	
DIBENZOFURAN	ppm	6	13	0.462	0.026	0.973	15		58	
DIETHYL PHTHALATE	ppm		13				61		110	
DIMETHYL PHTHALATE	ppm	2	13	0.154	0.051	0.283	53		53	
FLUORANTHENE	ppm	11	13	0.846	0.253	19.084	160		1,200	
FLUORENE	ppm	5	13	0.385	0.046	1.412	23		79	
HEXACHLOROBENZENE	ppm		13				0.38		2.3	
HEXACHLOROBUTADIENE	ppm		13				3.9		6.2	
HEXACHLOROCYCLOPENTADIENE	µg/kg		13							
HEXACHLOROETHANE	µg/kg		13							
HPAH	ppm	12	13	0.923	1.144	63.798	960		5,300	
INDENO(1,2,3-CD)PYRENE	ppm	6	13	0.462	0.080	2.672	34		88	
ISOPHORONE	µg/kg		13							
LPAH	ppm	13	13	1	0.242	19.046	370		780	
N-NITROSO-DI-N-PROPYLAMINE	µg/kg		13							
N-NITROSODIPHENYLAMINE	ppm		13				11		11	
NAPHTHALENE	ppm	4	13	0.308	0.036	0.272	99		170	
NITROBENZENE	µg/kg		13							
PENTACHLOROPHENOL	µg/kg		13				360		690	
PHENANTHRENE	ppm	13	13	1	0.033	13.931	100		480	
PHENOL	µg/kg	3	13	0.231	880	3,500	420	3	1,200	2
PYRENE	ppm	12	13	0.923	0.189	15.267	1,000		1,400	
TOTAL BENZOFLUORANTHENES	ppm	11	13	0.846	0.230	12.595	230		460	

SMS = Sediment Management Standards (WAC 173-204).
SQS = Sediment Quality Standards (WAC 173-204-320).
CSL/MCUL = Sediment Cleanup Screening Levels and Minimum Cleanup Levels (WAC 173-204-520).

Table 4-16
Constituents Detected Above Action Levels in Other Sewer Sediments

Sample No.	Chemical Grouping	Parameter	Result	Units	TOC%	Action Levels: TOC Normalized Value (ppm-TOC)	Action Levels: SMS SQS	Action Levels: SMS CSL/ MCULs	Action Levels: Units
010-SEW	IORG	CADMIUM, TOTAL	10.1	mg/kg			5.1	6.7	mg/kg
010-SEW	IORG	COPPER, TOTAL	41,300	mg/kg			390	390	mg/kg
010-SEW	IORG	ZINC, TOTAL	1,420	mg/kg			410	960	mg/kg
014-SEW	IORG	CADMIUM, TOTAL	23.1	mg/kg			5.1	6.7	mg/kg
014-SEW	IORG	COPPER, TOTAL	10,900	mg/kg			390	390	mg/kg
014-SEW	IORG	ZINC, TOTAL	3,590	mg/kg			410	960	mg/kg
014-SEW	SVO	4-METHYLPHENOL	910	µg/kg			670	670	µg/kg
014-SEW	SVO	PHENOL	880	µg/kg			420	1,200	µg/kg
014-SEW(FD)	IORG	CADMIUM, TOTAL	24.5	mg/kg			5.1	6.7	mg/kg
014-SEW(FD)	IORG	COPPER, TOTAL	10,200	mg/kg			390	390	mg/kg
014-SEW(FD)	IORG	ZINC, TOTAL	3,720	mg/kg			410	960	mg/kg
014-SEW(FD)	SVO	4-METHYLPHENOL	930	µg/kg			670	670	µg/kg
014-SEW(FD)	SVO	PHENOL	1,100	µg/kg			420	1,200	µg/kg
016-SEW	IORG	COPPER, TOTAL	470	mg/kg			390	390	mg/kg
026-SEW	IORG	CADMIUM, TOTAL	16.9	mg/kg			5.1	6.7	mg/kg
026-SEW	IORG	COPPER, TOTAL	6,000	mg/kg			390	390	mg/kg
026-SEW	IORG	LEAD, TOTAL	1,290	mg/kg			450	530	mg/kg
026-SEW	IORG	ZINC, TOTAL	2,670	mg/kg			410	960	mg/kg
026-SEW	SVO	BENZYL ALCOHOL	2,500	µg/kg			57	73	µg/kg
030-SEW	IORG	ARSENIC, TOTAL	64.1	mg/kg			57	93	mg/kg
030-SEW	IORG	CADMIUM, TOTAL	15.9	mg/kg			5.1	6.7	mg/kg
030-SEW	IORG	COPPER, TOTAL	6,250	mg/kg			390	390	mg/kg
030-SEW	IORG	LEAD, TOTAL	530	mg/kg			450	530	mg/kg
030-SEW	IORG	ZINC, TOTAL	1,650	mg/kg			410	960	mg/kg
038-SEW	IORG	COPPER, TOTAL	11,800	mg/kg			390	390	mg/kg
038-SEW	IORG	ZINC, TOTAL	413	mg/kg			410	960	mg/kg
040-SEW	IORG	ARSENIC, TOTAL	400	mg/kg			57	93	mg/kg
040-SEW	IORG	CADMIUM, TOTAL	46	mg/kg			5.1	6.7	mg/kg
040-SEW	IORG	COPPER, TOTAL	4,230	mg/kg			390	390	mg/kg
040-SEW	IORG	LEAD, TOTAL	2,920	mg/kg			450	530	mg/kg
040-SEW	IORG	SILVER, TOTAL	9.2	mg/kg			6.1	6.1	mg/kg
040-SEW	IORG	ZINC, TOTAL	2,740	mg/kg			410	960	mg/kg
040-SEW	SVO	PHENOL	3,500	µg/kg			420	1,200	µg/kg
045-SEW	IORG	ARSENIC, TOTAL	70.9	mg/kg			57	93	mg/kg
045-SEW	IORG	CADMIUM, TOTAL	36.5	mg/kg			5.1	6.7	mg/kg
045-SEW	IORG	COPPER, TOTAL	1,040	mg/kg			390	390	mg/kg
045-SEW	IORG	LEAD, TOTAL	805	mg/kg			450	530	mg/kg
045-SEW	IORG	ZINC, TOTAL	4,410	mg/kg			410	960	mg/kg
045-SEW	SVO	BIS(2-ETHYLHEXYL)PHTHALATE	1,120 D	ppm	12.5	14,000	47	78	ppm
045-SEW	SVO	DI-N-OCTYL PHTHALATE	112 D	ppm	12.5	1,400	58	4,500	ppm
045-SEW	SVO	PHENOL	1,300	µg/kg			420	1,200	µg/kg
047-SEW	IORG	CADMIUM, TOTAL	11.3	mg/kg			5.1	6.7	mg/kg
047-SEW	IORG	COPPER, TOTAL	2,190	mg/kg			390	390	mg/kg
047-SEW	IORG	SILVER, TOTAL	17.1	mg/kg			6.1	6.1	mg/kg
047-SEW	IORG	ZINC, TOTAL	474	mg/kg			410	960	mg/kg
068-SEW	IORG	CADMIUM, TOTAL	5.1	mg/kg			5.1	6.7	mg/kg
068-SEW	IORG	COPPER, TOTAL	1,430	mg/kg			390	390	mg/kg
068-SEW	IORG	ZINC, TOTAL	560	mg/kg			410	960	mg/kg

TABLES4.XLS
T4-16 - SSGTSED

Table 4-16
Constituents Detected Above Action Levels in Other Sewer Sediments

Sample No.	Chemical Grouping	Parameter	Result	Units	TOC%	Action Levels: TOC Normalized Value (ppm-TOC)	Action Levels: SMS SQS	Action Levels: SMS CSL/ MCULs	Action Levels: Units
084-SEW	IORG	CADMIUM, TOTAL	9.8	mg/kg			5.1	6.7	mg/kg
084-SEW	IORG	COPPER, TOTAL	18,000	mg/kg			390	390	mg/kg
084-SEW	IORG	SILVER, TOTAL	318	mg/kg			6.1	6.1	mg/kg
084-SEW	IORG	ZINC, TOTAL	763	mg/kg			410	960	mg/kg
088-SEW	IORG	CADMIUM, TOTAL	6.6	mg/kg			5.1	6.7	mg/kg
088-SEW	IORG	ZINC, TOTAL	908	mg/kg			410	960	mg/kg
088-SEW	SVO	4-METHYLPHENOL	8,500	µg/kg			670	670	µg/kg
089-SEW	IORG	CADMIUM, TOTAL	7.6	mg/kg			5.1	6.7	mg/kg
089-SEW	IORG	COPPER, TOTAL	835	mg/kg			390	390	mg/kg
089-SEW	IORG	ZINC, TOTAL	518	mg/kg			410	960	mg/kg

014-SEW (FD) = Field Duplicate 014-SEW.
CSL/MCUL = Sediment Cleanup Screening Levels and Minimum Cleanup Levels (WAC 173-204-520).
D = Diluted.
J = Estimated Result.
SMS = Sediment Management Standards (WAC 173-204).
SQS = Sediment Quality Standards (WAC 173-204-320).

Table 4-17
Estimated Depths to Sediments Potentially Affected by Facility Discharges

Outfall	Year Last Used for Discharge	Estimated Depth to Top of Facility-Affected Sediments
2	1989	6 - 12 cm
3	1989	6 - 12 cm
4	1976	10 - 20 cm
5	1976	10 - 20 cm
6	1989	6 - 12 cm
7	1991	4 - 8 cm

Note: Outfall 1 is the discharge to the King County Storm Drain and does not discharge directly to a surface water body. Outfall 7 was reopened to the Duwamish Waterway in October 1995 after the sewers were cleaned.

Table 5-1
Outfall 7 Rinsate and Stormwater Samples

Parameter	Rinsate Sample (9/7/95)		Storm Event Sample (10/17/95)				Calculated Maximum Daily Limit[b]	Water Quality Criteria or MTCA Method C Surface Water Concentration[c]
			First Flush		Composite			
	Result	PQL[a]	Result	PQL[a]	Result	PQL[a]		
Metals (all values in mg/l unless otherwise specified)								
Arsenic	ND	0.15	ND	0.15	ND	0.15	9.072	
Cadmium	ND	0.010	ND	0.010	ND	0.010	0.072	
Chromium	ND	0.01	ND	0.01	ND	0.01	40	
Hexavalent chromium	ND	0.01	ND	0.01	ND	0.01		0.011
Copper	1.9	0.025	0.20	0.025	0.15	0.025	0.30	
Lead	0.14	0.05	0.05	0.05	0.06	0.05	0.70	
Selenium	ND	0.15	ND	0.20	ND	0.20	0.504	
Silver	ND	0.01	ND	0.01	ND	0.01	--	0.005
Zinc	0.32	0.02	0.37	0.02	ND	0.02	--	0.0525
Mercury	0.0056	0.0002	0.0003	0.0002	0.0002	0.002	0.0030	
Semivolatile Organics[d] (µg/l)								
Fluorene	51	5.9	17	9.4	13	9.5	5,700	
Pyrene	36	5.9	19	9.4	13	9.5	16,300	
Benzo(a)anthracene	23	5.9	ND	9.4	ND	9.5	19	
Chrysene	26	5.9	13	9.4	9.2J	9.5	19	
Bis(2-ethylhexyl)phthalate[e]	20B1	5.9	14B1	9.4	12B1	9.5	2,200	
Benzo(b)fluoranthene	20	5.9	ND	9.4	ND	9.5	19	
Benzo(k)fluoranthene	ND	5.9	11	9.4	12	9.5	19	
Benzo(a)pyrene	12	5.9	7.2J	9.4	5.6J	9.5	19	
Indeno(1,2,3-cd)pyrene	11	5.9	6.9J	9.4	6.6J	9.5	19	
Benzo(g,h,i)perylene	10	5.9	6J	9.4	6J	9.5	--	NA

Table 5-1
Outfall 7 Rinsate and Stormwater Samples

Parameter	Rinsate Sample (9/7/95)		Storm Event Sample (10/17/95)				Calculated Maximum Daily Limit[b]	Water Quality Criteria or MTCA Method C Surface Water Concentration[c]
			First Flush		Composite			
	Result	PQL[a]	Result	PQL[a]	Result	PQL[a]		
Pesticides and PCBs[f] (µg/l)								
Arochlor 1254	1.3	0.51	ND	0.51	ND	0.52	3.53[g]	
Aldrin	ND	0.01	0.062	0.01	0.039	0.01	0.48	
4,4'-DDE	0.021	0.02	ND	0.02	ND	0.021	0.25[h]	
DDT	ND	0.02	0.067	0.02	ND	0.021	0.25[h]	
Heptachlor epoxide	ND	0.01	0.028	0.01	ND	0.01	0.96[i]	
Lindane	ND	0.01	0.023	0.01	ND	0.01	20	
General Chemistry								
Oil and Grease	ND	5 mg/l	9 mg/l	5 mg/l	--		15 mg/l	
Hardness (as $CaCO_3$)[j]	50 mg/l	2 mg/l	27 mg/l		26 mg/l		NA	NA
pH	7.70	NA	7.50		7.31		6.5 - 8.5	

ND = Not detected.
-- = Limit not calculated or no water quality criteria available or calculated.
NA = Not applicable.
B1 = Value not significantly different than that found in the method blank.
J = Positively identified, but value is an estimated quantity.
No BTEX were detected (PQLs were 5 µg/l).
[a] PQL = Practical quantitation limit.
[b] Calculated maximum daily limit assuming a 4.5-acre impervious surface, developed by S. Hays/Hays Consulting based on information provided by P. Elardo/Ecology.
[c] Water Quality Criteria (WAC 173-201A) or Model Toxics Control Act (MTCA) Method C for Surface Water (WAC 173-340) (MTCA is used only for semivolatile organics). Used for comparison only when allowable discharge concentrations were not available. Note that some of the Water Quality Criteria are below PQLs.
[d] Semivolatile organic were analyzed using EPA Method 8270. All other semivolatile organics were not detected.
[e] Note that bis(2-ethylhexyl)phthalate was found in the method blank at 0.85 µg/l.
[f] Pesticides and PCBs were analyzed using EPA Method 8080. All other pesticides and PCBs were not detected.
[g] Maximum daily limit is calculated for total PCBs.
[h] Maximum daily limit is calculated for DDT and metabolites.
[i] Maximum daily limit is based on federal criterion which is identical for heptachlor and heptachlor epoxide.
[j] Hardness is used for metals criteria calculations.

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12/13/95

Table 5-2
Detected Constituents in Composite Sewer Sediment Sample[a]

Parameter	Results
Total copper	6,300 mg/kg
TCLP barium[b]	1.4 mg/l
TCLP cadmium[b]	0.035 mg/l
Arochlor 1254	6.6 mg/kg
Acetone	4,100 µg/l
Toluene	700 µg/l
M-xylene	310 µg/l
P-xylene	310 µg/l
O-xylene	560 µg/l

[a]Sample collected by Philip Environmental on 7/13/95.
[b]All other TCLP metals were not detected.

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Table 6-1
Constituents to be Addressed in the Risk Assessment/MCS Evaluation

Parameter	Media in Which Action Level Was Exceeded	Source of Most Stringent Action Level
Inorganics		
Cobalt	Soil	No action level
Total arsenic	Groundwater, seeps	GW MTCA B & SW HH FED FISH
Total barium	Seeps	No action level
Total cadmium	Groundwater, seeps	SW FWC FED, SW FWC ST, & SW MWC ST
Total chromium	Groundwater	GW GWQS
Total cobalt	Groundwater, seeps	No action level
Total copper	Groundwater, seeps	SW MWA ST
Total lead	Groundwater, seeps	SW FWC FED, SW MWC ST, & SW MWC FED
Total mercury	Groundwater, seeps	SW FWC FED & SW MWC FED
Total nickel	Groundwater, seeps	SW MWC ST
Total selenium	Groundwater	GW GWQS & SW FWC FED
Total thallium	Groundwater	GW FED MCL
Total vanadium	Groundwater, seeps	GW MTCA B, No action level
Total zinc	Groundwater, seeps	SW FWC ST & SW MWC ST
Pesticides/PCBs		
Endosulfan I	Groundwater	SW MWC ST
Endosulfan sulfate	Groundwater	SW FWC ST
4,4′-DDD	Groundwater	SW HH FED FISH
Semivolatiles		
2-Methylnaphthalene	Soil, groundwater	No action level
Benzo(g,h,i)perylene	Soil	No action level
Phenanthrene	Soil, groundwater	No action level
Isopropyl alcohol (2-propanol)	Soil	No action level
Benzo(a)pyrene	Groundwater	GW GWQS

Table 6-1
Constituents to be Addressed in the Risk Assessment/MCS Evaluation

Parameter	Media in Which Action Level Was Exceeded	Source of Most Stringent Action Level
Chrysene	Groundwater	GW MTCA B
Bis(2-chloroethyl)ether	Groundwater	GW MTCA B
Pentachlorophenol	Groundwater	GW MTCA B
2-Methylphenol	Groundwater	GW MTCA B
4-Methylphenol	Groundwater	GW MTCA B
Bis(2-ethylhexyl)phthalate	Groundwater, seeps	SW HH FED FISH
Dibenzofuran	Groundwater	No action level
Volatiles		
Toluene	Groundwater	GW FED MCL
Benzene	Groundwater	GW GWQS
Methylene chloride	Groundwater	GW FED MCL
1,1-Dichloroethane	Groundwater	GW GWQS
Acetone	Groundwater	GW MTCA B
Formaldehyde	Groundwater	GW MTCA B
Conventionals		
Nitrite	Groundwater	GW FED MCL

Source of the most stringent action level:

GW FED MCL	Federal Maximum Contaminant Levels (MCLs) for Drinking Water (40 CFR 141 and 142)
GW ST SMCL	Washington State Secondary Maximum Contaminant Levels (State MCLs) for Drinking Water (WAC 246-290)
GW GWQS	Washington Groundwater Quality Standards (WAC 173-200)
GW MTCA B	Washington State Model Toxic Control Act Cleanup Level Method B for Groundwater (WAC 173-340)
SW MWC ST	Washington Water Quality Standards for Marine Water Chronic (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Chronic (WAC 173-201A)
SW MWA ST	Washington Water Quality Standards for Marine Water Acute (WAC 173-201A)
SW FWC ST	Washington Water Quality Standards for Freshwater, Acute (WAC 173-201A)
SW FWC FED	Federal Freshwater Chronic - Federal Water Quality Criteria for Surface Water, Freshwater Chronic (40 CFR 131)
SW MWC FED	Federal Marine Chronic - Federal Water Quality Criteria for Surface Water, Marine Chronic (40 CFR 131)
SW FWA FED	Federal Water Quality Criteria for Surface Water, Freshwater Acute (40 CFR 131)
SW FMA FED	Federal Water Quality Criteria for Surface Water, Marine Acute (40 CFR 131)
SW HH FED FISH	Federal Water Quality Criteria for the Consumption of Organisms Only (40 CFR 131)

Table 6-2
Recommended Sediment Sampling

Location	Parameter	Sample Depth[a]
Outfall 2	Metals	0-10 cm
Outfall 3	Metals	0-10 cm
Outfall 6	Metals	0-10 cm
Outfall 7	Metals	0-10 cm
Seep 2	Metals, Semivolatiles, TOC	0-10 cm
Seep 5	Metals	0-10 cm
Seep 7	Semivolatiles, TOC	0-10 cm

[a]Depth from present sediment surface.

Table 2-4
Seep and Surface Water Sampling and Analysis Matrix

Sample Number	Conventional Parameters[a]	Hexavalent Chromium	Inorganics[b]	Semivolatiles	Volatiles	Pesticides/PCBs	Herbicides	Formaldehyde	Guaiacols/ Resin Acids
01-SP	X	X	X	X	X			X	X
02-SP[c]	X	X	X	X	X	X	X	X	X
03-SP	X	X	X	X	X			X	X
04-SP	X	X	X	X	X			X	X
05-SP	X	X	X	X	X			X	X
06-SP	X	X	X	X	X			X	X
07-SP	X	X	X	X	X			X	X
01-SW		X							
02-SW		X							

[a]Conventional parameters include alkalinity as $CaCO_3$, carbonate/bicarbonate, nitrate, nitrite, total kjeldahl nitrogen (TKN), total dissolved solids (TDS), total organic carbon (TOC), sulfate, sulfide, phosphorus, and chloride.
[b]Inorganics include Target Analyte List (TAL) and common ions (sodium, potassium, magnesium, and calcium).
[c]This sample was collected from seep 2, which had a dark brown tint. Seep 3 was slightly tea-colored. All other seeps were clear.

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Monsanto Company 104(e) Response

Monsanto 2A001008

Appendix A
RFI Field Sampling Plan Addenda

MEMORANDUM CH2M HILL

TO: Liz Luecker/CH2M HILL

COPIES: Doug Holsten/CH2M HILL
Artemis Antipas/CH2M HILL

FROM: Doug Kunkel/CH2M HILL
Judi Radloff/CH2M HILL

DATE: April 12, 1995

SUBJECT: Rhone Poulenc, Inc., Seep Sampling, April 18, 1995

PROJECT: NPE35051.A5

Introduction

Three groundwater seeps were noted along the Duwamish Waterway shoreline area on the western perimeter of the Rhone Poulenc Facility (the Facility) during an investigation by Landau (1991). These seeps were documented and designated Seeps 1, 2 and 3 (see Figure 1).

The existence of the seeps and their status was assessed during a Facility reconnaissance performed by CH2M HILL on May 6, 1993. At the time of the site visit, Seep 1 could not be located; it may have been under water. Seeps 2 and 3 appeared to be dry. One small seep, slightly tinted brown, was noted north of Seep 2 and west of Seep 3. Additional groundwater seeps were observed along the bank of the Duwamish Waterway during the May 6 site visit; however, these seeps were not discolored.

A large seep, possibly Seep 1, was noted by CH2M HILL personnel performing Round 2 sediment sampling as part of the RCRA Facility Investigation (RFI). The seep was not sampled at this time because the field crew was performing sediment sampling and was not prepared to sample the seep. In addition, the CH2M HILL field personnel noted that a water collection device would likely need to be used to channel seep flow into sample bottles.

Based on information gained during the May 6, 1993 site visit and during RFI sediment sampling it is thought that the seeps are only exposed during (minus) tide events. The optimal time for sampling the seeps is during a minus tide event when the Duwamish Waterway water level is sufficiently low for the seeps to be exposed and accessible.

Samples of water from the Duwamish Waterway will be obtained in addition to the seep samples. The Duwamish Waterway samples will be obtained from upstream of Slip 6 and downstream of the seeps at the Facility. A total of two samples will be obtained.

Sampling Schedule

Favorable tidal conditions for seep sampling (negative tides during daylight hours) do not occur during winter months, therefore seep sampling was postponed until spring 1995. The date selected for seep sampling is April 18, 1995. The low low-tide event for April 18, 1995 occurs at 2:00 pm and the predicted tide is -1.9 feet NGVD (see Figure 2). CH2M HILL personnel should arrive earlier, at approximately 11:00 a.m., to evaluate the sampling sites and prepare the seep sample collection equipment and bottles. Additional sampling days may be required to sample up to 7 seeps and 2 Duwamish Waterway samples. Favorable tides also occur on April 19, 20, and 21, 1995. CH2M HILL personnel will return to the site on subsequent days, as needed, to complete the sampling.

Sampling Equipment

The following equipment is needed for seep sampling:

- appropriate sample bottles (provided by the analytical laboratory)
- sample coolers (provided by the analytical laboratory)
- pH meter with buffer solutions (Orion model 250A or equivalent)
- conductivity meter with standard solutions (YSI model 33 or equivalent)
- dissolved oxygen meter (YSI model 51B or equivalent)
- organic vapor meter with calibration gas
- nitrile inner gloves (1 box XL)
- shovel
- two (2) 4'X4' pieces of plywood (3/8-inch thickness)
- disposable plastic cups (12 or 16 ounce)
- Tyvek® or Saranex® suits for sampling personnel
- camera with film
- Sharpie® pens
- field book
- clear tape
- paper towels
- two decontamination tubs
- ice for sample preservation
- strapping tape
- nitric acid ampules
- pH paper
- bubble wrap
- Forms (Fed X and chain of custody)
- custody seals

- Ziploc® bags (1 box each, gallon and quart size)
- seven (7) 1-foot long sections of 2-inch diameter PVC pipe[1]
- survey stakes and hammer
- survey flagging
- small boat (12-foot Avon inflatable boat)
- personal floatation devices

[1] Flow from the seep will need to be channelized and controlled such that sample bottles can be filled without undue disturbance to the sediment. A 1-foot long section of 2-inch diameter PVC pipe may be used. A shovel will be used to dig a hole beneath the outlet of the PVC pipe so that sample bottles can be filled while upright.

Sample Matrix

If there is only one seep noted at the time of sampling, one sample will be obtained and analyzed for Appendix IX and additional parameters. Appendix IX (and additional) analytes, method numbers, bottle quantities and types, preservatives, and holding times are presented in Table 1. If more than one seep is noted, a sample will be obtained from the most discolored seep and analyzed for Appendix IX analytes. The remaining seeps will be analyzed for the parameters listed in Table 2. Duwamish Waterway samples will be analyzed for chromium speciation only.

Low discharge rates in some seeps may not allow all sample bottles to be filled before the water level in the Duwamish Waterway rises to the seep locations. If this occurs sampling may need to be completed on the following day.

All seep samples will be analyzed in the field for the following parameters; pH, conductivity, dissolved oxygen, temperature, and appearance. Field analysis will be performed prior to obtaining samples for laboratory analysis. Field parameter results will be documented in the field book.

The sampling crew should be prepared to sample up to seven (7) seeps as stipulated in the RFI Workplan. One duplicate sample will be obtained (in addition to the seven seep samples).

Each sample will be designated by a unique alpha-numeric identifier ("sample number") according to the following scheme:

01-AB

where:

01 = Two-digit sequential number of sample (use zeros as place holders where necessary, e.g., 01, 09)

AB = Location code.

- SP for seep samples
- DW for Duwamish Waterway samples

Character groups will be separated by a dash. An example of a sample identification number is:

05-SP = (Seep sample collected from seep 5)

Sample numbers will be recorded in a field notebook, on sample container labels, and on chain-of-custody forms. Other information on the sample container label includes:

- Time and date of sampling
- Initials of sampler(s)
- Laboratory analysis to be performed
- Preservatives used, if any.

Quality assurance/quality control (QA/QC) samples will be identified like true samples and will be called out as QA/QC samples in the field notebook only. QA/QC samples will not be identifiable by the laboratory.

Laboratory Contact

Contact Person: Don Magarian
Pace/Mid Pacific
625B Clyde Ave.
Mountain View, CA 94043

Telephone: (415)964-0844

Decontamination

Seep sampling equipment will be decontaminated following the procedures for aqueous sampling equipment as specified in Section 5.6.4 of the RFI Workplan. Decontamination fluids will be retained and transferred to the onsite storage tank. Buzz Rahier/RPI has a trash pump that can be used to pump fluids to the onsite storage tank. Fluids in the onsite storage tank are tested by an analytical lab and, if acceptable, batched to METRO along with stormwater.

Table 1:
Appendix IX and Additional Analytes, Method Numbers, Bottle Types, Preservatives, and Holding Times

Analyte	Method	Bottle Number and Type	Preservatives	Holding Time
VOCs	8240/CLP	(3) 40-ml VOA	HCl to pH <2	14 days
SVOCs	8270/CLP	(2) 1-liter amber glass	none	7 days
Pesticides/PCBs	8080/CLP	(2) 1-liter amber glass	none	7 days
O-P Pesticides	8140	(2) 1-liter amber glass	none	7 days
Herbicides	8150	(2) 1-liter amber glass	none	7 days
Metals (total)	6010/CLP	(1) 1-liter HDPE	HNO_3 to pH <2	28 days
Sulfide	9030	(1) 500-ml HDPE	ZnAc+NaOH to pH >9	7 days
Common ions (Na, K, Mg, Ca)	6010/CLP	included with metals	included with metals	6 months
SO_4, Cl	300.0	(1) 500-ml HDPE	none	28 days
Alkalinity and CO_3/HCO_3	403	(1) 1-liter HDPE	none	14 days
TDS	160.1	included with alkalinity	none	7 days
TOC	415.1	(1) 500-ml HDPE	H_2SO_4 to pH <2	28 days
TKN	365.2	(1) 1-liter HDPE	H_2SO_4 to pH <2	28 days
Phosphorus (total)	365.2	included with TKN	H_2SO_4 to pH <2	28 days
Formaldehyde	8315 (modified)	(3) 40-ml VOAs	none	14 days
NO_3 - NO_2	300.0	included with anions	none	2 days
Chromium speciation	218.6			48 hours
Guaiacol and Resin Acids	3540 extraction, NCASI Tech. Bull. 501, App.D RA/FA - 85.01	as directed by lab	as directed by lab	

Table 2:
Analytes, Method Numbers, Bottle Types, Preservatives, and Holding Times for Additional Seep Samples

Analyte	Method	Bottle Number and Type	Preservatives	Holding Time
VOCs	8240/CLP	(3) 40-ml VOA	HCl to pH <2	14 days
SVOCs	8270/CLP	(2) 1-liter amber glass	none	7 days
Total Metals (Cu, Cr III, Cr VI, Mn, Fe)	6010/CLP	(1) 1-liter HDPE	HNO_3 to pH <2	28 days
Sulfide	9030	(1) 500-ml HDPE	ZnAc+NaOH to pH >9	7 days
Common ions (Na, K, Mg, Ca)	6010/CLP	included with metals	included with metals	6 months
SO_4, Cl	300.0	(1) 500-ml HDPE	none	28 days
Alkalinity and CO_3/HCO_3	403	(1) 1-liter HDPE	none	14 days
TDS	160.1	included with alkalinity	none	7 days
TOC	415.1	(1) 500-ml HDPE	H_2SO_4 to pH <2	28 days
TKN	365.2	(1) 1-liter HDPE	H_2SO_4 to pH <2	28 days
Phosphorus (total)	365.2	included with TKN	H_2SO_4 to pH <2	28 days
Formaldehyde	8315 (modified)	(3) 40-ml VOAs	none	14 days
NO_3 - NO_2	300.0	included with anions	none	2 days
Chromium speciation	218.6			48 hours
Guaiacol and Resin Acids	3540 extraction, NCASI Tech. Bull. 501, App.D RA/FA - 85.01	as directed by lab	as directed by lab	

MEMORANDUM CH2M HILL

TO: Edwin Liu/RPI

Teresa Michelsen/Ecology

COPIES: Sue Hays/Hays Consulting

Artemis Antipas/CH2M HILL

Doug Holsten/CH2M HILL

Judi Radloff/CH2M HILL

Jim Crawford/CH2M HILL

FROM: Liz Luecker/CH2M HILL

DATE: May 23, 1995

SUBJECT: Rhone Poulenc, Inc. Sewer System Sediment Sampling Plan

PROJECT: NPE35051.S1

INTRODUCTION

Sampling of sewer system sediments at Rhône-Poulenc's (RPI) Marginal Way facility in Tukwila, Washington, is planned for May 24-25, 1995. This sampling will be performed as part of investigations planned to supplement the Draft RFI Report (CH2M HILL, 1995). The purpose of this sampling is:

1. To characterize residual sediment in the storm drain lines leading to the King County Storm Drain to determine what sediment contaminants may have discharged offsite to the King County Storm Drain,

2. To characterize residual sediment in the six storm drain lines originating in the process areas that historically discharged to the Duwamish Waterway and Slip 6 to determine what contaminants may have discharged to the sediments, and

3. To assess the current condition of the process and storm drainage systems at the RPI Facility.

The results of this sampling will be used to determine if additional sediment sampling will be required along the waterway and the disposition of sewer sediments. The objectives and scope of work for this analysis are presented in a proposal to RPI dated May 4, 1995.

A field reconnaissance of the storm water outfall system was conducted by CH2M HILL on May 8, 1995. During this visit, tentative sampling locations for outfalls 3, 6 and 7 were identified. However, no suitable access points were found for outfalls 2, 4, and 5.

SAMPLING METHODS AND FIELD PROCEDURES

Sampling methods and field procedures will be in accordance with the RFI Workplan (CH2M HILL, 1993). Two types of sediment samples will be collected:

- Historical outfall and discharge to King County Storm Drain samples (seven samples plus QA samples)
- Other process and storm water sewer system samples (15 samples plus QA samples)

Historical storm water outfall and discharge to King County Storm Drain samples will be obtained from as near as possible to the outfall or discharge point of each storm water line. Sampling locations for Outfalls 3, 6, and 7 are shown in Figure 1 (and in more detail in Figure 2). Field sampling locations for Outfalls 2, 4, and 5 will be accessed by digging test pits by backhoe and breaking open the drain line at the locations shown in Figure 1. The backhoe and operator will be provided by RPI. Buzz Rahier/RPI recently broke the line to outfall 2 during other work at the site. This line will be available for sampling access. If sufficient sediment is not present in the outfall, or if suitable access to outfall sampling locations cannot be obtained, it will be noted and the sample will not be collected. Water present in the sampling area will be pumped or drained and collected before sediments in the sewers are sampled. Water present in the sampling area will be contained on-site with any other potentially contaminated fluids generated during the sampling.

Other process and storm water sewer system sediment samples will be obtained from catch basins, manholes, or other portions of the system, as shown in Figures 2 and 3. Although sampling locations are not fully defined, one sample will be taken from each discrete sewer drainage area to determine the constituents of the sediments before they migrate from that area. Proposed sample locations were determined during the sewer system assessment on May 19, 1995; actual sample locations will be determined in the field. The strategy behind the proposed sampling locations is as follows:

Sewer System Sampling Rationale

Sewer Access Number (see Figures)	System	Rationale	Sample Count
1	Storm	Only catch basin remaining upstream of discharge to King County Storm Drain	1
2	Storm	Historical outfall 2	2
3	Storm	Historical outfall 3 - only sampling point accessible without digging test pit	3

Sewer System Sampling Rationale			
Sewer Access Number (see Figures)	**System**	**Rationale**	**Sample Count**
4	Storm	Historical outfall 4	4
5	Storm	Historical outfall 5	5
6	Storm	Only sampling point accessible	6
7	Storm	Historical outfall 7 (plus duplicate)	7, 8
30	Process	Part of a loop that received process water from NW corner of site	9
26	Process	Junction downstream from process tank storage area (unable to sample), vanillin & toluene areas	10
88	Process	Process overflow to storm sewer, vanillin & toluene area	11
68	Process	Only available catch basin, center of site (control building)	12
16	Process	Closed loop system, vanillin production area	13
14	Process	Catch basin to intercept drain, tank storage area	14
10	Process	Centrally located, received flow from maintenance shop area, lab, & areas west	15
84	Process	Manhole from lab	16
38	Process	Junction of lines from distribution warehouse	17
40	Process	Toluene tank farm	18
62	Process	Larox tank farm	19
61 or 64	Process	VBL tank farm	20
45	Process	Monsize tanks	21
47	Process	Caustic tanks	22
89	Process	Catch basin at tanks by maintenance shop	23
TBD	Process	Second Duplicate	24

Each sediment sample will consist of multiple grabs from a single sampling location. Grabs will be collected from the bottoms of manholes, inside pipes leading away from catch basins, or inside test pits, as feasible, so that samples are representative. Samples for BTEX will be

collected first and placed directly into the appropriate sample container. Additional grabs will be composited into one representative sample for each outfall. Sediments will be collected with decontaminated stainless steel scoops or dedicated, pre-cleaned glass sample jars (provided by the analytical laboratory) attached to an extendible pole with stainless steel hose clamps. Grabs will be composited in decontaminated stainless steel bowls and mixed until a homogenous texture is obtained. The sample will be described, photographed, and split into individual sample containers provided by the laboratory.

Field personnel will not enter manholes or access pits. If sample is present in a manhole (or access pit) greater than 4 feet deep and cannot be sampled by field personnel without entering the manhole, it will be noted, and the sample will not be collected until confined space permits and field safety procedures are implemented. Implementation of confined space procedures is outside the scope of this sampling plan.

Field Documentation and Sample Management Procedures

Field documentation will include recording locations of sample collection sites, procedures used to collect samples including the general soil conditions during excavation of test pits, calibration of air monitoring equipment and readings from sampling locations, the number and type of samples collected, and documentation of samples delivered to the laboratory.

Sample descriptions will be recorded immediately after homogenizing samples. The following observations will be noted in the field log:

- Approximate depth below ground surface of sampling
- Sketch showing location of sediments in the pipe, catch basin, or manhole
- Texture of sediment
- Color of sediment
- Presence of water (including color of water)
- Presence of oily sheen
- Odor (e.g. hydrogen sulfide, oil)
- Observations on the amount of sediment present in the pipe, catch basin, or manhole and how deep the sediment is, if possible (e.g. using a yardstick)
- Other observations that may be unusual

Analytical Parameters and Methods

Outfall sediment samples will be analyzed for potential contaminants and conventional sediment parameters for comparison to the state Sediment Management Standards (SMS). Analytical parameters, methods, sample volume requirements, holding times, and preservatives are provided in Table 1. Other sediment samples will be analyzed for common site contaminates, listed in Table 2.

Samples will be placed on ice immediately after sampling.

Analytical protocols used will be CLP as adapted by the Puget Sound Estuary Program (PSEP). Laboratory work will be conducted under the RFI Workplan Laboratory Statement of Work (Appendix G of the RFI Workplan, CH2M HILL, 1993). Samples will be delivered to S Cubed Laboratories of San Diego, California. Five-day turn around will be requested for BTEX, SVOCs, PCBs, metals, and TOC analysis. S Cubed will be requested to provide pre-cleaned sample containers and coolers.

Sample Labeling

Each sample will be designated by a unique alpha-numeric identifier ("sample number") according to the following scheme:

Outfall Samples: 01-SWO

where:

01 = two digit sequential number of sample representing a specific outfall line (use zeros as place holders where necessary, e.g. 01, 09)

SWO = location code representing "storm water outfall"

Character groups will be separated by a dash. An example of a sample identification number is:

03-SWO = (sediment sample from storm water outfall 3)

Other Sediment Samples: NNN-SEW

where:

NNN = three digit number of sewer system component as identified on the sewer system map

line (use zeros as place holders where necessary, e.g. 001, 009)

SEW = location code representing "sewer line"

100-SEW = (sediment sample from sewer line 100)

Sample numbers will be recorded in a field notebook, on sample container labels, and on chain of custody forms. Other information on the sample container label will include:

- Time and date of sampling
- Initials of sampler(s)
- Laboratory analysis to be performed
- Preservatives used (if any)

Quality assurance/quality control (QA/QC) samples will be identified like true samples and will be called out as QA/QC samples in the field book only. QA/QC samples will not be identifiable by the laboratory.

Field QC Samples

Outfall Samples Field QC samples will consist of one duplicate sample and one MS/MSD to be collected at Outfall 7. This station was selected during field investigations which found sediments to be both accessible and sufficient in volume for QC requirements. One equipment rinsate blank will be collected and analyzed for BTEX, semivolatiles, PCBs, metals, and TOC. The rinsate blank will consist of ASTM Type II water poured over decontaminated sampling scoops, spoons, mixing bowls and the lower end of the extendible sample pole. Trip blanks will be included at a rate of 1 per sample shipment.

Other Samples Field QC samples will consist of 5% duplicates, 5% MS/MSD, 1 rinsate blank, and a daily trip blank.

Sampling Equipment

- Appropriate sample containers (provided by the analytical laboratory)
- Sample coolers (provided by the analytical laboratory)
- Organic Vapor Meter (OVM) with calibration gas
- Nitrile inner gloves (one box extra large)
- 15 foot extendible fiberglass pole
- Stainless steel hose clamps - sized from 4 to 8 inch diameter
- Stainless steel scoops - 12
- Stainless steel spoons - 12
- Stainless steel bowls - 12
- Plastic sheeting for ground cloth
- Disposable protective suits for sampling personnel

- Camera and film
- Marking pens
- Field book
- Clear Tape
- Paper Towels
- Ice for sample preservation
- Two decontamination tubs
- Bubble wrap
- Forms (Federal Express and chain of custody)
- Custody seals
- Sealing plastic bags - 6 boxes 1 gal. size, 4 box quart size

Sampling Schedule

Sampling is currently planned for May 24-25, 1995. CH2M HILL personnel will coordinate with onsite RPI personnel for excavation of test pits and assistance with access to other sampling locations.

Decontamination Procedures

Sampling equipment, including stainless steel scoops, spoons, mixing bowls, and the lower end of the extendible sampling pole, will be decontaminated following the same procedures as for aqueous sampling equipment as specified in Section 5.6.4 of the RFI Workplan (CH2M HILL, 1993). Sufficient stainless steel sampling equipment will be decontaminated for one day's use prior to the day's sampling. Once used, this equipment will not be used to collect samples at other locations until it has been decontaminated at the end of the day. If glass sample bottles are used to collect samples, they will be discarded after sampling at each location is completed. The lower end of the sampling pole will be decontaminated between each sampling location.

Data Validation

Data validation will be performed by a CH2M HILL chemist and may include checks of raw data.

LABORATORY QA/QC

Laboratory QA/QC will be as specified in Appendix G of the RFI Workplan (CH2M HILL 1993).

Table 1

Analytical Parameter, Methods, Sample Volume Requirements, Holding Times, and Sample Preservatives

For Historical RPI Storm Water Outfall Sampling

Parameters	Methods	Minimum Laboratory Sample Volume Requirements	Holding Times	Sample Preservatives
Benzene, Toluene, Ethylbenzene, Total Xylenes (BTEX)	8240/CLP/PSEP	10 gms/2 oz jar - no headspace	14 days	Cool, 4 deg. C
Semivolatile Organic Compounds (SVOCs)	8270/CLP/PSEP	150 gms/8 oz jar	14 days	Cool, 4 deg. C
PCBs	8081/CLP/PSEP	150 gms/8 oz jar	14 days	Cool, 4 deg. C
Total Metals-As, Cd, Cr, Cu, Pb, Ag, Zn	6010/CLP/PSEP	25 gms/8 oz jar	6 months	Cool, 4 deg. C
Total Mercury	7071/CLP/PSEP	From Total Metals jar	28 days	Cool, 4 deg. C
Total Organic Carbon (TOC)	Standard Methods 5310B	20 gms/4 oz jar	28 days	Cool, 4 deg. C
pH	150.1	From TOC jar	14 days	Cool, 4 deg. C
Grain Size	ASTM D422/PSEP	Full 32 oz jar	6 months	Cool, 4 deg. C
Specific Gravity	ASTM D854	From grain size jar	6 months	Cool, 4 deg. C

Table 2

Analytical Parameter, Methods, Sample Volume Requirements, Holding Times, and Sample Preservatives

For Historical RPI Process & Storm Water Sewer System Sampling

Parameters	Methods	Minimum Laboratory Sample Volume Requirements	Holding Times	Sample Preservatives
Benzene, Toluene, Ethylbenzene, Total Xylenes (BTEX)	8240/CLP/PSEP	10 gms/2 oz jar - no headspace	14 days	Cool, 4 deg. C
Semivolatile Organic Compounds (SVOCs)	8270/CLP/PSEP	150 gms/8 oz jar	14 days	Cool, 4 deg. C
PCBs	8081/CLP/PSEP	150 gms/8 oz jar	14 days	Cool, 4 deg. C
Total Metals-As, Cd, Cr, Cu, Pb, Ag, Zn	6010/CLP/PSEP	25 gms/8 oz jar	6 months	Cool, 4 deg. C
Total Mercury	7071/CLP/PSEP	From Total Metals jar	28 days	Cool, 4 deg. C
Total Organic Carbon (TOC)	Standard Methods 5310B	20 gms/4 oz jar	28 days	Cool, 4 deg. C

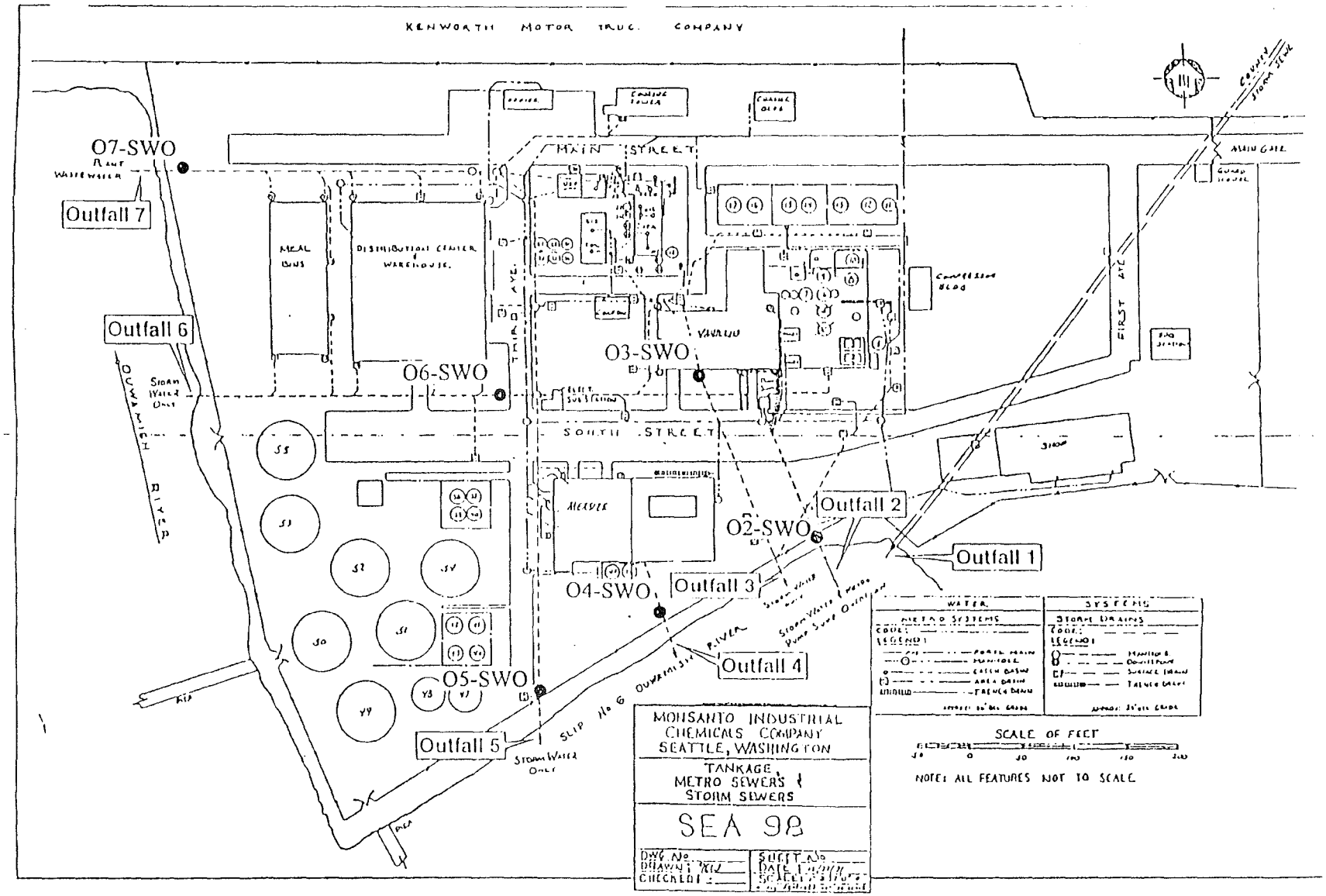
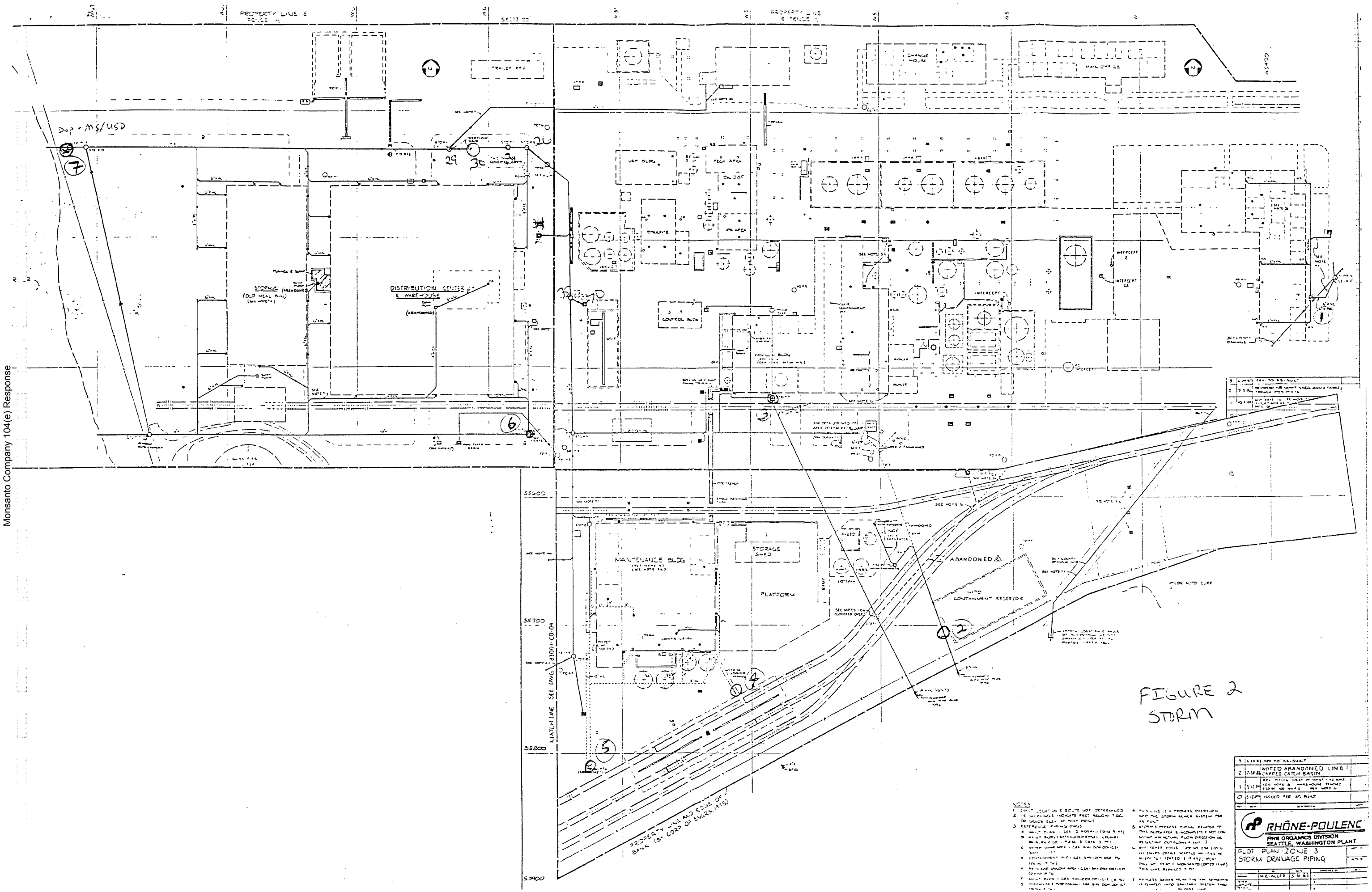


Figure 1
Historical Outfalls
Rhone-Poulenc Inc.
Tukwila, WA

05-SWO ● Proposed Sewer System

Sediment S[illegible]ing [illegible]

Monsanto Company 104(e) Response



Monsanto 2A001027

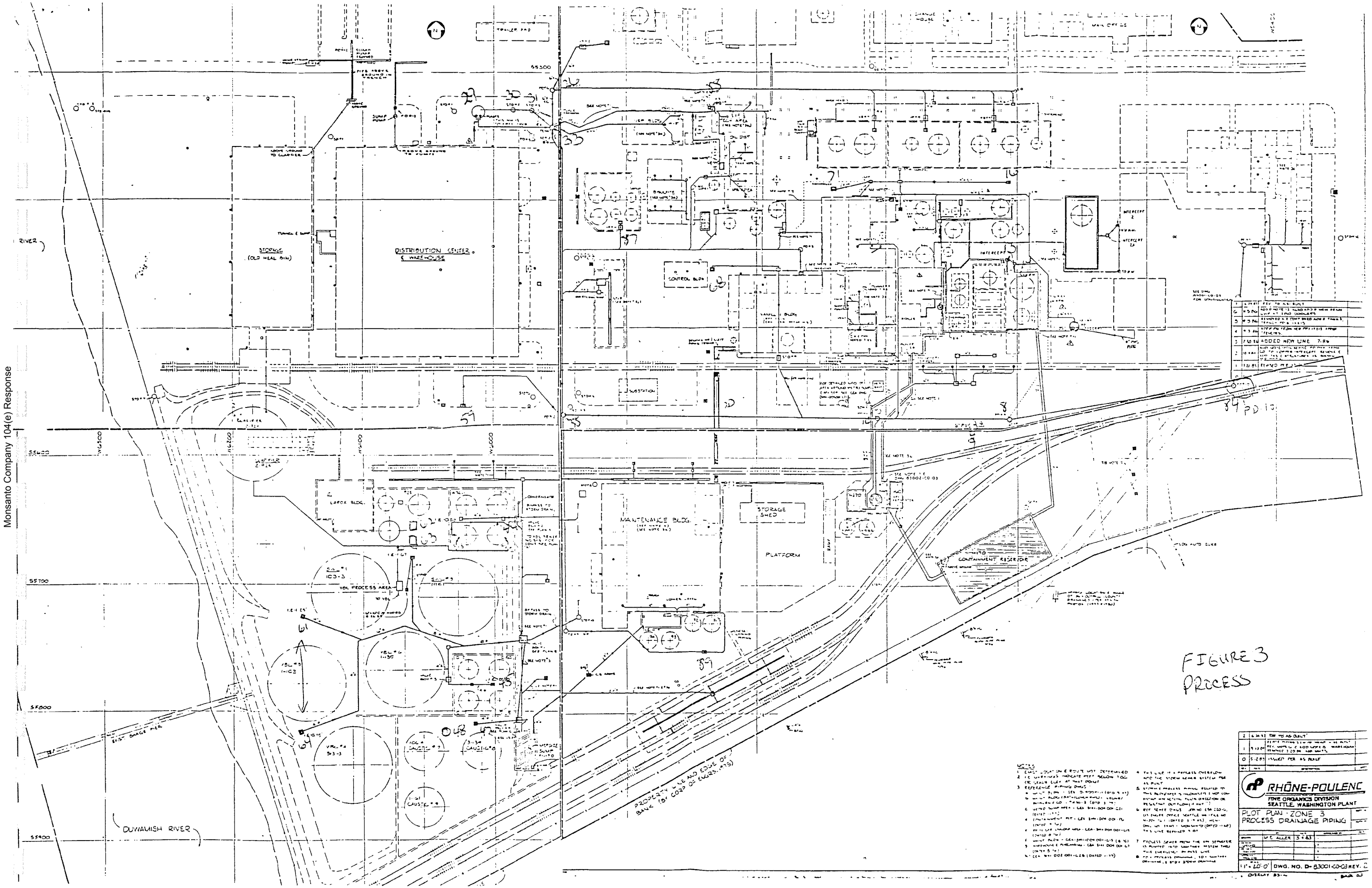


FIGURE 3
PROCESS

Appendix B
Modifications to Methods and Procedures Specified in the RFI Workplan

Appendix B
Modifications to Methods and Procedures Specified in the RFI Workplan

This appendix contains a list of the modifications that, during the RFI Round 3 activities conducted in 1995, were made to the methods and procedures specified in the RFI Workplan (RPI, December 1993). The modifications are presented in the following sequence:

- Groundwater sampling
- Seep sampling

sea1002B761.wp5

Modifications to Methods and Procedures Specified in the RFI Workplan			
Number	**Original RFI Workplan Procedure or Wording**	**Page Reference in RFI Workplan**	**Modification**
Modifications to Round 3 Groundwater Sampling Procedures			
1	Well Purging. Monitoring wells will be purged prior to sampling by removing a minimum of three and no more than five casing volumes of water using a peristaltic purge pump.	5-26	Monitoring wells were purged prior to sampling using bladder, diaphragm, and submersible pumps. Low-flow purge techniques were employed and significantly less than three purge volumes were removed from the wells.
2	Well Purging. The peristaltic purge pump will employ single-use, disposable polyethylene intake tubing that will be changed between wells.	5-26	Teflon tubing was reused and decontaminated between wells using an alconox and tap-water wash and tap-water rinse.
3	Well Purging. The pump intake will be lowered to a level just below the water surface.	5-27	The bladder pump intake was midpoint in the well screen.
4	Groundwater Sample Collection. Groundwater samples will be collected using decontaminated stainless steel bailers.	5-27	Sampling was conducted using dedicated laboratory-cleaned teflon bailers or using the bladder pump and tubing.
5	Trip Blanks. Trip blanks will be collected at a frequency of one per sample shipment.	5-34	The trip blank for the second day's shipment was not sent.
6	Matrix Spike/Matrix Spike Duplicates. Triplicate volumes of sample will be collected at a frequency of 10 percent of the total number of samples collected.	5-34	Extra volume for MS/MSDs was not collected. MS/MSDs were not analyzed.
Modifications to Seep Sampling Procedures			
1	Seeps will be sampled by holding a laboratory-prepared, prelabeled sample bottle under the flowing water until the bottle is filled.	5-8	Seep flow and volume were insufficient to sample in the manner described for five of seven seeps. The sampling procedure is described in Appendix E.
2	One seep sample will be analyzed for Appendix IX parameters	5-9	A duplicate sample was taken from seep 2. Both the sample and the duplicate were analyzed for Appendix IX parameters.

Modifications to Methods and Procedures Specified in the RFI Workplan			
Number	**Original RFI Workplan Procedure or Wording**	**Page Reference in RFI Workplan**	**Modification**
3	All seeps will be analyzed for common ions including sodium, potassium, magnesium, and calcium	5-9	Samples from seeps 1 and 3 were not analyzed for sodium, potassium, magnesium, and calcium.
4	Only the seep sample analyzed for Appendix IX parameters will be analyzed for pesticides.	5-8	The laboratory analyzed the samples from seeps 1 and 3 for pesticides/PCBs, organophosphate pesticides, and herbicides.

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Appendix C
RFI Database of Detected Results From Round 3 Groundwater, Seep and Sewer Sediment Analyses

Detected Groundwater Results

Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
Conventionals							
01	A-2	MW-A02		Dissolved Oxygen	2.7		mg/L
01	A-2	MW-A02		pH (field)	7.19		-log+H
01	A-2	MW-A02		Specific Conductance (field)	880		µmhos/cm
01	A-2	MW-A02		Temperature	15.9		°C
Inorganics							
01	A-2	MW-A02		Aluminum, Total	1140		µg/L
01	A-2	MW-A02		Arsenic, Total	40		µg/L
01	A-2	MW-A02		Barium, Total	18	B	µg/L
01	A-2	MW-A02		Boron, Total	807		µg/L
01	A-2	MW-A02		Calcium, Total	3820	B	µg/L
01	A-2	MW-A02		Chromium, Total	16.8		µg/L
01	A-2	MW-A02		Copper, Total	12.5	B	µg/L
01	A-2	MW-A02		Iron, Total	14500		µg/L
01	A-2	MW-A02		Magnesium, Total	6280		µg/L
01	A-2	MW-A02		Manganese, Total	668		µg/L
01	A-2	MW-A02		Potassium, Total	7590		µg/L
01	A-2	MW-A02		Sodium, Total	222000		µg/L
01	A-2	MW-A02		Vanadium, Total	207		µg/L
01	A-2	MW-A02		Zinc, Total	8.4	B	µg/L
Semivolatiles							
01	A-2	MW-A02		bis(2-Chloroethyl)Ether	1	J	µg/L
Volatiles							
01	A-2	MW-A02		1,1-Dichloroethane	0.6	J	µg/L
01	A-2	MW-A02		1,2-Dichloroethene (Total)	0.3	J	µg/L
Inorganics							
01	A-2D-FD	MW-A02	FD	Aluminum, Total	1630		µg/L
01	A-2D-FD	MW-A02	FD	Arsenic, Total	42.5		µg/L
01	A-2D-FD	MW-A02	FD	Barium, Total	21.3	B	µg/L
01	A-2D-FD	MW-A02	FD	Boron, Total	417	B	µg/L
01	A-2D-FD	MW-A02	FD	Calcium, Total	4450	B	µg/L
01	A-2D-FD	MW-A02	FD	Chromium, Total	18.3		µg/L
01	A-2D-FD	MW-A02	FD	Copper, Total	12.6	B	µg/L
01	A-2D-FD	MW-A02	FD	Iron, Total	15800		µg/L
01	A-2D-FD	MW-A02	FD	Magnesium, Total	6920		µg/L
01	A-2D-FD	MW-A02	FD	Manganese, Total	706		µg/L
01	A-2D-FD	MW-A02	FD	Potassium, Total	7880		µg/L
01	A-2D-FD	MW-A02	FD	Sodium, Total	228000		µg/L
01	A-2D-FD	MW-A02	FD	Vanadium, Total	220		µg/L
01	A-2D-FD	MW-A02	FD	Zinc, Total	11.5	B	µg/L
Volatiles							
01	A-2D-FD	MW-A02	FD	1,1-Dichloroethane	0.6	J	µg/L
01	A-2D-FD	MW-A02	FD	1,2-Dichloroethene (Total)	0.3	J	µg/L
Conventionals							
01	A-9	MW-A09		Dissolved Oxygen	2		mg/L
01	A-9	MW-A09		pH (field)	6.38		-log+H
01	A-9	MW-A09		Specific Conductance (field)	272		µmhos/cm

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
01	A-9	MW-A09		Temperature	14.4		°C
Inorganics							
01	A-9	MW-A09		Aluminum, Total	5080		µg/L
01	A-9	MW-A09		Arsenic, Total	3.7	B	µg/L
01	A-9	MW-A09		Barium, Total	31.8	B	µg/L
01	A-9	MW-A09		Boron, Total	548	B	µg/L
01	A-9	MW-A09		Calcium, Total	9250		µg/L
01	A-9	MW-A09		Chromium, Total	5.3	B	µg/L
01	A-9	MW-A09		Cobalt, Total	2.5	B	µg/L
01	A-9	MW-A09		Copper, Total	17.7	B	µg/L
01	A-9	MW-A09		Iron, Total	10200		µg/L
01	A-9	MW-A09		Lead, Total	1.4	B	µg/L
01	A-9	MW-A09		Magnesium, Total	12100		µg/L
01	A-9	MW-A09		Manganese, Total	826		µg/L
01	A-9	MW-A09		Nickel, Total	6.7	B	µg/L
01	A-9	MW-A09		Potassium, Total	7150		µg/L
01	A-9	MW-A09		Sodium, Total	32600		µg/L
01	A-9	MW-A09		Vanadium, Total	23.7	B	µg/L
01	A-9	MW-A09		Zinc, Total	16.7	B	µg/L
Conventionals							
01	DM-3A	DM-03A		Dissolved Oxygen	2.75		mg/L
01	DM-3A	DM-03A		pH (field)	6.92		-log+H
01	DM-3A	DM-03A		Specific Conductance (field)	244		umhos/cm
01	DM-3A	DM-03A		Temperature	13.7		°C
Inorganics							
01	DM-3A	DM-03A		Boron, Total	203	B	µg/L
01	DM-3A	DM-03A		Calcium, Total	2620	B	µg/L
01	DM-3A	DM-03A		Iron, Total	2770		µg/L
01	DM-3A	DM-03A		Magnesium, Total	4990	B	µg/L
01	DM-3A	DM-03A		Manganese, Total	338		µg/L
01	DM-3A	DM-03A		Potassium, Total	8300		µg/L
01	DM-3A	DM-03A		Sodium, Total	36200		µg/L
01	DM-3A	DM-03A		Vanadium, Total	4.3	B	µg/L
01	DM-3A	DM-03A		Zinc, Total	15.2	B	µg/L
Conventionals							
01	DM-3B	DM-03B		Dissolved Oxygen	1.5		mg/L
01	DM-3B	DM-03B		pH (field)	8.1		-log+H
01	DM-3B	DM-03B		Specific Conductance (field)	1361		umhos/cm
01	DM-3B	DM-03B		Temperature	14		°C
Volatiles							
01	DM-3B	DM-03B		Toluene	0.4	J	µg/L
Conventionals							
01	FB-01		FB	Nitrogen, Kjeldahl	0.44	J	mg/L
01	FB-01		FB	pH (lab)	5.4		-log+H
Volatiles							
01	FB-01		FB	2-Butanone	3		µg/L
01	FB-01		FB	Chloroform	0.8	J	µg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
Conventionals							
02	B-2	MW-B02		Dissolved Oxygen	1.4		mg/L
02	B-2	MW-B02		pH (field)	7.06		-log+H
02	B-2	MW-B02		Specific Conductance (field)	1602		ımhos/cn
02	B-2	MW-B02		Temperature	16.4		°C
Inorganics							
02	B-2	MW-B02		Aluminum, Total	2950		µg/L
02	B-2	MW-B02		Barium, Total	143	B	µg/L
02	B-2	MW-B02		Boron, Total	437	B	µg/L
02	B-2	MW-B02		Calcium, Total	31300		µg/L
02	B-2	MW-B02		Chromium, Total	73.2		µg/L
02	B-2	MW-B02		Cobalt, Total	9.2	B	µg/L
02	B-2	MW-B02		Copper, Total	181		µg/L
02	B-2	MW-B02		Iron, Total	29300		µg/L
02	B-2	MW-B02		Lead, Total	15	J	µg/L
02	B-2	MW-B02		Magnesium, Total	11400		µg/L
02	B-2	MW-B02		Manganese, Total	962		µg/L
02	B-2	MW-B02		Mercury, Total	0.15	B	µg/L
02	B-2	MW-B02		Nickel, Total	8.4	B	µg/L
02	B-2	MW-B02		Potassium, Total	10300		µg/L
02	B-2	MW-B02		Sodium, Total	485000		µg/L
02	B-2	MW-B02		Vanadium, Total	387		µg/L
02	B-2	MW-B02		Zinc, Total	112		µg/L
Conventionals							
02	B-4	MW-B04		Dissolved Oxygen	2		mg/L
02	B-4	MW-B04		pH (field)	7.59		-log+H
02	B-4	MW-B04		Specific Conductance (field)	2224		ımhos/cn
02	B-4	MW-B04		Temperature	14.6		°C
Inorganics							
02	B-4	MW-B04		Aluminum, Total	1480		µg/L
02	B-4	MW-B04		Barium, Total	32.4	B	µg/L
02	B-4	MW-B04		Boron, Total	1520		µg/L
02	B-4	MW-B04		Calcium, Total	6740		µg/L
02	B-4	MW-B04		Chromium, Total	13		µg/L
02	B-4	MW-B04		Copper, Total	11.9	B	µg/L
02	B-4	MW-B04		Iron, Total	2260		µg/L
02	B-4	MW-B04		Magnesium, Total	7230	J	µg/L
02	B-4	MW-B04		Manganese, Total	87.5		µg/L
02	B-4	MW-B04		Potassium, Total	24500		µg/L
02	B-4	MW-B04		Sodium, Total	546000	J	µg/L
02	B-4	MW-B04		Vanadium, Total	43.7	B	µg/L
BTEX							
02	B-5	MW-B05		Benzene	2		µg/L
02	B-5	MW-B05		Toluene	15		µg/L
Conventionals							
02	B-5	MW-B05		Alkalinity (as CaCO3)	230		mg/L
02	B-5	MW-B05		Ammonia	0.6		mg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
02	B-5	MW-B05		Bicarbonate (from Alkalinity)	230		mg/L
02	B-5	MW-B05		Chloride	35		mg/L
02	B-5	MW-B05		Dissolved Oxygen	2.6		mg/L
02	B-5	MW-B05		Methane	73		ppmv
02	B-5	MW-B05		Nitrate Nitrogen	0.05		mg/L
02	B-5	MW-B05		Nitrogen, Kjeldahl	1.8		mg/L
02	B-5	MW-B05		Orthophosphate	0.62		mg/L
02	B-5	MW-B05		pH (field)	6.66		-log+H
02	B-5	MW-B05		pH (lab)	6.5		-log+H
02	B-5	MW-B05		Specific Conductance (field)	582		umhos/cm
02	B-5	MW-B05		Specific Conductance (lab)	610		umhos/cm
02	B-5	MW-B05		Sulfate	4.5		mg/L
02	B-5	MW-B05		Temperature	14.4		°C
02	B-5	MW-B05		Total Dissolved Solids	450		mg/L
02	B-5	MW-B05		Total Hardness (as CaCO3)	120		mg/L
02	B-5	MW-B05		Total Organic Carbon	41		mg/L
Inorganics							
02	B-5	MW-B05		Aluminum, Total	756		µg/L
02	B-5	MW-B05		Arsenic, Total	3.3	B	µg/L
02	B-5	MW-B05		Barium, Total	8.5	B	µg/L
02	B-5	MW-B05		Boron, Total	213	B	µg/L
02	B-5	MW-B05		Calcium, Total	15300		µg/L
02	B-5	MW-B05		Chromium, Total	12		µg/L
02	B-5	MW-B05		Iron, Total	8040		µg/L
02	B-5	MW-B05		Magnesium, Total	12300	J	µg/L
02	B-5	MW-B05		Manganese, Total	299		µg/L
02	B-5	MW-B05		Potassium, Total	3140	B	µg/L
02	B-5	MW-B05		Sodium, Total	85700	J	µg/L
02	B-5	MW-B05		Vanadium, Total	72		µg/L
02	B-5	MW-B05		Zinc, Total	59.2	J	µg/L
Conventionals							
02	B-6	MW-B06		Alkalinity (as CaCO3)	340		mg/L
02	B-6	MW-B06		Ammonia	5.8		mg/L
02	B-6	MW-B06		Bicarbonate (from Alkalinity)	340		mg/L
02	B-6	MW-B06		Chloride	15		mg/L
02	B-6	MW-B06		Dissolved Oxygen	3.8		mg/L
02	B-6	MW-B06		Methane	930		ppmv
02	B-6	MW-B06		Nitrate Nitrogen	0.11		mg/L
02	B-6	MW-B06		Nitrogen, Kjeldahl	6.6		mg/L
02	B-6	MW-B06		Orthophosphate	3.3		mg/L
02	B-6	MW-B06		pH (field)	6.78		-log+H
02	B-6	MW-B06		pH (lab)	6.6		-log+H
02	B-6	MW-B06		Phosphorus	4		mg/L
02	B-6	MW-B06		Specific Conductance (field)	722		umhos/cm
02	B-6	MW-B06		Specific Conductance (lab)	730		umhos/cm
02	B-6	MW-B06		Sulfate	0.88		mg/L
02	B-6	MW-B06		Sulfide (as S)	0.2		mg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
02	B-6	MW-B06		Temperature	15.5		°C
02	B-6	MW-B06		Total Dissolved Solids	500		mg/L
02	B-6	MW-B06		Total Hardness (as CaCO3)	140		mg/L
02	B-6	MW-B06		Total Organic Carbon	23		mg/L
Inorganics							
02	B-6	MW-B06		Aluminum, Total	3140		µg/L
02	B-6	MW-B06		Barium, Total	22.7	B	µg/L
02	B-6	MW-B06		Boron, Total	138	B	µg/L
02	B-6	MW-B06		Calcium, Total	6850		µg/L
02	B-6	MW-B06		Chromium, Total	12.1		µg/L
02	B-6	MW-B06		Copper, Total	42.3		µg/L
02	B-6	MW-B06		Iron, Total	11900		µg/L
02	B-6	MW-B06		Magnesium, Total	5360	J	µg/L
02	B-6	MW-B06		Manganese, Total	310		µg/L
02	B-6	MW-B06		Potassium, Total	7990		µg/L
02	B-6	MW-B06		Sodium, Total	125000	J	µg/L
02	B-6	MW-B06		Vanadium, Total	34	B	µg/L
Semivolatiles							
02	B-6	MW-B06		2-Methylnaphthalene	0.4	J	µg/L
02	B-6	MW-B06		Acenaphthene	3	J	µg/L
02	B-6	MW-B06		Anthracene	0.4	J	µg/L
02	B-6	MW-B06		Dibenzofuran	0.8	J	µg/L
02	B-6	MW-B06		Fluorene	1	J	µg/L
02	B-6	MW-B06		Phenanthrene	0.8	J	µg/L
02	B-6	MW-B06		Pyrene	0.6	J	µg/L
Conventionals							
02	DM-4	DM-04		Dissolved Oxygen	1.85		mg/L
02	DM-4	DM-04		pH (field)	6.87		-log+H
02	DM-4	DM-04		Specific Conductance (field)	1272		umhos/cm
02	DM-4	DM-04		Temperature	15.1		°C
Inorganics							
02	DM-4	DM-04		Aluminum, Total	233		µg/L
02	DM-4	DM-04		Barium, Total	31	B	µg/L
02	DM-4	DM-04		Boron, Total	389	B	µg/L
02	DM-4	DM-04		Calcium, Total	27400		µg/L
02	DM-4	DM-04		Chromium, Total	17.7		µg/L
02	DM-4	DM-04		Copper, Total	5.1	B	µg/L
02	DM-4	DM-04		Iron, Total	17400		µg/L
02	DM-4	DM-04		Lead, Total	1.6	BJ	µg/L
02	DM-4	DM-04		Magnesium, Total	18600		µg/L
02	DM-4	DM-04		Manganese, Total	822		µg/L
02	DM-4	DM-04		Potassium, Total	8090		µg/L
02	DM-4	DM-04		Sodium, Total	284000		µg/L
02	DM-4	DM-04		Vanadium, Total	112		µg/L
02	DM-4	DM-04		Zinc, Total	12.1	B	µg/L
Conventionals							
02	DM-5	DM-05		Alkalinity (as CaCO3)	3300		mg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
02	DM-5	DM-05		Ammonia	17	J	mg/L
02	DM-5	DM-05		Bicarbonate (from Alkalinity)	3300		mg/L
02	DM-5	DM-05		Chloride	130		mg/L
02	DM-5	DM-05		Dissolved Oxygen	2.45		mg/L
02	DM-5	DM-05		Nitrate Nitrogen	7		mg/L
02	DM-5	DM-05		Nitrite Nitrogen	1.1		mg/L
02	DM-5	DM-05		Nitrogen, Kjeldahl	30	J	mg/L
02	DM-5	DM-05		Orthophosphate	25		mg/L
02	DM-5	DM-05		pH (field)	7.29		-log+H
02	DM-5	DM-05		pH (lab)	7.6		-log+H
02	DM-5	DM-05		Phosphorus	26		mg/L
02	DM-5	DM-05		Specific Conductance (field)	5170		µmhos/cm
02	DM-5	DM-05		Specific Conductance (lab)	5100		µmhos/cm
02	DM-5	DM-05		Sulfate	2.2		mg/L
02	DM-5	DM-05		Sulfide (as S)	1.4		mg/L
02	DM-5	DM-05		Temperature	16.1		°C
02	DM-5	DM-05		Total Dissolved Solids	5300		mg/L
02	DM-5	DM-05		Total Hardness (as CaCO3)	400		mg/L
02	DM-5	DM-05		Total Organic Carbon	3200		mg/L
Inorganics							
02	DM-5	DM-05		Aluminum, Total	5870		µg/L
02	DM-5	DM-05		Arsenic, Total	51.4		µg/L
02	DM-5	DM-05		Barium, Total	262		µg/L
02	DM-5	DM-05		Boron, Total	642		µg/L
02	DM-5	DM-05		Calcium, Total	52000		µg/L
02	DM-5	DM-05		Chromium, Total	301		µg/L
02	DM-5	DM-05		Cobalt, Total	35.3	B	µg/L
02	DM-5	DM-05		Copper, Total	28		µg/L
02	DM-5	DM-05		Iron, Total	31300		µg/L
02	DM-5	DM-05		Magnesium, Total	43300		µg/L
02	DM-5	DM-05		Manganese, Total	624		µg/L
02	DM-5	DM-05		Nickel, Total	12.8	B	µg/L
02	DM-5	DM-05		Potassium, Total	25000		µg/L
02	DM-5	DM-05		Sodium, Total	1570000		µg/L
02	DM-5	DM-05		Vanadium, Total	1410		µg/L
02	DM-5	DM-05		Zinc, Total	216		µg/L
BTEX							
02	MW-20	MW-20		Xylene (Total)	0.9		µg/L
Conventionals							
02	MW-20	MW-20		Alkalinity (as CaCO3)	58		mg/L
02	MW-20	MW-20		Bicarbonate (from Alkalinity)	58		mg/L
02	MW-20	MW-20		Chloride	2.2		mg/L
02	MW-20	MW-20		Dissolved Oxygen	2.35		mg/L
02	MW-20	MW-20		Nitrogen, Kjeldahl	0.92		mg/L
02	MW-20	MW-20		Orthophosphate	0.09		mg/L
02	MW-20	MW-20		pH (field)	6.31		-log+H
02	MW-20	MW-20		pH (lab)	5.9		-log+H

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
02	MW-20	MW-20		Specific Conductance (field)	138		µmhos/cm
02	MW-20	MW-20		Specific Conductance (lab)	140		µmhos/cm
02	MW-20	MW-20		Sulfate	7.1		mg/L
02	MW-20	MW-20		Temperature	14.5		°C
02	MW-20	MW-20		Total Dissolved Solids	90		mg/L
02	MW-20	MW-20		Total Hardness (as CaCO3)	57		mg/L
02	MW-20	MW-20		Total Organic Carbon	5.5		mg/L
Inorganics							
02	MW-20	MW-20		Barium, Total	6.7	B	µg/L
02	MW-20	MW-20		Boron, Total	49.3	B	µg/L
02	MW-20	MW-20		Cadmium, Total	1.2	B	µg/L
02	MW-20	MW-20		Calcium, Total	15100		µg/L
02	MW-20	MW-20		Chromium, Total	2.5	B	µg/L
02	MW-20	MW-20		Iron, Total	1980		µg/L
02	MW-20	MW-20		Lead, Total	18.4		µg/L
02	MW-20	MW-20		Magnesium, Total	3400	BJ	µg/L
02	MW-20	MW-20		Manganese, Total	100		µg/L
02	MW-20	MW-20		Potassium, Total	1650	B	µg/L
02	MW-20	MW-20		Vanadium, Total	2	B	µg/L
Conventionals							
03	C-1	MW-C01		Dissolved Oxygen	1.4		mg/L
03	C-1	MW-C01		pH (field)	6.59		-log+H
03	C-1	MW-C01		Specific Conductance (field)	490		µmhos/cm
03	C-1	MW-C01		Temperature	14.4		°C
Inorganics							
03	C-1	MW-C01		Aluminum, Total	732		µg/L
03	C-1	MW-C01		Boron, Total	360	B	µg/L
03	C-1	MW-C01		Calcium, Total	16600		µg/L
03	C-1	MW-C01		Chromium, Total	9.9	B	µg/L
03	C-1	MW-C01		Iron, Total	11800		µg/L
03	C-1	MW-C01		Lead, Total	1	B	µg/L
03	C-1	MW-C01		Magnesium, Total	14000		µg/L
03	C-1	MW-C01		Manganese, Total	328		µg/L
03	C-1	MW-C01		Potassium, Total	4060	B	µg/L
03	C-1	MW-C01		Sodium, Total	78300		µg/L
03	C-1	MW-C01		Vanadium, Total	27.7	B	µg/L
03	C-1	MW-C01		Zinc, Total	23.4		µg/L
Conventionals							
04	H-1	MW-H01		Dissolved Oxygen	0.65		mg/L
04	H-1	MW-H01		pH (field)	7.61		-log+H
04	H-1	MW-H01		Specific Conductance (field)	2520		µmhos/cm
04	H-1	MW-H01		Temperature	16.3		°C
Inorganics							
04	H-1	MW-H01		Aluminum, Total	2730		µg/L
04	H-1	MW-H01		Barium, Total	46.7	B	µg/L
04	H-1	MW-H01		Boron, Total	1950		µg/L
04	H-1	MW-H01		Calcium, Total	8500		µg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
04	H-1	MW-H01		Chromium, Total	19.3		µg/L
04	H-1	MW-H01		Copper, Total	11.1	B	µg/L
04	H-1	MW-H01		Iron, Total	3350		µg/L
04	H-1	MW-H01		Lead, Total	1.4	BJ	µg/L
04	H-1	MW-H01		Magnesium, Total	8840		µg/L
04	H-1	MW-H01		Manganese, Total	130		µg/L
04	H-1	MW-H01		Nickel, Total	8.8	B	µg/L
04	H-1	MW-H01		Potassium, Total	34000		µg/L
04	H-1	MW-H01		Sodium, Total	699000		µg/L
04	H-1	MW-H01		Vanadium, Total	58		µg/L
04	H-1	MW-H01		Zinc, Total	12.8	B	µg/L
Inorganics							
04	H-10	MW-H10		Aluminum, Total	451		µg/L
04	H-10	MW-H10		Arsenic, Total	18		µg/L
04	H-10	MW-H10		Barium, Total	15.2	B	µg/L
04	H-10	MW-H10		Boron, Total	48.4	B	µg/L
04	H-10	MW-H10		Calcium, Total	19400		µg/L
04	H-10	MW-H10		Chromium, Total	3.3	B	µg/L
04	H-10	MW-H10		Cobalt, Total	2.9	B	µg/L
04	H-10	MW-H10		Copper, Total	14.9	B	µg/L
04	H-10	MW-H10		Iron, Total	20500		µg/L
04	H-10	MW-H10		Magnesium, Total	14900		µg/L
04	H-10	MW-H10		Manganese, Total	1280		µg/L
04	H-10	MW-H10		Nickel, Total	4	B	µg/L
04	H-10	MW-H10		Potassium, Total	10200		µg/L
04	H-10	MW-H10		Sodium, Total	138000		µg/L
04	H-10	MW-H10		Vanadium, Total	21.3	B	µg/L
04	H-10	MW-H10		Zinc, Total	13.2	B	µg/L
Semivolatiles							
04	H-10-DL	MW-H10		2-Methylphenol	520		µg/L
04	H-10-DL	MW-H10		4-Methylphenol	180		µg/L
04	H-10-DL	MW-H10		bis(2-Ethylhexyl)Phthalate	45	J	µg/L
04	H-10-DL	MW-H10		Di-n-Octyl Phthalate	230		µg/L
04	H-10-DL	MW-H10		Diethyl Phthalate	48	J	µg/L
Volatiles							
04	H-10-DL1	MW-H10		Acetone	11000	J	µg/L
04	H-10-DL1	MW-H10		Benzene	600	J	µg/L
04	H-10-DL1	MW-H10		Carbon Disulfide	900	J	µg/L
04	H-10-DL1	MW-H10		Methylene Chloride	8300	J	µg/L
04	H-10-DL1	MW-H10		Xylene (Total)	400	J	µg/L
Volatiles							
04	H-10-DL2	MW-H10		Toluene	380000	J	µg/L
Conventionals							
04	H-11	MW-H11		Dissolved Oxygen	0.3		mg/L
04	H-11	MW-H11		pH (field)	7.01		-log+H
04	H-11	MW-H11		Specific Conductance (field)	3410		µmhos/cm
04	H-11	MW-H11		Temperature	17.2		°C

FD= Field Duplicate
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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
Inorganics							
04	H-11	MW-H11		Aluminum, Total	3520		µg/L
04	H-11	MW-H11		Arsenic, Total	62.8		µg/L
04	H-11	MW-H11		Barium, Total	146	B	µg/L
04	H-11	MW-H11		Boron, Total	115	B	µg/L
04	H-11	MW-H11		Calcium, Total	18300		µg/L
04	H-11	MW-H11		Chromium, Total	146		µg/L
04	H-11	MW-H11		Cobalt, Total	16.5	B	µg/L
04	H-11	MW-H11		Copper, Total	71.2		µg/L
04	H-11	MW-H11		Iron, Total	74900		µg/L
04	H-11	MW-H11		Lead, Total	7		µg/L
04	H-11	MW-H11		Magnesium, Total	12300		µg/L
04	H-11	MW-H11		Manganese, Total	3870		µg/L
04	H-11	MW-H11		Nickel, Total	7.4	B	µg/L
04	H-11	MW-H11		Potassium, Total	31300		µg/L
04	H-11	MW-H11		Sodium, Total	918000		µg/L
04	H-11	MW-H11		Vanadium, Total	1660		µg/L
04	H-11	MW-H11		Zinc, Total	26.4		µg/L
Semivolatiles							
04	H-11-DL	MW-H11		2-Methylphenol	3900		µg/L
04	H-11-DL	MW-H11		4-Methylphenol	1900		µg/L
04	H-11-DL	MW-H11		Phenol	1700		µg/L
Volatiles							
04	H-11-DL1	MW-H11		1,1,1-Trichloroethane	16	J	µg/L
04	H-11-DL1	MW-H11		Acetone	200	J	µg/L
04	H-11-DL1	MW-H11		Benzene	73	J	µg/L
04	H-11-DL1	MW-H11		Carbon Disulfide	1	J	µg/L
04	H-11-DL1	MW-H11		Ethylbenzene	33	J	µg/L
04	H-11-DL1	MW-H11		Methylene Chloride	15	J	µg/L
04	H-11-DL1	MW-H11		Xylene (Total)	56	J	µg/L
Volatiles							
04	H-11-DL2	MW-H11		Toluene	670000	J	µg/L
BTEX							
04	MW-12	MW-12		Benzene	5		µg/L
04	MW-12	MW-12		Ethylbenzene	9		µg/L
04	MW-12	MW-12		Toluene	45		µg/L
04	MW-12	MW-12		Xylene (Total)	17		µg/L
Conventionals							
04	MW-12	MW-12		Alkalinity (as CaCO3)	520		mg/L
04	MW-12	MW-12		Ammonia	1.6		mg/L
04	MW-12	MW-12		Bicarbonate (from Alkalinity)	520		mg/L
04	MW-12	MW-12		Chloride	12		mg/L
04	MW-12	MW-12		Dissolved Oxygen	1.65		mg/L
04	MW-12	MW-12		Methane	1900		ppmv
04	MW-12	MW-12		Nitrite Nitrogen	0.1		mg/L
04	MW-12	MW-12		Nitrogen, Kjeldahl	10		mg/L
04	MW-12	MW-12		Orthophosphate	0.63		mg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
04	MW-12	MW-12		pH (field)	6.66		-log+H
04	MW-12	MW-12		pH (lab)	6.3		-log+H
04	MW-12	MW-12		Phosphorus	1.1		mg/L
04	MW-12	MW-12		Specific Conductance (field)	1198		ımhos/cn
04	MW-12	MW-12		Specific Conductance (lab)	1400		ımhos/cn
04	MW-12	MW-12		Sulfate	0.58		mg/L
04	MW-12	MW-12		Sulfide (as S)	0.1		mg/L
04	MW-12	MW-12		Temperature	16.9		°C
04	MW-12	MW-12		Total Dissolved Solids	920		mg/L
04	MW-12	MW-12		Total Hardness (as CaCO3)	160		mg/L
04	MW-12	MW-12		Total Organic Carbon	380		mg/L
Inorganics							
04	MW-12	MW-12		Aluminum, Total	395		µg/L
04	MW-12	MW-12		Arsenic, Total	26.9		µg/L
04	MW-12	MW-12		Barium, Total	73.8	B	µg/L
04	MW-12	MW-12		Boron, Total	180	B	µg/L
04	MW-12	MW-12		Calcium, Total	19200		µg/L
04	MW-12	MW-12		Chromium, Total	13		µg/L
04	MW-12	MW-12		Cobalt, Total	10.1	B	µg/L
04	MW-12	MW-12		Copper, Total	45.1		µg/L
04	MW-12	MW-12		Iron, Total	75800		µg/L
04	MW-12	MW-12		Lead, Total	4.3		µg/L
04	MW-12	MW-12		Magnesium, Total	9190		µg/L
04	MW-12	MW-12		Manganese, Total	3130		µg/L
04	MW-12	MW-12		Nickel, Total	10.5	B	µg/L
04	MW-12	MW-12		Potassium, Total	13700		µg/L
04	MW-12	MW-12		Sodium, Total	256000		µg/L
04	MW-12	MW-12		Vanadium, Total	88.9		µg/L
04	MW-12	MW-12		Zinc, Total	23.6		µg/L
Semivolatiles							
04	MW-12-DL	MW-12		2-Methylphenol	75		µg/L
04	MW-12-DL	MW-12		4-Methylphenol	110		µg/L
04	MW-12-DL	MW-12		Di-n-Butyl Phthalate	1	J	µg/L
Conventionals							
04	MW-13	MW-13		Dissolved Oxygen	0.5		mg/L
04	MW-13	MW-13		pH (field)	7.75		-log+H
04	MW-13	MW-13		Specific Conductance (field)	2800		ımhos/cn
04	MW-13	MW-13		Temperature	18.4		°C
Inorganics							
04	MW-13	MW-13		Aluminum, Total	1040		µg/L
04	MW-13	MW-13		Barium, Total	43.6	B	µg/L
04	MW-13	MW-13		Boron, Total	2130		µg/L
04	MW-13	MW-13		Calcium, Total	11700		µg/L
04	MW-13	MW-13		Chromium, Total	13.3		µg/L
04	MW-13	MW-13		Copper, Total	8.8	B	µg/L
04	MW-13	MW-13		Iron, Total	2790		µg/L
04	MW-13	MW-13		Magnesium, Total	11700		µg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
04	MW-13	MW-13		Manganese, Total	147		µg/L
04	MW-13	MW-13		Nickel, Total	3.9	B	µg/L
04	MW-13	MW-13		Potassium, Total	37200		µg/L
04	MW-13	MW-13		Sodium, Total	740000		µg/L
04	MW-13	MW-13		Thallium, Total	3	B	µg/L
04	MW-13	MW-13		Vanadium, Total	43.7	B	µg/L
04	MW-13	MW-13		Zinc, Total	8	B	µg/L
BTEX							
04	MW-14	MW-14		Toluene	4		µg/L
04	MW-14	MW-14		Xylene (Total)	0.7		µg/L
Conventionals							
04	MW-14	MW-14		Alkalinity (as CaCO3)	730		mg/L
04	MW-14	MW-14		Ammonia	7.1		mg/L
04	MW-14	MW-14		Bicarbonate (from Alkalinity)	730		mg/L
04	MW-14	MW-14		Chloride	68		mg/L
04	MW-14	MW-14		Dissolved Oxygen	1.3		mg/L
04	MW-14	MW-14		Methane	2200		ppmv
04	MW-14	MW-14		Nitrate Nitrogen	0.56		mg/L
04	MW-14	MW-14		Nitrite Nitrogen	0.13		mg/L
04	MW-14	MW-14		Nitrogen, Kjeldahl	9.6		mg/L
04	MW-14	MW-14		Orthophosphate	2.9		mg/L
04	MW-14	MW-14		pH (field)	6.67		-log+H
04	MW-14	MW-14		pH (lab)	6.5		-log+H
04	MW-14	MW-14		Phosphorus	3.2		mg/L
04	MW-14	MW-14		Specific Conductance (field)	1645		umhos/cn
04	MW-14	MW-14		Specific Conductance (lab)	1600		umhos/cn
04	MW-14	MW-14		Sulfate	0.56		mg/L
04	MW-14	MW-14		Temperature	16.7		°C
04	MW-14	MW-14		Total Dissolved Solids	1200		mg/L
04	MW-14	MW-14		Total Hardness (as CaCO3)	120		mg/L
04	MW-14	MW-14		Total Organic Carbon	100		mg/L
Inorganics							
04	MW-14	MW-14		Aluminum, Total	2000		µg/L
04	MW-14	MW-14		Arsenic, Total	42.3		µg/L
04	MW-14	MW-14		Barium, Total	59.6	B	µg/L
04	MW-14	MW-14		Boron, Total	256	B	µg/L
04	MW-14	MW-14		Calcium, Total	14100		µg/L
04	MW-14	MW-14		Chromium, Total	36.8		µg/L
04	MW-14	MW-14		Cobalt, Total	6.5	B	µg/L
04	MW-14	MW-14		Copper, Total	27.3		µg/L
04	MW-14	MW-14		Iron, Total	65200		µg/L
04	MW-14	MW-14		Magnesium, Total	10900	J	µg/L
04	MW-14	MW-14		Manganese, Total	4250		µg/L
04	MW-14	MW-14		Potassium, Total	17800		µg/L
04	MW-14	MW-14		Selenium, Total	7.9		µg/L
04	MW-14	MW-14		Sodium, Total	333000	J	µg/L
04	MW-14	MW-14		Vanadium, Total	297		µg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
BTEX							
04	MW-18	MW-18		Toluene	360000		µg/L
Conventionals							
04	MW-18	MW-18		Dissolved Oxygen	0.9		mg/L
04	MW-18	MW-18		pH (field)	6.87		-log+H
04	MW-18	MW-18		Specific Conductance (field)	660		µmhos/cm
04	MW-18	MW-18		Temperature	16.4		°C
Inorganics							
04	MW-18	MW-18		Arsenic, Total	33.9		µg/L
04	MW-18	MW-18		Barium, Total	27.4	B	µg/L
04	MW-18	MW-18		Boron, Total	121	B	µg/L
04	MW-18	MW-18		Calcium, Total	40400		µg/L
04	MW-18	MW-18		Chromium, Total	6.9	B	µg/L
04	MW-18	MW-18		Cobalt, Total	3.6	B	µg/L
04	MW-18	MW-18		Copper, Total	27.8		µg/L
04	MW-18	MW-18		Iron, Total	45600		µg/L
04	MW-18	MW-18		Lead, Total	0.82	B	µg/L
04	MW-18	MW-18		Magnesium, Total	19500		µg/L
04	MW-18	MW-18		Manganese, Total	4260		µg/L
04	MW-18	MW-18		Potassium, Total	8930		µg/L
04	MW-18	MW-18		Sodium, Total	69900		µg/L
04	MW-18	MW-18		Vanadium, Total	43.2	B	µg/L
04	MW-18	MW-18		Zinc, Total	22.4		µg/L
BTEX							
04	MW-19	MW-19		Toluene	1400		µg/L
Conventionals							
04	MW-19	MW-19		Dissolved Oxygen	1.8		mg/L
04	MW-19	MW-19		pH (field)	6.72		-log+H
04	MW-19	MW-19		Specific Conductance (field)	699		µmhos/cm
04	MW-19	MW-19		Temperature	16.1		°C
Inorganics							
04	MW-19	MW-19		Aluminum, Total	264		µg/L
04	MW-19	MW-19		Barium, Total	26.3	B	µg/L
04	MW-19	MW-19		Boron, Total	187	B	µg/L
04	MW-19	MW-19		Calcium, Total	18200		µg/L
04	MW-19	MW-19		Chromium, Total	8.6	B	µg/L
04	MW-19	MW-19		Cobalt, Total	6.5	B	µg/L
04	MW-19	MW-19		Copper, Total	16.4	B	µg/L
04	MW-19	MW-19		Iron, Total	12900		µg/L
04	MW-19	MW-19		Magnesium, Total	9440		µg/L
04	MW-19	MW-19		Manganese, Total	782		µg/L
04	MW-19	MW-19		Nickel, Total	3.2	B	µg/L
04	MW-19	MW-19		Potassium, Total	6930		µg/L
04	MW-19	MW-19		Sodium, Total	133000		µg/L
04	MW-19	MW-19		Vanadium, Total	83.1		µg/L
04	MW-19	MW-19		Zinc, Total	11.1	B	µg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
Conventionals							
05	DM-2A	DM-02A		Alkalinity (as CaCO3)	860		mg/L
05	DM-2A	DM-02A		Bicarbonate (from Alkalinity)	860		mg/L
05	DM-2A	DM-02A		Chloride	19		mg/L
05	DM-2A	DM-02A		Dissolved Oxygen	1.35		mg/L
05	DM-2A	DM-02A		Nitrogen, Kjeldahl	2.6	J	mg/L
05	DM-2A	DM-02A		Orthophosphate	4.3		mg/L
05	DM-2A	DM-02A		pH (field)	7.34		-log+H
05	DM-2A	DM-02A		pH (lab)	7.5		-log+H
05	DM-2A	DM-02A		Phosphorus	4.3		mg/L
05	DM-2A	DM-02A		Specific Conductance (field)	1957		umhos/cm
05	DM-2A	DM-02A		Specific Conductance (lab)	1900		umhos/cm
05	DM-2A	DM-02A		Sulfate	200		mg/L
05	DM-2A	DM-02A		Temperature	15.7		°C
05	DM-2A	DM-02A		Total Dissolved Solids	1600		mg/L
05	DM-2A	DM-02A		Total Hardness (as CaCO3)	110		mg/L
05	DM-2A	DM-02A		Total Organic Carbon	580		mg/L
Inorganics							
05	DM-2A	DM-02A		Aluminum, Total	8371.64695		µg/L
05	DM-2A	DM-02A		Barium, Total	65.07725	B	µg/L
05	DM-2A	DM-02A		Boron, Total	132.5502	B	µg/L
05	DM-2A	DM-02A		Calcium, Total	19323.4375		µg/L
05	DM-2A	DM-02A		Chromium, Total	56.67085		µg/L
05	DM-2A	DM-02A		Cobalt, Total	7.72465	B	µg/L
05	DM-2A	DM-02A		Copper, Total	343.1158		µg/L
05	DM-2A	DM-02A		Iron, Total	10284.099		µg/L
05	DM-2A	DM-02A		Lead, Total	6.98045	J	µg/L
05	DM-2A	DM-02A		Magnesium, Total	6094.16185		µg/L
05	DM-2A	DM-02A		Manganese, Total	247.2865		µg/L
05	DM-2A	DM-02A		Nickel, Total	20.1604	B	µg/L
05	DM-2A	DM-02A		Potassium, Total	11045.493		µg/L
05	DM-2A	DM-02A		Sodium, Total	617913.685	J	µg/L
05	DM-2A	DM-02A		Vanadium, Total	252.88		µg/L
05	DM-2A	DM-02A		Zinc, Total	43.68585		µg/L
Conventionals							
05	DM-8	DM-08		Alkalinity (as CaCO3)	1400		mg/L
05	DM-8	DM-08		Ammonia	4.6	J	mg/L
05	DM-8	DM-08		Bicarbonate (from Alkalinity)	1400		mg/L
05	DM-8	DM-08		Chloride	84		mg/L
05	DM-8	DM-08		Dissolved Oxygen	0.95		mg/L
05	DM-8	DM-08		Nitrate Nitrogen	0.63		mg/L
05	DM-8	DM-08		Nitrite Nitrogen	0.51		mg/L
05	DM-8	DM-08		Nitrogen, Kjeldahl	9.9	J	mg/L
05	DM-8	DM-08		Orthophosphate	4.6		mg/L
05	DM-8	DM-08		pH (field)	7		-log+H
05	DM-8	DM-08		pH (lab)	7.1		-log+H
05	DM-8	DM-08		Phosphorus	4.2		mg/L
05	DM-8	DM-08		Specific Conductance (field)	2540		umhos/cm

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
05	DM-8	DM-08		Specific Conductance (lab)	2400		µmhos/cm
05	DM-8	DM-08		Sulfate	0.77		mg/L
05	DM-8	DM-08		Sulfide (as S)	0.5		mg/L
05	DM-8	DM-08		Temperature	17.6		°C
05	DM-8	DM-08		Total Dissolved Solids	3000		mg/L
05	DM-8	DM-08		Total Hardness (as CaCO3)	650		mg/L
05	DM-8	DM-08		Total Organic Carbon	1500		mg/L
Inorganics							
05	DM-8	DM-08		Aluminum, Total	2290		µg/L
05	DM-8	DM-08		Arsenic, Total	28.7		µg/L
05	DM-8	DM-08		Barium, Total	139	B	µg/L
05	DM-8	DM-08		Boron, Total	346	B	µg/L
05	DM-8	DM-08		Calcium, Total	78400		µg/L
05	DM-8	DM-08		Chromium, Total	146		µg/L
05	DM-8	DM-08		Cobalt, Total	21.2	B	µg/L
05	DM-8	DM-08		Copper, Total	44.8		µg/L
05	DM-8	DM-08		Iron, Total	57500		µg/L
05	DM-8	DM-08		Lead, Total	2.5	BJ	µg/L
05	DM-8	DM-08		Magnesium, Total	34800		µg/L
05	DM-8	DM-08		Manganese, Total	5690		µg/L
05	DM-8	DM-08		Nickel, Total	6.8	B	µg/L
05	DM-8	DM-08		Potassium, Total	22100		µg/L
05	DM-8	DM-08		Sodium, Total	749000		µg/L
05	DM-8	DM-08		Vanadium, Total	1410		µg/L
05	DM-8	DM-08		Zinc, Total	24.7		µg/L
Conventionals							
05	FB-03		FB	pH (lab)	5.4		-log+H
05	FB-03		FB	Phosphorus	0.34		mg/L
05	FB-03		FB	Total Dissolved Solids	9		mg/L
Inorganics							
05	FB-03		FB	Barium, Total	1.3	B	µg/L
05	FB-03		FB	Boron, Total	26.2	B	µg/L
05	FB-03		FB	Chromium, Total	2.3	B	µg/L
Conventionals							
05	H-6	MW-H06		Alkalinity (as CaCO3)	180		mg/L
05	H-6	MW-H06		Bicarbonate (from Alkalinity)	180		mg/L
05	H-6	MW-H06		Chloride	3.6		mg/L
05	H-6	MW-H06		Dissolved Oxygen	2.4		mg/L
05	H-6	MW-H06		Nitrate Nitrogen	0.54		mg/L
05	H-6	MW-H06		Orthophosphate	1.8		mg/L
05	H-6	MW-H06		pH (field)	7.57		-log+H
05	H-6	MW-H06		pH (lab)	7.5		-log+H
05	H-6	MW-H06		Phosphorus	1.7		mg/L
05	H-6	MW-H06		Specific Conductance (field)	451		µmhos/cm
05	H-6	MW-H06		Specific Conductance (lab)	380		µmhos/cm
05	H-6	MW-H06		Sulfate	22		mg/L
05	H-6	MW-H06		Temperature	13.3		°C

FD= Field Duplicate
EB= Equipment Blank
FB= Field Blank

Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
05	H-6	MW-H06		Total Dissolved Solids	400		mg/L
05	H-6	MW-H06		Total Hardness (as CaCO3)	21		mg/L
05	H-6	MW-H06		Total Organic Carbon	21		mg/L
Inorganics							
05	H-6	MW-H06		Aluminum, Total	10300		µg/L
05	H-6	MW-H06		Barium, Total	53.7	B	µg/L
05	H-6	MW-H06		Boron, Total	48.9	B	µg/L
05	H-6	MW-H06		Calcium, Total	2830	B	µg/L
05	H-6	MW-H06		Chromium, Total	77.4		µg/L
05	H-6	MW-H06		Cobalt, Total	4.8	B	µg/L
05	H-6	MW-H06		Copper, Total	167		µg/L
05	H-6	MW-H06		Iron, Total	13700		µg/L
05	H-6	MW-H06		Lead, Total	7	J	µg/L
05	H-6	MW-H06		Magnesium, Total	2330	B	µg/L
05	H-6	MW-H06		Manganese, Total	197		µg/L
05	H-6	MW-H06		Mercury, Total	0.36		µg/L
05	H-6	MW-H06		Nickel, Total	9.9	B	µg/L
05	H-6	MW-H06		Potassium, Total	2120	B	µg/L
05	H-6	MW-H06		Sodium, Total	81400		µg/L
05	H-6	MW-H06		Vanadium, Total	45.8	B	µg/L
05	H-6	MW-H06		Zinc, Total	31.5		µg/L
BTEX							
05	MW-15	MW-15		Toluene	120000		µg/L
Conventionals							
05	MW-15	MW-15		Alkalinity (as CaCO3)	550		mg/L
05	MW-15	MW-15		Ammonia	2		mg/L
05	MW-15	MW-15		Bicarbonate (from Alkalinity)	550		mg/L
05	MW-15	MW-15		Chloride	28		mg/L
05	MW-15	MW-15		Dissolved Oxygen	1.15		mg/L
05	MW-15	MW-15		Methane	4100		ppmv
05	MW-15	MW-15		Nitrogen, Kjeldahl	4.8		mg/L
05	MW-15	MW-15		Orthophosphate	5.6		mg/L
05	MW-15	MW-15		pH (lab)	6.5		-log+H
05	MW-15	MW-15		Phosphorus	6.2		mg/L
05	MW-15	MW-15		Specific Conductance (field)	1095		µmhos/cm
05	MW-15	MW-15		Specific Conductance (lab)	1100		µmhos/cm
05	MW-15	MW-15		Sulfate	3.8		mg/L
05	MW-15	MW-15		Temperature	13.5		°C
05	MW-15	MW-15		Total Dissolved Solids	930		mg/L
05	MW-15	MW-15		Total Hardness (as CaCO3)	200		mg/L
05	MW-15	MW-15		Total Organic Carbon	130		mg/L
Inorganics							
05	MW-15	MW-15		Aluminum, Total	1269.9243		µg/L
05	MW-15	MW-15		Arsenic, Total	13.5219		µg/L
05	MW-15	MW-15		Barium, Total	48.1189	B	µg/L
05	MW-15	MW-15		Boron, Total	165.5151	B	µg/L
05	MW-15	MW-15		Calcium, Total	15353.3435		µg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
05	MW-15	MW-15		Chromium, Total	37.9192		µg/L
05	MW-15	MW-15		Cobalt, Total	5.3127	B	µg/L
05	MW-15	MW-15		Copper, Total	38.9207		µg/L
05	MW-15	MW-15		Iron, Total	23629.0555		µg/L
05	MW-15	MW-15		Lead, Total	9.6024		µg/L
05	MW-15	MW-15		Magnesium, Total	7016.21385	J	µg/L
05	MW-15	MW-15		Manganese, Total	1177.1023		µg/L
05	MW-15	MW-15		Potassium, Total	6465.947		µg/L
05	MW-15	MW-15		Selenium, Total	3.8	B	µg/L
05	MW-15	MW-15		Sodium, Total	260767.795	J	µg/L
05	MW-15	MW-15		Vanadium, Total	261.8944		µg/L
05	MW-15	MW-15		Zinc, Total	36.5471	J	µg/L
BTEX							
05	MW-16	MW-16		Toluene	690		µg/L
Conventionals							
05	MW-16	MW-16		Dissolved Oxygen	0.05		mg/L
05	MW-16	MW-16		pH (field)	11.24		-log+H
05	MW-16	MW-16		Specific Conductance (field)	11190		µmhos/cn
05	MW-16	MW-16		Temperature	15		°C
Inorganics							
05	MW-16	MW-16		Aluminum, Total	13200		µg/L
05	MW-16	MW-16		Arsenic, Total	94.1		µg/L
05	MW-16	MW-16		Barium, Total	188	B	µg/L
05	MW-16	MW-16		Boron, Total	1330		µg/L
05	MW-16	MW-16		Cadmium, Total	2	B	µg/L
05	MW-16	MW-16		Calcium, Total	20300		µg/L
05	MW-16	MW-16		Chromium, Total	302		µg/L
05	MW-16	MW-16		Cobalt, Total	9	B	µg/L
05	MW-16	MW-16		Copper, Total	262		µg/L
05	MW-16	MW-16		Iron, Total	12200		µg/L
05	MW-16	MW-16		Magnesium, Total	4610	BJ	µg/L
05	MW-16	MW-16		Manganese, Total	305		µg/L
05	MW-16	MW-16		Nickel, Total	104		µg/L
05	MW-16	MW-16		Potassium, Total	44700		µg/L
05	MW-16	MW-16		Selenium, Total	22.8		µg/L
05	MW-16	MW-16		Sodium, Total	3200000	J	µg/L
05	MW-16	MW-16		Vanadium, Total	2360		µg/L
05	MW-16	MW-16		Zinc, Total	65	J	µg/L
BTEX							
05	MW-17	MW-17		Toluene	120000		µg/L
Conventionals							
05	MW-17	MW-17		Alkalinity (as CaCO3)	1600		mg/L
05	MW-17	MW-17		Ammonia	2.3		mg/L
05	MW-17	MW-17		Bicarbonate (from Alkalinity)	1600		mg/L
05	MW-17	MW-17		Chloride	54		mg/L
05	MW-17	MW-17		Dissolved Oxygen	0.8		mg/L
05	MW-17	MW-17		Methane	1200		ppmv

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
05	MW-17	MW-17		Nitrite Nitrogen	0.29		mg/L
05	MW-17	MW-17		Nitrogen, Kjeldahl	8.6		mg/L
05	MW-17	MW-17		Orthophosphate	2.2		mg/L
05	MW-17	MW-17		pH (field)	6.97		-log+H
05	MW-17	MW-17		pH (lab)	6.9		-log+H
05	MW-17	MW-17		Phosphorus	2.4		mg/L
05	MW-17	MW-17		Specific Conductance (field)	2330		µmhos/cm
05	MW-17	MW-17		Specific Conductance (lab)	2900		µmhos/cm
05	MW-17	MW-17		Sulfate	8.1		mg/L
05	MW-17	MW-17		Sulfide (as S)	0.3		mg/L
05	MW-17	MW-17		Temperature	14.9		°C
05	MW-17	MW-17		Total Dissolved Solids	3500		mg/L
05	MW-17	MW-17		Total Hardness (as CaCO3)	780		mg/L
05	MW-17	MW-17		Total Organic Carbon	710		mg/L
Inorganics							
05	MW-17	MW-17		Aluminum, Total	2970		µg/L
05	MW-17	MW-17		Arsenic, Total	49.6		µg/L
05	MW-17	MW-17		Barium, Total	115	B	µg/L
05	MW-17	MW-17		Boron, Total	93.7	B	µg/L
05	MW-17	MW-17		Calcium, Total	112000		µg/L
05	MW-17	MW-17		Chromium, Total	130		µg/L
05	MW-17	MW-17		Cobalt, Total	17.7	B	µg/L
05	MW-17	MW-17		Copper, Total	39.2		µg/L
05	MW-17	MW-17		Iron, Total	34300		µg/L
05	MW-17	MW-17		Magnesium, Total	23100	J	µg/L
05	MW-17	MW-17		Manganese, Total	7700		µg/L
05	MW-17	MW-17		Potassium, Total	17200		µg/L
05	MW-17	MW-17		Selenium, Total	10.8		µg/L
05	MW-17	MW-17		Sodium, Total	515000	J	µg/L
05	MW-17	MW-17		Vanadium, Total	1290		µg/L
05	MW-17	MW-17		Zinc, Total	28.9	J	µg/L
BTEX							
06	DM-7	DM-07		Benzene	3		µg/L
Conventionals							
06	DM-7	DM-07		Alkalinity (as CaCO3)	490		mg/L
06	DM-7	DM-07		Ammonia	3.7		mg/L
06	DM-7	DM-07		Bicarbonate (from Alkalinity)	490		mg/L
06	DM-7	DM-07		Chloride	52		mg/L
06	DM-7	DM-07		Dissolved Oxygen	1.55		mg/L
06	DM-7	DM-07		Methane	510		ppmv
06	DM-7	DM-07		Nitrite Nitrogen	0.05		mg/L
06	DM-7	DM-07		Nitrogen, Kjeldahl	5.1		mg/L
06	DM-7	DM-07		Orthophosphate	2.1		mg/L
06	DM-7	DM-07		pH (field)	6.72		-log+H
06	DM-7	DM-07		pH (lab)	6.5		-log+H
06	DM-7	DM-07		Phosphorus	2.1		mg/L
06	DM-7	DM-07		Specific Conductance (field)	1066		µmhos/cm

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
06	DM-7	DM-07		Specific Conductance (lab)	1400		µmhos/cm
06	DM-7	DM-07		Sulfate	13		mg/L
06	DM-7	DM-07		Temperature	17.3		°C
06	DM-7	DM-07		Total Dissolved Solids	860		mg/L
06	DM-7	DM-07		Total Hardness (as CaCO3)	110		mg/L
06	DM-7	DM-07		Total Organic Carbon	51		mg/L
Inorganics							
06	DM-7	DM-07		Barium, Total	28.4	B	µg/L
06	DM-7	DM-07		Boron, Total	289	B	µg/L
06	DM-7	DM-07		Calcium, Total	15900		µg/L
06	DM-7	DM-07		Chromium, Total	9.1	B	µg/L
06	DM-7	DM-07		Iron, Total	27900		µg/L
06	DM-7	DM-07		Magnesium, Total	11500		µg/L
06	DM-7	DM-07		Manganese, Total	3540		µg/L
06	DM-7	DM-07		Potassium, Total	8460		µg/L
06	DM-7	DM-07		Sodium, Total	246000		µg/L
06	DM-7	DM-07		Vanadium, Total	54		µg/L
06	DM-7	DM-07		Zinc, Total	41.8		µg/L
BTEX							
06	DM-7D-FD	DM-07	FD	Benzene	3		µg/L
Conventionals							
06	DM-7D-FD	DM-07	FD	Alkalinity (as CaCO3)	510		mg/L
06	DM-7D-FD	DM-07	FD	Ammonia	3.5		mg/L
06	DM-7D-FD	DM-07	FD	Bicarbonate (from Alkalinity)	510		mg/L
06	DM-7D-FD	DM-07	FD	Chloride	52		mg/L
06	DM-7D-FD	DM-07	FD	Methane	700		ppmv
06	DM-7D-FD	DM-07	FD	Nitrate Nitrogen	0.35		mg/L
06	DM-7D-FD	DM-07	FD	Nitrite Nitrogen	0.06		mg/L
06	DM-7D-FD	DM-07	FD	Nitrogen, Kjeldahl	5.1		mg/L
06	DM-7D-FD	DM-07	FD	Orthophosphate	2.6		mg/L
06	DM-7D-FD	DM-07	FD	pH (lab)	6.5		-log+H
06	DM-7D-FD	DM-07	FD	Phosphorus	2		mg/L
06	DM-7D-FD	DM-07	FD	Specific Conductance (lab)	1400		µmhos/cm
06	DM-7D-FD	DM-07	FD	Sulfate	13		mg/L
06	DM-7D-FD	DM-07	FD	Sulfide (as S)	0.1		mg/L
06	DM-7D-FD	DM-07	FD	Total Dissolved Solids	800		mg/L
06	DM-7D-FD	DM-07	FD	Total Hardness (as CaCO3)	96		mg/L
06	DM-7D-FD	DM-07	FD	Total Organic Carbon	59		mg/L
Inorganics							
06	DM-7D-FD	DM-07	FD	Barium, Total	24.3	B	µg/L
06	DM-7D-FD	DM-07	FD	Boron, Total	322	B	µg/L
06	DM-7D-FD	DM-07	FD	Calcium, Total	16100		µg/L
06	DM-7D-FD	DM-07	FD	Chromium, Total	8.9	B	µg/L
06	DM-7D-FD	DM-07	FD	Iron, Total	28400		µg/L
06	DM-7D-FD	DM-07	FD	Magnesium, Total	11600		µg/L
06	DM-7D-FD	DM-07	FD	Manganese, Total	3550		µg/L
06	DM-7D-FD	DM-07	FD	Potassium, Total	8510		µg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
06	DM-7D-FD	DM-07	FD	Sodium, Total	244000		µg/L
06	DM-7D-FD	DM-07	FD	Vanadium, Total	54.1		µg/L
06	DM-7D-FD	DM-07	FD	Zinc, Total	7.2	B	µg/L
Conventionals							
06	FB-02		FB	Nitrogen, Kjeldahl	0.38		mg/L
06	FB-02		FB	pH (lab)	6.1		-log+H
06	FB-02		FB	Total Dissolved Solids	5		mg/L
Volatiles							
06	FB-02		FB	Carbon Disulfide	0.7	J	µg/L
06	FB-02		FB	Methylene Chloride	2	J	µg/L
Conventionals							
06	G-3	MW-G03		Alkalinity (as CaCO3)	230		mg/L
06	G-3	MW-G03		Ammonia	0.35		mg/L
06	G-3	MW-G03		Bicarbonate (from Alkalinity)	230		mg/L
06	G-3	MW-G03		Chloride	4.4		mg/L
06	G-3	MW-G03		Dissolved Oxygen	2.55		mg/L
06	G-3	MW-G03		Nitrogen, Kjeldahl	1.2		mg/L
06	G-3	MW-G03		Orthophosphate	1.5		mg/L
06	G-3	MW-G03		pH (field)	7.25		-log+H
06	G-3	MW-G03		pH (lab)	7.1		-log+H
06	G-3	MW-G03		Phosphorus	2.1		mg/L
06	G-3	MW-G03		Specific Conductance (field)	450		umhos/cm
06	G-3	MW-G03		Specific Conductance (lab)	460		umhos/cm
06	G-3	MW-G03		Sulfate	3.4		mg/L
06	G-3	MW-G03		Temperature	14.8		°C
06	G-3	MW-G03		Total Hardness (as CaCO3)	150		mg/L
06	G-3	MW-G03		Total Organic Carbon	21		mg/L
Inorganics							
06	G-3	MW-G03		Aluminum, Total	3750		µg/L
06	G-3	MW-G03		Arsenic, Total	10		µg/L
06	G-3	MW-G03		Barium, Total	20.6	B	µg/L
06	G-3	MW-G03		Boron, Total	355	B	µg/L
06	G-3	MW-G03		Calcium, Total	24100		µg/L
06	G-3	MW-G03		Chromium, Total	12.4		µg/L
06	G-3	MW-G03		Cobalt, Total	3	B	µg/L
06	G-3	MW-G03		Copper, Total	15.4	B	µg/L
06	G-3	MW-G03		Iron, Total	4410		µg/L
06	G-3	MW-G03		Magnesium, Total	6130	J	µg/L
06	G-3	MW-G03		Manganese, Total	435		µg/L
06	G-3	MW-G03		Potassium, Total	9150		µg/L
06	G-3	MW-G03		Sodium, Total	66800	J	µg/L
06	G-3	MW-G03		Vanadium, Total	72.2		µg/L
Conventionals							
06	H-9	MW-H09		Alkalinity (as CaCO3)	270		mg/L
06	H-9	MW-H09		Bicarbonate (from Alkalinity)	270		mg/L
06	H-9	MW-H09		Chloride	5.4		mg/L
06	H-9	MW-H09		Dissolved Oxygen	2.7		mg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
06	H-9	MW-H09		Nitrate Nitrogen	0.2	J	mg/L
06	H-9	MW-H09		Orthophosphate	1.2		mg/L
06	H-9	MW-H09		pH (field)	7.2		-log+H
06	H-9	MW-H09		pH (lab)	7.1		-log+H
06	H-9	MW-H09		Phosphorus	1.6		mg/L
06	H-9	MW-H09		Specific Conductance (field)	7.12		µmhos/cm
06	H-9	MW-H09		Specific Conductance (lab)	700		µmhos/cm
06	H-9	MW-H09		Sulfate	98		mg/L
06	H-9	MW-H09		Temperature	13.4		°C
06	H-9	MW-H09		Total Dissolved Solids	620		mg/L
06	H-9	MW-H09		Total Hardness (as CaCO3)	42		mg/L
06	H-9	MW-H09		Total Organic Carbon	40		mg/L
Inorganics							
06	H-9	MW-H09		Aluminum, Total	23000		µg/L
06	H-9	MW-H09		Barium, Total	132	B	µg/L
06	H-9	MW-H09		Boron, Total	68.2	B	µg/L
06	H-9	MW-H09		Cadmium, Total	11.1		µg/L
06	H-9	MW-H09		Calcium, Total	12900		µg/L
06	H-9	MW-H09		Chromium, Total	36.1		µg/L
06	H-9	MW-H09		Cobalt, Total	22.4	B	µg/L
06	H-9	MW-H09		Copper, Total	281		µg/L
06	H-9	MW-H09		Iron, Total	14800		µg/L
06	H-9	MW-H09		Lead, Total	9.5	J	µg/L
06	H-9	MW-H09		Magnesium, Total	4300	B	µg/L
06	H-9	MW-H09		Manganese, Total	887		µg/L
06	H-9	MW-H09		Mercury, Total	0.67		µg/L
06	H-9	MW-H09		Nickel, Total	24.3	B	µg/L
06	H-9	MW-H09		Potassium, Total	5070		µg/L
06	H-9	MW-H09		Sodium, Total	184000		µg/L
06	H-9	MW-H09		Vanadium, Total	121		µg/L
06	H-9	MW-H09		Zinc, Total	186		µg/L
Conventionals							
07	G-1	MW-G01		Dissolved Oxygen	1.75		mg/L
07	G-1	MW-G01		pH (field)	6.71		-log+H
07	G-1	MW-G01		Specific Conductance (field)	945		µmhos/cm
07	G-1	MW-G01		Temperature	14.2		°C
Inorganics							
07	G-1	MW-G01		Aluminum, Total	3960		µg/L
07	G-1	MW-G01		Arsenic, Total	29.5		µg/L
07	G-1	MW-G01		Barium, Total	20.9	B	µg/L
07	G-1	MW-G01		Boron, Total	156	B	µg/L
07	G-1	MW-G01		Calcium, Total	61100		µg/L
07	G-1	MW-G01		Chromium, Total	12.6		µg/L
07	G-1	MW-G01		Cobalt, Total	4.2	B	µg/L
07	G-1	MW-G01		Copper, Total	17.3	B	µg/L
07	G-1	MW-G01		Iron, Total	71600		µg/L
07	G-1	MW-G01		Lead, Total	7.1		µg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
07	G-1	MW-G01		Magnesium, Total	24200	J	µg/L
07	G-1	MW-G01		Manganese, Total	1000		µg/L
07	G-1	MW-G01		Potassium, Total	7110		µg/L
07	G-1	MW-G01		Selenium, Total	6.9		µg/L
07	G-1	MW-G01		Sodium, Total	74800	J	µg/L
07	G-1	MW-G01		Vanadium, Total	82.5		µg/L
07	G-1	MW-G01		Zinc, Total	129	J	µg/L
Conventionals							
09	A-4	MW-A04		Dissolved Oxygen	2.75		mg/L
09	A-4	MW-A04		pH (field)	6.47		-log+H
09	A-4	MW-A04		Specific Conductance (field)	565		ımhos/cn
09	A-4	MW-A04		Temperature	14.2		°C
Inorganics							
09	A-4	MW-A04		Barium, Total	14.6	B	µg/L
09	A-4	MW-A04		Boron, Total	83.9	B	µg/L
09	A-4	MW-A04		Cadmium, Total	1.4	B	µg/L
09	A-4	MW-A04		Calcium, Total	16700		µg/L
09	A-4	MW-A04		Chromium, Total	5.1	B	µg/L
09	A-4	MW-A04		Iron, Total	23900		µg/L
09	A-4	MW-A04		Magnesium, Total	27300	J	µg/L
09	A-4	MW-A04		Manganese, Total	1260		µg/L
09	A-4	MW-A04		Potassium, Total	6860		µg/L
09	A-4	MW-A04		Selenium, Total	5.5		µg/L
09	A-4	MW-A04		Sodium, Total	31800	J	µg/L
09	A-4	MW-A04		Vanadium, Total	5.7	B	µg/L
Conventionals							
09	B-1A	MW-B01A		Dissolved Oxygen	1.9		mg/L
09	B-1A	MW-B01A		pH (field)	6.76		-log+H
09	B-1A	MW-B01A		Specific Conductance (field)	745		ımhos/cn
09	B-1A	MW-B01A		Temperature	11.1		°C
Inorganics							
09	B-1A	MW-B01A		Aluminum, Total	1420		µg/L
09	B-1A	MW-B01A		Arsenic, Total	5.2	B	µg/L
09	B-1A	MW-B01A		Barium, Total	11	B	µg/L
09	B-1A	MW-B01A		Boron, Total	73.2	B	µg/L
09	B-1A	MW-B01A		Calcium, Total	25300		µg/L
09	B-1A	MW-B01A		Chromium, Total	2.3	B	µg/L
09	B-1A	MW-B01A		Iron, Total	10700		µg/L
09	B-1A	MW-B01A		Magnesium, Total	10800	J	µg/L
09	B-1A	MW-B01A		Manganese, Total	386		µg/L
09	B-1A	MW-B01A		Potassium, Total	8300		µg/L
09	B-1A	MW-B01A		Selenium, Total	2.6	B	µg/L
09	B-1A	MW-B01A		Sodium, Total	104000	J	µg/L
09	B-1A	MW-B01A		Vanadium, Total	12	B	µg/L
Conventionals							
09	B-1B	MW-B01B		Dissolved Oxygen	1.05		mg/L
09	B-1B	MW-B01B		pH (field)	8.61		-log+H

FD= Field Duplicate
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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
09	B-1B	MW-B01B		Specific Conductance (field)	838		umhos/cm
09	B-1B	MW-B01B		Temperature	13.5		°C
Inorganics							
09	B-1B	MW-B01B		Aluminum, Total	197	B	µg/L
09	B-1B	MW-B01B		Arsenic, Total	3.3	B	µg/L
09	B-1B	MW-B01B		Barium, Total	6.9	B	µg/L
09	B-1B	MW-B01B		Boron, Total	700		µg/L
09	B-1B	MW-B01B		Calcium, Total	3870	B	µg/L
09	B-1B	MW-B01B		Chromium, Total	9.8	B	µg/L
09	B-1B	MW-B01B		Copper, Total	19.5	B	µg/L
09	B-1B	MW-B01B		Iron, Total	689		µg/L
09	B-1B	MW-B01B		Magnesium, Total	2400	BJ	µg/L
09	B-1B	MW-B01B		Manganese, Total	34.4		µg/L
09	B-1B	MW-B01B		Potassium, Total	14600		µg/L
09	B-1B	MW-B01B		Sodium, Total	189000	J	µg/L
09	B-1B	MW-B01B		Vanadium, Total	30.4	B	µg/L
Conventionals							
BG	DM-1A	DM-01A		Dissolved Oxygen	6.5		mg/L
BG	DM-1A	DM-01A		pH (field)	6.6		-log+H
BG	DM-1A	DM-01A		Specific Conductance (field)	112		umhos/cm
BG	DM-1A	DM-01A		Temperature	14		°C
Inorganics							
BG	DM-1A	DM-01A		Aluminum, Total	674.72525	J	µg/L
BG	DM-1A	DM-01A		Barium, Total	8.19465	B	µg/L
BG	DM-1A	DM-01A		Boron, Total	38.553	B	µg/L
BG	DM-1A	DM-01A		Calcium, Total	6998.11085		µg/L
BG	DM-1A	DM-01A		Copper, Total	4.42195	B	µg/L
BG	DM-1A	DM-01A		Iron, Total	4779.14915	J	µg/L
BG	DM-1A	DM-01A		Lead, Total	1.646	B	µg/L
BG	DM-1A	DM-01A		Magnesium, Total	4511.91	B	µg/L
BG	DM-1A	DM-01A		Manganese, Total	52.39165	J	µg/L
BG	DM-1A	DM-01A		Nickel, Total	2.22105	B	µg/L
BG	DM-1A	DM-01A		Potassium, Total	6654.0825		µg/L
BG	DM-1A	DM-01A		Sodium, Total	11183.428		µg/L
BG	DM-1A	DM-01A		Vanadium, Total	14.33815	B	µg/L
BG	DM-1A	DM-01A		Zinc, Total	11.0125	B	µg/L
Conventionals							
BG	E-3	MW-E03		Dissolved Oxygen	1.95		mg/L
BG	E-3	MW-E03		pH (field)	6.52		-log+H
BG	E-3	MW-E03		Specific Conductance (field)	546		umhos/cm
BG	E-3	MW-E03		Temperature	13.7		°C
Inorganics							
BG	E-3	MW-E03		Boron, Total	489	B	µg/L
BG	E-3	MW-E03		Calcium, Total	31600		µg/L
BG	E-3	MW-E03		Copper, Total	4.2	B	µg/L
BG	E-3	MW-E03		Iron, Total	15400		µg/L
BG	E-3	MW-E03		Magnesium, Total	14000		µg/L

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Rhone-Poulenc RFI

Round 3

Detected Groundwater Results

Area	Sample ID	Station ID	QA/QC	Parameter	Result	Qualifier	Units
BG	E-3	MW-E03		Manganese, Total	239		µg/L
BG	E-3	MW-E03		Potassium, Total	3070	B	µg/L
BG	E-3	MW-E03		Sodium, Total	31400		µg/L
BG	E-3	MW-E03		Vanadium, Total	9.9	B	µg/L
BG	E-3	MW-E03		Zinc, Total	12.2	B	µg/L

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Detected Seep Results

Rhone-Poulenc RFI

Round 3

Detected Seep Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifier	Units
Conventionals						
11	01-SP		Alkalinity (as CaCO3)	150		mg/L
11	01-SP		Bicarbonate (from Alkalinity)	150		mg/L
11	01-SP		Chloride	8100		mg/L
11	01-SP		Dissolved Oxygen	2.6		mg/L
11	01-SP		Nitrate Nitrogen	0.1		mg/L
11	01-SP		Nitrogen, Kjeldahl	2.2		mg/L
11	01-SP		pH (field)	6.37		-log+H
11	01-SP		Phosphorus	0.83		mg/L
11	01-SP		Specific Conductance (field)	14200		µmhos/cm
11	01-SP		Sulfate	920		mg/L
11	01-SP		Temperature	11.9		°C
11	01-SP		Total Dissolved Solids	30000		mg/L
11	01-SP		Total Organic Carbon	4.9		mg/L
Inorganics						
11	01-SP		Aluminum, Total	3390		µg/L
11	01-SP		Barium, Total	174	B	µg/L
11	01-SP		Cadmium, Total	2.1	B	µg/L
11	01-SP		Vanadium, Total	10.1	B	µg/L
Conventionals						
11	01-SW		Dissolved Oxygen	10.6		mg/L
11	01-SW		pH (field)	6.63		-log+H
11	01-SW		Salinity	5		ppt
11	01-SW		Specific Conductance (field)	600		µmhos/cm
11	01-SW		Temperature	9		°C
Conventionals						
11	02-SP		Alkalinity (as CaCO3)	960		mg/L
11	02-SP		Bicarbonate (from Alkalinity)	960		mg/L
11	02-SP		Chloride	4600		mg/L
11	02-SP		Dissolved Oxygen	2.6		mg/L
11	02-SP		Nitrate Nitrogen	0.21		mg/L
11	02-SP		Nitrite Nitrogen	0.07		mg/L
11	02-SP		Nitrogen, Kjeldahl	2.6		mg/L
11	02-SP		pH (field)	7.16		-log+H
11	02-SP		Phosphorus	1.6		mg/L
11	02-SP		Salinity	7.2		ppt
11	02-SP		Specific Conductance (field)	8800		µmhos/cm
11	02-SP		Sulfate	570		mg/L
11	02-SP		Temperature	12.4		°C
11	02-SP		Total Dissolved Solids	34000		mg/L
11	02-SP		Total Organic Carbon	180		mg/L
Inorganics						
11	02-SP		Aluminum, Total	64700		µg/L
11	02-SP		Arsenic, Total	29.5		µg/L
11	02-SP		Barium, Total	187	B	µg/L
11	02-SP		Beryllium, Total	0.84	B	µg/L
11	02-SP		Cadmium, Total	12.6		µg/L

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RB= Rinsate Blank
TB= Trip Blank

Rhone-Poulenc RFI

Round 3

Detected Seep Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifier	Units
11	02-SP		Calcium, Total	110000		µg/L
11	02-SP		Chromium, Total	211		µg/L
11	02-SP		Cobalt, Total	59.1		µg/L
11	02-SP		Copper, Total	209		µg/L
11	02-SP		Lead, Total	47.8		µg/L
11	02-SP		Magnesium, Total	281000		µg/L
11	02-SP		Nickel, Total	75.9		µg/L
11	02-SP		Potassium, Total	128000		µg/L
11	02-SP		Sodium, Total	2850000		µg/L
11	02-SP		Vanadium, Total	419		µg/L
11	02-SP		Zinc, Total	242		µg/L
Semivolatiles						
11	02-SP		bis(2-Ethylhexyl)Phthalate	15.3		µg/L
Conventionals						
11	02-SP-FD	FD	Alkalinity (as CaCO3)	1000		mg/L
11	02-SP-FD	FD	Bicarbonate (from Alkalinity)	1000		mg/L
11	02-SP-FD	FD	Chloride	4000		mg/L
11	02-SP-FD	FD	Nitrate Nitrogen	0.23		mg/L
11	02-SP-FD	FD	Nitrite Nitrogen	0.09		mg/L
11	02-SP-FD	FD	Nitrogen, Kjeldahl	1.5		mg/L
11	02-SP-FD	FD	Phosphorus	1.6		mg/L
11	02-SP-FD	FD	Sulfate	500		mg/L
11	02-SP-FD	FD	Total Dissolved Solids	9000		mg/L
11	02-SP-FD	FD	Total Organic Carbon	140		mg/L
Inorganics						
11	02-SP-FD	FD	Aluminum, Total	54400		µg/L
11	02-SP-FD	FD	Arsenic, Total	32.5		µg/L
11	02-SP-FD	FD	Barium, Total	160	B	µg/L
11	02-SP-FD	FD	Beryllium, Total	0.94	B	µg/L
11	02-SP-FD	FD	Cadmium, Total	10.6		µg/L
11	02-SP-FD	FD	Calcium, Total	98900		µg/L
11	02-SP-FD	FD	Chromium, Total	192		µg/L
11	02-SP-FD	FD	Cobalt, Total	51.9		µg/L
11	02-SP-FD	FD	Copper, Total	196		µg/L
11	02-SP-FD	FD	Lead, Total	40.3		µg/L
11	02-SP-FD	FD	Magnesium, Total	255000		µg/L
11	02-SP-FD	FD	Nickel, Total	64.1		µg/L
11	02-SP-FD	FD	Potassium, Total	122000		µg/L
11	02-SP-FD	FD	Sodium, Total	2700000		µg/L
11	02-SP-FD	FD	Vanadium, Total	381		µg/L
11	02-SP-FD	FD	Zinc, Total	203		µg/L
Semivolatiles						
11	02-SP-FD	FD	bis(2-Ethylhexyl)Phthalate	38.6		µg/L
Volatiles						
11	02-SP-RB	RB	Methylene Chloride	5.6	J	µg/L
Conventionals						
11	02-SW		Dissolved Oxygen	11.8		mg/L

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TB= Trip Blank

Rhone-Poulenc RFI

Round 3

Detected Seep Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifier	Units
11	02-SW		pH (field)	6.97		-log+H
11	02-SW		Salinity	5.8		ppt
11	02-SW		Specific Conductance (field)	5100		µmhos/cm
11	02-SW		Temperature	9		°C
Conventionals						
11	03-SP		Alkalinity (as CaCO3)	89		mg/L
11	03-SP		Bicarbonate (from Alkalinity)	89		mg/L
11	03-SP		Chloride	6900		mg/L
11	03-SP		Dissolved Oxygen	8		mg/L
11	03-SP		Nitrate Nitrogen	0.47		mg/L
11	03-SP		Nitrogen, Kjeldahl	0.16		mg/L
11	03-SP		pH (field)	6.78		-log+H
11	03-SP		Phosphorus	0.21		mg/L
11	03-SP		Specific Conductance (field)	12200		µmhos/cm
11	03-SP		Sulfate	830		mg/L
11	03-SP		Temperature	11		°C
11	03-SP		Total Dissolved Solids	12000		mg/L
11	03-SP		Total Organic Carbon	4.3		mg/L
Inorganics						
11	03-SP		Aluminum, Total	361		µg/L
11	03-SP		Barium, Total	7.7	B	µg/L
11	03-SP		Cobalt, Total	2.9	B	µg/L
11	03-SP		Vanadium, Total	17.5	B	µg/L
Conventionals						
11	04-SP		Alkalinity (as CaCO3)	89		mg/L
11	04-SP		Bicarbonate (from Alkalinity)	89		mg/L
11	04-SP		Chloride	8400		mg/L
11	04-SP		Dissolved Oxygen	7.8		mg/L
11	04-SP		Nitrate Nitrogen	0.47		mg/L
11	04-SP		Nitrogen, Kjeldahl	0.14		mg/L
11	04-SP		pH (field)	7.79		-log+H
11	04-SP		Phosphorus	0.28		mg/L
11	04-SP		Salinity	12.3		ppt
11	04-SP		Specific Conductance (field)	14000		µmhos/cm
11	04-SP		Sulfate	1200		mg/L
11	04-SP		Temperature	10.8		°C
11	04-SP		Total Dissolved Solids	34000		mg/L
11	04-SP		Total Organic Carbon	2.8		mg/L
Inorganics						
11	04-SP		Aluminum, Total	1280		µg/L
11	04-SP		Barium, Total	12.8	B	µg/L
11	04-SP		Calcium, Total	168000		µg/L
11	04-SP		Magnesium, Total	541000		µg/L
11	04-SP		Potassium, Total	211000		µg/L
11	04-SP		Sodium, Total	5190000		µg/L
11	04-SP		Vanadium, Total	8.4	B	µg/L
Conventionals						

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Rhone-Poulenc RFI

Round 3

Detected Seep Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifier	Units
11	05-SP		Alkalinity (as CaCO3)	68		mg/L
11	05-SP		Bicarbonate (from Alkalinity)	68		mg/L
11	05-SP		Chloride	2900		mg/L
11	05-SP		Dissolved Oxygen	9.9		mg/L
11	05-SP		Nitrate Nitrogen	0.38		mg/L
11	05-SP		Nitrogen, Kjeldahl	0.29		mg/L
11	05-SP		pH (field)	6.87		-log+H
11	05-SP		Salinity	4.5		ppt
11	05-SP		Specific Conductance (field)	5000		µmhos/cm
11	05-SP		Sulfate	290		mg/L
11	05-SP		Temperature	12.7		°C
11	05-SP		Total Dissolved Solids	25000		mg/L
11	05-SP		Total Organic Carbon	1.6		mg/L
Inorganics						
11	05-SP		Aluminum, Total	674		µg/L
11	05-SP		Barium, Total	5.8	B	µg/L
11	05-SP		Calcium, Total	52500		µg/L
11	05-SP		Magnesium, Total	164000		µg/L
11	05-SP		Mercury, Total	0.65		µg/L
11	05-SP		Potassium, Total	70300		µg/L
11	05-SP		Sodium, Total	1580000		µg/L
11	05-SP		Vanadium, Total	2.8	B	µg/L
Conventionals						
11	06-SP		Alkalinity (as CaCO3)	68		mg/L
11	06-SP		Bicarbonate (from Alkalinity)	68		mg/L
11	06-SP		Chloride	6200		mg/L
11	06-SP		Dissolved Oxygen	8.6		mg/L
11	06-SP		Nitrate Nitrogen	0.47		mg/L
11	06-SP		pH (field)	6.91		-log+H
11	06-SP		Salinity	8.2		ppt
11	06-SP		Specific Conductance (field)	10400		µmhos/cm
11	06-SP		Sulfate	690		mg/L
11	06-SP		Temperature	11		°C
11	06-SP		Total Dissolved Solids	11000		mg/L
11	06-SP		Total Organic Carbon	2.2		mg/L
Inorganics						
11	06-SP		Aluminum, Total	852		µg/L
11	06-SP		Barium, Total	13.4	B	µg/L
11	06-SP		Calcium, Total	143000		µg/L
11	06-SP		Magnesium, Total	440000		µg/L
11	06-SP		Potassium, Total	146000		µg/L
11	06-SP		Sodium, Total	3380000		µg/L
11	06-SP		Vanadium, Total	3	B	µg/L
Volatiles						
11	06-SP		Formaldehyde	24	J	µg/L
Conventionals						
11	07-SP		Alkalinity (as CaCO3)	68		mg/L

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Rhone-Poulenc RFI

Round 3

Detected Seep Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifier	Units
11	07-SP		Bicarbonate (from Alkalinity)	68		mg/L
11	07-SP		Chloride	9100		mg/L
11	07-SP		Dissolved Oxygen	8.4		mg/L
11	07-SP		Nitrate Nitrogen	0.18		mg/L
11	07-SP		Nitrogen, Kjeldahl	0.27		mg/L
11	07-SP		pH (field)	7.54		-log+H
11	07-SP		Phosphorus	0.44		mg/L
11	07-SP		Salinity	2.5		ppt
11	07-SP		Specific Conductance (field)	2450		µmhos/cm
11	07-SP		Sulfate	130		mg/L
11	07-SP		Temperature	13.8		°C
11	07-SP		Total Dissolved Solids	1900		mg/L
11	07-SP		Total Organic Carbon	7.6		mg/L
Inorganics						
11	07-SP		Aluminum, Total	655.36595		µg/L
11	07-SP		Barium, Total	4.5448	B	µg/L
11	07-SP		Calcium, Total	15011.816		µg/L
11	07-SP		Magnesium, Total	46585.412		µg/L
11	07-SP		Potassium, Total	30611.4645		µg/L
11	07-SP		Sodium, Total	693175.965		µg/L
11	07-SP		Vanadium, Total	5.6629	B	µg/L
Semivolatiles						
11	07-SP		bis(2-Ethylhexyl)Phthalate	13.8		µg/L
Volatiles						
11	07-SP-TB	TB	Methylene Chloride	5.1	J	µg/L
Volatiles						
11	08-SP-TB	TB	Methylene Chloride	5.4	J	µg/L

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Detected Stormwater and Sewer Sediment Results

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
BTEX						
01	026-SEW		Ethylbenzene	6	J	µg/kg
01	026-SEW		Toluene	4	J	µg/kg
01	026-SEW		Xylene (Total)	32		µg/kg
Conventionals						
01	026-SEW		Total Organic Carbon	150000		mg/kg
Inorganics						
01	026-SEW		Arsenic, Total	22.6		mg/kg
01	026-SEW		Cadmium, Total	16.9		mg/kg
01	026-SEW		Chromium, Total	141		mg/kg
01	026-SEW		Copper, Total	6000		mg/kg
01	026-SEW		Lead, Total	1290		mg/kg
01	026-SEW		Silver, Total	2.8	B	mg/kg
01	026-SEW		Zinc, Total	2670		mg/kg
Semivolatiles						
01	026-SEW		4-Methylphenol	630		µg/kg
01	026-SEW		Acenaphthene	1700		µg/kg
01	026-SEW		Anthracene	2900		µg/kg
01	026-SEW		Benzo(A)Anthracene	8900		µg/kg
01	026-SEW		Benzo(A)Pyrene	19000		µg/kg
01	026-SEW		Benzo(B)Fluoranthene	16000	D	µg/kg
01	026-SEW		Benzo(G,H,I)Perylene	15000		µg/kg
01	026-SEW		Benzo(K)Fluoranthene	17000		µg/kg
01	026-SEW		Benzyl Alcohol	2500		µg/kg
01	026-SEW		Benzyl Butyl Phthalate	800		µg/kg
01	026-SEW		bis(2-Ethylhexyl)Phthalate	5600		µg/kg
01	026-SEW		Carbazole	6300		µg/kg
01	026-SEW		Chrysene	12000		µg/kg
01	026-SEW		Di-n-Butyl Phthalate	3300	B	µg/kg
01	026-SEW		Di-n-Octyl Phthalate	3100		µg/kg
01	026-SEW		Dibenzo(A,H)Anthracene	13000		µg/kg
01	026-SEW		Dibenzofuran	1300		µg/kg
01	026-SEW		Dimethyl Phthalate	760	B	µg/kg
01	026-SEW		Fluoranthene	39000	D	µg/kg
01	026-SEW		Fluorene	1400		µg/kg
01	026-SEW		Indeno(1,2,3-CD)Pyrene	13000		µg/kg
01	026-SEW		Phenanthrene	19000	D	µg/kg
01	026-SEW		Pyrene	29000	D	µg/kg
Conventionals						
01	030-SEW		Total Organic Carbon	237000		mg/kg
Inorganics						
01	030-SEW		Arsenic, Total	64.1		mg/kg
01	030-SEW		Cadmium, Total	15.9		mg/kg
01	030-SEW		Chromium, Total	61.4		mg/kg
01	030-SEW		Copper, Total	6250		mg/kg
01	030-SEW		Lead, Total	530		mg/kg
01	030-SEW		Silver, Total	3	B	mg/kg
01	030-SEW		Zinc, Total	1650		mg/kg
Pesticides/PCBs						
01	030-SEW		Aroclor-1254	9300	D	µg/kg

FD= Field Duplicate

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
Semivolatiles						
01	030-SEW		Acenaphthene	880		µg/kg
01	030-SEW		Acenaphthylene	520		µg/kg
01	030-SEW		Anthracene	4000		µg/kg
01	030-SEW		Benzo(A)Anthracene	14000		µg/kg
01	030-SEW		Benzo(A)Pyrene	20000		µg/kg
01	030-SEW		Benzo(B)Fluoranthene	40000	D	µg/kg
01	030-SEW		Benzo(K)Fluoranthene	24000		µg/kg
01	030-SEW		Benzyl Butyl Phthalate	2200		µg/kg
01	030-SEW		bis(2-Ethylhexyl)Phthalate	8000		µg/kg
01	030-SEW		Carbazole	7400		µg/kg
01	030-SEW		Chrysene	48000	D	µg/kg
01	030-SEW		Di-n-Octyl Phthalate	260000	D	µg/kg
01	030-SEW		Dibenzo(A,H)Anthracene	7700		µg/kg
01	030-SEW		Dibenzofuran	620		µg/kg
01	030-SEW		Fluoranthene	93000	D	µg/kg
01	030-SEW		Fluorene	1100		µg/kg
01	030-SEW		Phenanthrene	23000		µg/kg
01	030-SEW		Pyrene	63000	D	µg/kg
BTEX						
01	07-SWO		Toluene	8		µg/kg
Conventionals						
01	07-SWO		pH (lab)	8.4		-log+H
01	07-SWO		Total Organic Carbon	55700		mg/kg
Inorganics						
01	07-SWO		Arsenic, Total	59.8		mg/kg
01	07-SWO		Cadmium, Total	27		mg/kg
01	07-SWO		Chromium, Total	65.6		mg/kg
01	07-SWO		Copper, Total	1650		mg/kg
01	07-SWO		Lead, Total	128		mg/kg
01	07-SWO		Silver, Total	3.9		mg/kg
01	07-SWO		Zinc, Total	4570		mg/kg
Pesticides/PCBs						
01	07-SWO		Aroclor-1254	9960	D	µg/kg
Semivolatiles						
01	07-SWO		Acenaphthene	1200		µg/kg
01	07-SWO		Anthracene	3800		µg/kg
01	07-SWO		Benzo(A)Anthracene	10000		µg/kg
01	07-SWO		Benzo(A)Pyrene	8700		µg/kg
01	07-SWO		Benzo(B)Fluoranthene	14000		µg/kg
01	07-SWO		Benzo(G,H,I)Perylene	5300		µg/kg
01	07-SWO		Benzo(K)Fluoranthene	11000		µg/kg
01	07-SWO		bis(2-Ethylhexyl)Phthalate	2300		µg/kg
01	07-SWO		Carbazole	1500		µg/kg
01	07-SWO		Chrysene	10000		µg/kg
01	07-SWO		Di-n-Octyl Phthalate	72000	D	µg/kg
01	07-SWO		Dibenzo(A,H)Anthracene	2300		µg/kg
01	07-SWO		Dibenzofuran	690		µg/kg
01	07-SWO		Fluoranthene	30000	D	µg/kg
01	07-SWO		Fluorene	1500		µg/kg

FD= Field Duplicate

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
01	07-SWO		Indeno(1,2,3-CD)Pyrene	1000		µg/kg
01	07-SWO		Phenanthrene	15000		µg/kg
01	07-SWO		Pyrene	21000	D	µg/kg
BTEX						
01	07-SWO-FD	FD	Toluene	9		µg/kg
Conventionals						
01	07-SWO-FD	FD	pH (lab)	8.4		-log+H
01	07-SWO-FD	FD	Total Organic Carbon	29700		mg/kg
Inorganics						
01	07-SWO-FD	FD	Arsenic, Total	35.3		mg/kg
01	07-SWO-FD	FD	Cadmium, Total	18.1		mg/kg
01	07-SWO-FD	FD	Chromium, Total	43.4		mg/kg
01	07-SWO-FD	FD	Copper, Total	1600		mg/kg
01	07-SWO-FD	FD	Lead, Total	131		mg/kg
01	07-SWO-FD	FD	Silver, Total	2.9		mg/kg
01	07-SWO-FD	FD	Zinc, Total	3290		mg/kg
Pesticides/PCBs						
01	07-SWO-FD	FD	Aroclor-1254	11000	D	µg/kg
Semivolatiles						
01	07-SWO-FD	FD	Acenaphthene	430		µg/kg
01	07-SWO-FD	FD	Anthracene	750		µg/kg
01	07-SWO-FD	FD	Benzo(A)Anthracene	3200		µg/kg
01	07-SWO-FD	FD	Benzo(A)Pyrene	2800		µg/kg
01	07-SWO-FD	FD	Benzo(B)Fluoranthene	3700		µg/kg
01	07-SWO-FD	FD	Benzo(K)Fluoranthene	2800		µg/kg
01	07-SWO-FD	FD	bis(2-Ethylhexyl)Phthalate	900		µg/kg
01	07-SWO-FD	FD	Carbazole	630		µg/kg
01	07-SWO-FD	FD	Chrysene	4300		µg/kg
01	07-SWO-FD	FD	Di-n-Octyl Phthalate	60000	D	µg/kg
01	07-SWO-FD	FD	Dibenzo(A,H)Anthracene	540		µg/kg
01	07-SWO-FD	FD	Dibenzofuran	270	J	µg/kg
01	07-SWO-FD	FD	Fluoranthene	9000		µg/kg
01	07-SWO-FD	FD	Fluorene	450		µg/kg
01	07-SWO-FD	FD	Phenanthrene	4700		µg/kg
01	07-SWO-FD	FD	Pyrene	6800		µg/kg
BTEX						
02	014-SEW		Ethylbenzene	14	U	µg/kg
02	014-SEW		Toluene	33000		µg/kg
02	014-SEW		Xylene (Total)	14	U	µg/kg
Conventionals						
02	014-SEW		Total Organic Carbon	193000		mg/kg
Inorganics						
02	014-SEW		Arsenic, Total	49.5		mg/kg
02	014-SEW		Cadmium, Total	23.1		mg/kg
02	014-SEW		Chromium, Total	75.6		mg/kg
02	014-SEW		Copper, Total	10900		mg/kg
02	014-SEW		Lead, Total	283		mg/kg
02	014-SEW		Silver, Total	4.5	B	mg/kg
02	014-SEW		Zinc, Total	3590		mg/kg
Semivolatiles						

FD= Field Duplicate

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
02	014-SEW		2-Methylnaphthalene	1100		µg/kg
02	014-SEW		4-Methylphenol	910		µg/kg
02	014-SEW		Acenaphthylene	1500		µg/kg
02	014-SEW		Anthracene	6500		µg/kg
02	014-SEW		Benzo(A)Anthracene	2900		µg/kg
02	014-SEW		Benzo(A)Pyrene	6300		µg/kg
02	014-SEW		Benzo(B)Fluoranthene	7200		µg/kg
02	014-SEW		Benzo(K)Fluoranthene	6100		µg/kg
02	014-SEW		Benzyl Butyl Phthalate	2400		µg/kg
02	014-SEW		bis(2-Ethylhexyl)Phthalate	17000	D	µg/kg
02	014-SEW		Carbazole	6200		µg/kg
02	014-SEW		Chrysene	12000		µg/kg
02	014-SEW		Di-n-Butyl Phthalate	5000		µg/kg
02	014-SEW		Di-n-Octyl Phthalate	4500		µg/kg
02	014-SEW		Dibenzofuran	2300		µg/kg
02	014-SEW		Fluoranthene	28000		µg/kg
02	014-SEW		Fluorene	3200		µg/kg
02	014-SEW		Naphthalene	710		µg/kg
02	014-SEW		Phenanthrene	25000		µg/kg
02	014-SEW		Phenol	880		µg/kg
02	014-SEW		Pyrene	18000		µg/kg
BTEX						
02	014-SEW-FD	FD	Ethylbenzene	18		µg/kg
02	014-SEW-FD	FD	Toluene	120000	D	µg/kg
02	014-SEW-FD	FD	Xylene (Total)	28		µg/kg
Conventionals						
02	014-SEW-FD	FD	Total Organic Carbon	92700		mg/kg
Inorganics						
02	014-SEW-FD	FD	Arsenic, Total	47.1		mg/kg
02	014-SEW-FD	FD	Cadmium, Total	24.5		mg/kg
02	014-SEW-FD	FD	Chromium, Total	76.5		mg/kg
02	014-SEW-FD	FD	Copper, Total	10200		mg/kg
02	014-SEW-FD	FD	Lead, Total	329		mg/kg
02	014-SEW-FD	FD	Silver, Total	4.1	B	mg/kg
02	014-SEW-FD	FD	Zinc, Total	3720		mg/kg
Pesticides/PCBs						
02	014-SEW-FD	FD	Aroclor-1254	1910	D	µg/kg
Semivolatiles						
02	014-SEW-FD	FD	2-Methylnaphthalene	1000		µg/kg
02	014-SEW-FD	FD	4-Methylphenol	930		µg/kg
02	014-SEW-FD	FD	Acenaphthylene	1200		µg/kg
02	014-SEW-FD	FD	Anthracene	4500		µg/kg
02	014-SEW-FD	FD	Benzo(A)Anthracene	4400		µg/kg
02	014-SEW-FD	FD	Benzo(A)Pyrene	5300		µg/kg
02	014-SEW-FD	FD	Benzo(B)Fluoranthene	7200		µg/kg
02	014-SEW-FD	FD	Benzo(K)Fluoranthene	6500		µg/kg
02	014-SEW-FD	FD	Benzyl Butyl Phthalate	4800		µg/kg
02	014-SEW-FD	FD	bis(2-Ethylhexyl)Phthalate	10000		µg/kg
02	014-SEW-FD	FD	Carbazole	5400		µg/kg
02	014-SEW-FD	FD	Chrysene	8900		µg/kg

FD= Field Duplicate

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Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
02	014-SEW-FD	FD	Di-n-Butyl Phthalate	3100		µg/kg
02	014-SEW-FD	FD	Di-n-Octyl Phthalate	5500		µg/kg
02	014-SEW-FD	FD	Dibenzofuran	2000		µg/kg
02	014-SEW-FD	FD	Dimethyl Phthalate	490	J	µg/kg
02	014-SEW-FD	FD	Fluoranthene	25000		µg/kg
02	014-SEW-FD	FD	Fluorene	2600		µg/kg
02	014-SEW-FD	FD	Indeno(1,2,3-CD)Pyrene	2200		µg/kg
02	014-SEW-FD	FD	Naphthalene	850		µg/kg
02	014-SEW-FD	FD	Phenanthrene	20000		µg/kg
02	014-SEW-FD	FD	Phenol	1100		µg/kg
02	014-SEW-FD	FD	Pyrene	16000		µg/kg
BTEX						
02	016-SEW		Toluene	4	J	µg/kg
Conventionals						
02	016-SEW		Total Organic Carbon	39600		mg/kg
Inorganics						
02	016-SEW		Arsenic, Total	7.2		mg/kg
02	016-SEW		Cadmium, Total	3.2		mg/kg
02	016-SEW		Chromium, Total	23.3		mg/kg
02	016-SEW		Copper, Total	470		mg/kg
02	016-SEW		Lead, Total	20.6		mg/kg
02	016-SEW		Zinc, Total	267		mg/kg
Pesticides/PCBs						
02	016-SEW		Aroclor-1254	378		µg/kg
Semivolatiles						
02	016-SEW		Anthracene	250		µg/kg
02	016-SEW		Benzo(A)Anthracene	240	J	µg/kg
02	016-SEW		Benzo(B)Fluoranthene	350		µg/kg
02	016-SEW		Benzo(K)Fluoranthene	560		µg/kg
02	016-SEW		bis(2-Ethylhexyl)Phthalate	420		µg/kg
02	016-SEW		Chrysene	640		µg/kg
02	016-SEW		Di-n-Octyl Phthalate	180	J	µg/kg
02	016-SEW		Fluoranthene	1000		µg/kg
02	016-SEW		Phenanthrene	680		µg/kg
02	016-SEW		Pyrene	790		µg/kg
Conventionals						
02	02-SWO		pH (lab)	7.3		-log+H
02	02-SWO		Total Organic Carbon	15300		mg/kg
Inorganics						
02	02-SWO		Arsenic, Total	77.5		mg/kg
02	02-SWO		Cadmium, Total	4.5		mg/kg
02	02-SWO		Chromium, Total	18.1		mg/kg
02	02-SWO		Copper, Total	24200		mg/kg
02	02-SWO		Lead, Total	173		mg/kg
02	02-SWO		Silver, Total	2.4		mg/kg
02	02-SWO		Zinc, Total	704		mg/kg
Pesticides/PCBs						
02	02-SWO		Aroclor-1254	526000	D	µg/kg
Semivolatiles						
02	02-SWO		Benzo(K)Fluoranthene	150	J	µg/kg

FD= Field Duplicate

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
02	02-SWO		bis(2-Ethylhexyl)Phthalate	530		µg/kg
02	02-SWO		Chrysene	180	J	µg/kg
02	02-SWO		Fluoranthene	300		µg/kg
02	02-SWO		Pyrene	200	J	µg/kg
Pesticides/PCBs						
02	02-SWO-B		Aroclor-1254	64000	D	µg/kg
Pesticides/PCBs						
02	02-SWO-C		Aroclor-1254	13800000	D	µg/kg
Conventionals						
02	03-SWO		Total Organic Carbon	175000		mg/kg
Inorganics						
02	03-SWO		Arsenic, Total	43.4		mg/kg
02	03-SWO		Cadmium, Total	9.7		mg/kg
02	03-SWO		Chromium, Total	80.3		mg/kg
02	03-SWO		Copper, Total	31200		mg/kg
02	03-SWO		Lead, Total	427		mg/kg
02	03-SWO		Silver, Total	4.2	B	mg/kg
02	03-SWO		Zinc, Total	1790		mg/kg
Pesticides/PCBs						
02	03-SWO		Aroclor-1254	4100	D	µg/kg
Semivolatiles						
02	03-SWO		Acenaphthene	990		µg/kg
02	03-SWO		Anthracene	1600		µg/kg
02	03-SWO		Benzo(A)Anthracene	11000		µg/kg
02	03-SWO		Benzo(A)Pyrene	17000		µg/kg
02	03-SWO		Benzo(B)Fluoranthene	24000		µg/kg
02	03-SWO		Benzo(K)Fluoranthene	17000		µg/kg
02	03-SWO		Benzyl Butyl Phthalate	530		µg/kg
02	03-SWO		bis(2-Ethylhexyl)Phthalate	6200		µg/kg
02	03-SWO		Carbazole	4800		µg/kg
02	03-SWO		Chrysene	18000		µg/kg
02	03-SWO		Di-n-Octyl Phthalate	8900		µg/kg
02	03-SWO		Dibenzo(A,H)Anthracene	4900		µg/kg
02	03-SWO		Dibenzofuran	610		µg/kg
02	03-SWO		Dimethyl Phthalate	940		µg/kg
02	03-SWO		Fluoranthene	42000	D	µg/kg
02	03-SWO		Fluorene	870		µg/kg
02	03-SWO		Phenanthrene	15000		µg/kg
02	03-SWO		Pyrene	29000	D	µg/kg
BTEX						
02	068-SEW		Toluene	12		µg/kg
Conventionals						
02	068-SEW		Total Organic Carbon	52400		mg/kg
Inorganics						
02	068-SEW		Arsenic, Total	12.6		mg/kg
02	068-SEW		Cadmium, Total	5.1		mg/kg
02	068-SEW		Chromium, Total	29.4		mg/kg
02	068-SEW		Copper, Total	1430		mg/kg
02	068-SEW		Lead, Total	102		mg/kg
02	068-SEW		Zinc, Total	560		mg/kg

FD= Field Duplicate

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
Semivolatiles						
02	068-SEW		2-Methylnaphthalene	680		µg/kg
02	068-SEW		Acenaphthene	7600		µg/kg
02	068-SEW		Anthracene	9400		µg/kg
02	068-SEW		Benzo(A)Anthracene	29000	D	µg/kg
02	068-SEW		Benzo(A)Pyrene	9000		µg/kg
02	068-SEW		Benzo(B)Fluoranthene	31000	D	µg/kg
02	068-SEW		Benzo(G,H,I)Perylene	15000		µg/kg
02	068-SEW		Benzo(K)Fluoranthene	35000	D	µg/kg
02	068-SEW		Benzyl Butyl Phthalate	13000		µg/kg
02	068-SEW		bis(2-Ethylhexyl)Phthalate	15000		µg/kg
02	068-SEW		Carbazole	15000	D	µg/kg
02	068-SEW		Chrysene	16000		µg/kg
02	068-SEW		Di-n-Octyl Phthalate	1500		µg/kg
02	068-SEW		Dibenzo(A,H)Anthracene	5300		µg/kg
02	068-SEW		Dibenzofuran	5100		µg/kg
02	068-SEW		Fluoranthene	100000	D	µg/kg
02	068-SEW		Fluorene	7400		µg/kg
02	068-SEW		Indeno(1,2,3-CD)Pyrene	14000		µg/kg
02	068-SEW		Naphthalene	1400		µg/kg
02	068-SEW		Phenanthrene	73000	D	µg/kg
02	068-SEW		Pyrene	80000	D	µg/kg
BTEX						
02	088-SEW		Toluene	10		µg/kg
Conventionals						
02	088-SEW		Total Organic Carbon	80600		mg/kg
Inorganics						
02	088-SEW		Arsenic, Total	9.9		mg/kg
02	088-SEW		Cadmium, Total	6.6		mg/kg
02	088-SEW		Chromium, Total	48.8		mg/kg
02	088-SEW		Copper, Total	320		mg/kg
02	088-SEW		Lead, Total	187		mg/kg
02	088-SEW		Zinc, Total	908		mg/kg
Semivolatiles						
02	088-SEW		4-Methylphenol	8500		µg/kg
02	088-SEW		Phenanthrene	270	J	µg/kg
BTEX						
03	01-SWO		Toluene	140		µg/kg
Conventionals						
03	01-SWO		pH (lab)	7.6		-log+H
03	01-SWO		Total Organic Carbon	90300		mg/kg
Inorganics						
03	01-SWO		Arsenic, Total	156		mg/kg
03	01-SWO		Cadmium, Total	3.6		mg/kg
03	01-SWO		Chromium, Total	30.7		mg/kg
03	01-SWO		Copper, Total	1010		mg/kg
03	01-SWO		Lead, Total	228		mg/kg
03	01-SWO		Zinc, Total	886		mg/kg
Semivolatiles						
03	01-SWO		2-Methylnaphthalene	3200		µg/kg

FD= Field Duplicate

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
03	01-SWO		Acenaphthene	47000	D	µg/kg
03	01-SWO		Anthracene	59000	D	µg/kg
03	01-SWO		Benzo(A)Anthracene	140000	D	µg/kg
03	01-SWO		Benzo(A)Pyrene	130000	D	µg/kg
03	01-SWO		Benzo(B)Fluoranthene	150000	D	µg/kg
03	01-SWO		Benzo(G,H,I)Perylene	24000		µg/kg
03	01-SWO		Benzo(K)Fluoranthene	84000	D	µg/kg
03	01-SWO		Benzyl Butyl Phthalate	4000		µg/kg
03	01-SWO		bis(2-Ethylhexyl)Phthalate	74000	D	µg/kg
03	01-SWO		Carbazole	54000	D	µg/kg
03	01-SWO		Chrysene	190000	D	µg/kg
03	01-SWO		Di-n-Octyl Phthalate	11000		µg/kg
03	01-SWO		Dibenzo(A,H)Anthracene	32000	D	µg/kg
03	01-SWO		Dibenzofuran	20000		µg/kg
03	01-SWO		Fluoranthene	400000	D	µg/kg
03	01-SWO		Fluorene	47000	D	µg/kg
03	01-SWO		Indeno(1,2,3-CD)Pyrene	81000	D	µg/kg
03	01-SWO		Naphthalene	9400		µg/kg
03	01-SWO		Phenanthrene	340000	D	µg/kg
03	01-SWO		Pyrene	380000	D	µg/kg
Conventionals						
03	084-SEW		Total Organic Carbon	115000		mg/kg
Inorganics						
03	084-SEW		Arsenic, Total	36.8		mg/kg
03	084-SEW		Cadmium, Total	9.8		mg/kg
03	084-SEW		Chromium, Total	66.8		mg/kg
03	084-SEW		Copper, Total	18000		mg/kg
03	084-SEW		Lead, Total	262		mg/kg
03	084-SEW		Silver, Total	318		mg/kg
03	084-SEW		Zinc, Total	763		mg/kg
Pesticides/PCBs						
03	084-SEW		Aroclor-1254	4360	D	µg/kg
Semivolatiles						
03	084-SEW		Acenaphthene	2100		µg/kg
03	084-SEW		Acenaphthylene	640		µg/kg
03	084-SEW		Anthracene	3700		µg/kg
03	084-SEW		Benzo(A)Anthracene	16000	D	µg/kg
03	084-SEW		Benzo(A)Pyrene	30000	D	µg/kg
03	084-SEW		Benzo(B)Fluoranthene	34000	D	µg/kg
03	084-SEW		Benzo(G,H,I)Perylene	12000		µg/kg
03	084-SEW		Benzo(K)Fluoranthene	32000	D	µg/kg
03	084-SEW		bis(2-Ethylhexyl)Phthalate	8700		µg/kg
03	084-SEW		Carbazole	7300		µg/kg
03	084-SEW		Chrysene	17000		µg/kg
03	084-SEW		Di-n-Octyl Phthalate	3800		µg/kg
03	084-SEW		Dibenzo(A,H)Anthracene	5700		µg/kg
03	084-SEW		Dibenzofuran	1100		µg/kg
03	084-SEW		Fluoranthene	69000	D	µg/kg
03	084-SEW		Fluorene	1300		µg/kg
03	084-SEW		Indeno(1,2,3-CD)Pyrene	13000		µg/kg

FD= Field Duplicate

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
03	084-SEW		Naphthalene	410	J	µg/kg
03	084-SEW		Phenanthrene	32000	D	µg/kg
03	084-SEW		Pyrene	50000	D	µg/kg
BTEX						
04	010-SEW		Ethylbenzene	9	J	µg/kg
04	010-SEW		Toluene	15		µg/kg
04	010-SEW		Xylene (Total)	34		µg/kg
Conventionals						
04	010-SEW		Total Organic Carbon	120000		mg/kg
Inorganics						
04	010-SEW		Arsenic, Total	31.2		mg/kg
04	010-SEW		Cadmium, Total	10.1		mg/kg
04	010-SEW		Chromium, Total	60		mg/kg
04	010-SEW		Copper, Total	41300		mg/kg
04	010-SEW		Lead, Total	288		mg/kg
04	010-SEW		Silver, Total	5.1		mg/kg
04	010-SEW		Zinc, Total	1420		mg/kg
Pesticides/PCBs						
04	010-SEW		Aroclor-1254	5560	D	µg/kg
Semivolatiles						
04	010-SEW		Anthracene	3200		µg/kg
04	010-SEW		Benzo(A)Anthracene	18000	D	µg/kg
04	010-SEW		Benzo(A)Pyrene	22000	D	µg/kg
04	010-SEW		Benzo(B)Fluoranthene	29000	D	µg/kg
04	010-SEW		Benzo(G,H,I)Perylene	2600		µg/kg
04	010-SEW		Benzo(K)Fluoranthene	19000	D	µg/kg
04	010-SEW		Chrysene	32000	D	µg/kg
04	010-SEW		Di-n-Octyl Phthalate	12000		µg/kg
04	010-SEW		Dibenzo(A,H)Anthracene	15000		µg/kg
04	010-SEW		Fluoranthene	78000	D	µg/kg
04	010-SEW		Indeno(1,2,3-CD)Pyrene	14000		µg/kg
04	010-SEW		Phenanthrene	36000	D	µg/kg
04	010-SEW		Pyrene	59000	D	µg/kg
BTEX						
04	038-SEW		Toluene	40		µg/kg
Conventionals						
04	038-SEW		Total Organic Carbon	28100		mg/kg
Inorganics						
04	038-SEW		Arsenic, Total	10		mg/kg
04	038-SEW		Cadmium, Total	4.5		mg/kg
04	038-SEW		Chromium, Total	25.6		mg/kg
04	038-SEW		Copper, Total	11800		mg/kg
04	038-SEW		Lead, Total	54.7		mg/kg
04	038-SEW		Zinc, Total	413		mg/kg
Semivolatiles						
04	038-SEW		Anthracene	840		µg/kg
04	038-SEW		Benzo(A)Anthracene	2200		µg/kg
04	038-SEW		Benzo(A)Pyrene	2800		µg/kg
04	038-SEW		Benzo(B)Fluoranthene	4100		µg/kg
04	038-SEW		Benzo(K)Fluoranthene	2400		µg/kg

FD= Field Duplicate

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
04	038-SEW		bis(2-Ethylhexyl)Phthalate	5400		µg/kg
04	038-SEW		Carbazole	1600		µg/kg
04	038-SEW		Chrysene	4000		µg/kg
04	038-SEW		Di-n-Butyl Phthalate	3700		µg/kg
04	038-SEW		Di-n-Octyl Phthalate	1200		µg/kg
04	038-SEW		Dibenzo(A,H)Anthracene	440		µg/kg
04	038-SEW		Dibenzofuran	220	J	µg/kg
04	038-SEW		Fluoranthene	13000		µg/kg
04	038-SEW		Phenanthrene	6200		µg/kg
04	038-SEW		Pyrene	6400		µg/kg
BTEX						
04	040-SEW		Ethylbenzene	8	J	µg/kg
04	040-SEW		Xylene (Total)	27		µg/kg
Conventionals						
04	040-SEW		Total Organic Carbon	58100		mg/kg
Inorganics						
04	040-SEW		Arsenic, Total	400		mg/kg
04	040-SEW		Cadmium, Total	46		mg/kg
04	040-SEW		Chromium, Total	220		mg/kg
04	040-SEW		Copper, Total	4230		mg/kg
04	040-SEW		Lead, Total	2920		mg/kg
04	040-SEW		Silver, Total	9.2		mg/kg
04	040-SEW		Zinc, Total	2740		mg/kg
Pesticides/PCBs						
04	040-SEW		Aroclor-1260	240		µg/kg
Semivolatiles						
04	040-SEW		Benzo(B)Fluoranthene	950		µg/kg
04	040-SEW		Benzo(K)Fluoranthene	880		µg/kg
04	040-SEW		Benzyl Butyl Phthalate	1300		µg/kg
04	040-SEW		bis(2-Ethylhexyl)Phthalate	15000		µg/kg
04	040-SEW		Chrysene	1000		µg/kg
04	040-SEW		Di-n-Octyl Phthalate	41000	D	µg/kg
04	040-SEW		Fluoranthene	1700		µg/kg
04	040-SEW		Phenanthrene	990		µg/kg
04	040-SEW		Phenol	3500		µg/kg
04	040-SEW		Pyrene	1600		µg/kg
Conventionals						
04	06-SWO		pH (lab)	8.5		-log+H
04	06-SWO		Total Organic Carbon	56200		mg/kg
Inorganics						
04	06-SWO		Arsenic, Total	67		mg/kg
04	06-SWO		Cadmium, Total	14.8		mg/kg
04	06-SWO		Chromium, Total	43.9		mg/kg
04	06-SWO		Copper, Total	1480		mg/kg
04	06-SWO		Lead, Total	257		mg/kg
04	06-SWO		Silver, Total	2.7		mg/kg
04	06-SWO		Zinc, Total	1940		mg/kg
Semivolatiles						
04	06-SWO		Acenaphthene	740		µg/kg
04	06-SWO		Acenaphthylene	180	J	µg/kg

FD= Field Duplicate

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
04	06-SWO		Anthracene	940		µg/kg
04	06-SWO		Benzo(A)Anthracene	5700		µg/kg
04	06-SWO		Benzo(A)Pyrene	9500		µg/kg
04	06-SWO		Benzo(B)Fluoranthene	14000	D	µg/kg
04	06-SWO		Benzo(K)Fluoranthene	12000		µg/kg
04	06-SWO		Benzyl Butyl Phthalate	200	J	µg/kg
04	06-SWO		bis(2-Ethylhexyl)Phthalate	3000		µg/kg
04	06-SWO		Carbazole	2200		µg/kg
04	06-SWO		Chrysene	8600		µg/kg
04	06-SWO		Di-n-Octyl Phthalate	58000	D	µg/kg
04	06-SWO		Dibenzofuran	360		µg/kg
04	06-SWO		Fluoranthene	21000	D	µg/kg
04	06-SWO		Fluorene	620		µg/kg
04	06-SWO		Naphthalene	170	J	µg/kg
04	06-SWO		Phenanthrene	8200		µg/kg
04	06-SWO		Phenol	250		µg/kg
04	06-SWO		Pyrene	14000	D	µg/kg
BTEX						
05	045-SEW		Ethylbenzene	24		µg/kg
05	045-SEW		Toluene	59		µg/kg
05	045-SEW		Xylene (Total)	110		µg/kg
Conventionals						
05	045-SEW		Total Organic Carbon	125000		mg/kg
Inorganics						
05	045-SEW		Arsenic, Total	70.9		mg/kg
05	045-SEW		Cadmium, Total	36.5		mg/kg
05	045-SEW		Chromium, Total	68.4		mg/kg
05	045-SEW		Copper, Total	1040		mg/kg
05	045-SEW		Lead, Total	805		mg/kg
05	045-SEW		Zinc, Total	4410		mg/kg
Semivolatiles						
05	045-SEW		2-Methylnaphthalene	1900		µg/kg
05	045-SEW		Anthracene	4000		µg/kg
05	045-SEW		Benzo(A)Pyrene	5600		µg/kg
05	045-SEW		Benzo(B)Fluoranthene	3100		µg/kg
05	045-SEW		Benzo(G,H,I)Perylene	1200		µg/kg
05	045-SEW		Benzo(K)Fluoranthene	2300		µg/kg
05	045-SEW		bis(2-Ethylhexyl)Phthalate	14000000	D	µg/kg
05	045-SEW		Di-n-Butyl Phthalate	3700		µg/kg
05	045-SEW		Di-n-Octyl Phthalate	1400000	D	µg/kg
05	045-SEW		Indeno(1,2,3-CD)Pyrene	1000		µg/kg
05	045-SEW		Naphthalene	3400		µg/kg
05	045-SEW		Phenanthrene	4900		µg/kg
05	045-SEW		Phenol	1300		µg/kg
05	045-SEW		Pyrene	10000		µg/kg
BTEX						
05	047-SEW		Ethylbenzene	10		µg/kg
05	047-SEW		Toluene	5	J	µg/kg
Conventionals						
05	047-SEW		Total Organic Carbon	42400		mg/kg

FD= Field Duplicate

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
Inorganics						
05	047-SEW		Arsenic, Total	10.6		mg/kg
05	047-SEW		Cadmium, Total	11.3		mg/kg
05	047-SEW		Chromium, Total	46.6		mg/kg
05	047-SEW		Copper, Total	2190		mg/kg
05	047-SEW		Lead, Total	403		mg/kg
05	047-SEW		Silver, Total	17.1		mg/kg
05	047-SEW		Zinc, Total	474		mg/kg
Semivolatiles						
05	047-SEW		Benzo(A)Anthracene	240	J	µg/kg
05	047-SEW		bis(2-Ethylhexyl)Phthalate	5200		µg/kg
05	047-SEW		Chrysene	530		µg/kg
05	047-SEW		Di-n-Octyl Phthalate	190000	D	µg/kg
05	047-SEW		Dimethyl Phthalate	1200		µg/kg
05	047-SEW		Fluoranthene	1300		µg/kg
05	047-SEW		Phenanthrene	810		µg/kg
05	047-SEW		Pyrene	800		µg/kg
BTEX						
06	05-SWO		Toluene	27		µg/kg
Conventionals						
06	05-SWO		pH (lab)	8.2		-log+H
06	05-SWO		Total Organic Carbon	138000		mg/kg
Inorganics						
06	05-SWO		Arsenic, Total	18.5		mg/kg
06	05-SWO		Cadmium, Total	7.9		mg/kg
06	05-SWO		Chromium, Total	202		mg/kg
06	05-SWO		Copper, Total	888		mg/kg
06	05-SWO		Lead, Total	270		mg/kg
06	05-SWO		Zinc, Total	1650		mg/kg
Semivolatiles						
06	05-SWO		bis(2-Ethylhexyl)Phthalate	420		µg/kg
06	05-SWO		Pentachlorophenol	480	J	µg/kg
Conventionals						
06	089-SEW		Total Organic Carbon	48200		mg/kg
Inorganics						
06	089-SEW		Arsenic, Total	10.6		mg/kg
06	089-SEW		Cadmium, Total	7.6		mg/kg
06	089-SEW		Chromium, Total	120		mg/kg
06	089-SEW		Copper, Total	835		mg/kg
06	089-SEW		Lead, Total	175		mg/kg
06	089-SEW		Silver, Total	1.9	B	mg/kg
06	089-SEW		Zinc, Total	518		mg/kg
Semivolatiles						
06	089-SEW		Anthracene	560		µg/kg
06	089-SEW		Benzo(A)Anthracene	3000		µg/kg
06	089-SEW		Benzo(A)Pyrene	4100		µg/kg
06	089-SEW		Benzo(B)Fluoranthene	4700		µg/kg
06	089-SEW		Benzo(G,H,I)Perylene	3200		µg/kg
06	089-SEW		Benzo(K)Fluoranthene	3600		µg/kg
06	089-SEW		bis(2-Ethylhexyl)Phthalate	35000	D	µg/kg

FD= Field Duplicate

Rhone-Poulenc RFI

Round 3

Detected Storm Water and Sewer Sediment Results

Area	Sample ID	QA/QC	Parameter	Result	Qualifer	Units
06	089-SEW		Carbazole	740		µg/kg
06	089-SEW		Chrysene	4200		µg/kg
06	089-SEW		Di-n-Butyl Phthalate	550		µg/kg
06	089-SEW		Di-n-Octyl Phthalate	3200		µg/kg
06	089-SEW		Dibenzo(A,H)Anthracene	1600		µg/kg
06	089-SEW		Fluoranthene	8200		µg/kg
06	089-SEW		Indeno(1,2,3-CD)Pyrene	3200		µg/kg
06	089-SEW		Phenanthrene	5000		µg/kg
06	089-SEW		Pyrene	12000		µg/kg
BTEX						
07	04-SWO		Benzene	6	J	µg/kg
07	04-SWO		Ethylbenzene	15		µg/kg
07	04-SWO		Toluene	76000		µg/kg
07	04-SWO		Xylene (Total)	89		µg/kg
Conventionals						
07	04-SWO		pH (lab)	8.9		-log+H
07	04-SWO		Total Organic Carbon	100000		mg/kg
Inorganics						
07	04-SWO		Arsenic, Total	14.3		mg/kg
07	04-SWO		Cadmium, Total	16		mg/kg
07	04-SWO		Chromium, Total	15.2		mg/kg
07	04-SWO		Copper, Total	6710		mg/kg
07	04-SWO		Lead, Total	16.1		mg/kg
07	04-SWO		Zinc, Total	417		mg/kg
Semivolatiles						
07	04-SWO		2-Methylnaphthalene	410		µg/kg
07	04-SWO		2-Methylphenol	330	J	µg/kg
07	04-SWO		4-Methylphenol	31000	D	µg/kg
07	04-SWO		Acenaphthene	330	J	µg/kg
07	04-SWO		Di-n-Octyl Phthalate	500000	D	µg/kg
07	04-SWO		Dibenzofuran	320	J	µg/kg
07	04-SWO		Fluoranthene	660		µg/kg
07	04-SWO		Naphthalene	460		µg/kg
07	04-SWO		Phenanthrene	1100		µg/kg
07	04-SWO		Phenol	7600		µg/kg

FD= Field Duplicate

Appendix D

Groundwater Sampling Report by Terra Nova Associates

TERRA NOVA

ASSOCIATES

Environmental Consultants

Round 3 Groundwater Sampling Report

for

Former Rhone-Poulenc, Inc. Facility
9229 East Marginal Way South
Seattle, Washington

Prepared for

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Prepared by

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May 1, 1995

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Introduction

Terra Nova Associates conducted groundwater sampling of thirty-five (35) wells at the Rhone-Poulenc, Inc. facility located at 9229 E. Marginal Way South, Seattle (Tukwila), Washington on March 29, 30, and 31, 1995. The sampling was conducted according the RCRA Groundwater Monitoring: Draft Technical Guidance Document (1992), the Terra Nova Associates Field Sampling Procedures Manual, and documents supplied by Rhone-Poulenc, Inc including certain sections of the CH_2M Hill workplan and a document supplied by Tom Post of USEPA; Puls, R.W. and M.J. Barcelona, Ground Water Sampling for Metals Analysis, USEPA/540/4-89/001. When situation were encountered in the field that were not discussed in the above mentioned documents, or when procedures conflicted among these documents, the sampling was completed by utilizing procedures/protocol as similar as possible to the procedures found in the RCRA Groundwater Monitoring: Draft Technical Guidance Document.

Table 1 lists the order in which sample parameters were collected at each well. Table 2 lists the well identification, date of collection, well depth, depth to water, purge time, purge volume, temperature, field parameter results, and comments. Table 3 lists the specific well identification, purge method, sampling method, date of collection, volume purged, purge rate, and lab analysis conducted. Chains of custody forms are found in Appendix I. Appendix II contains the parameter list for lab and field as prepared by CH_2M Hill, Seattle. Appendix III contains Terra Nova Associates SOP's for field parameter analysis.

Description of Sampling Event; Procedures

DECONTAMINATION PROCEDURES

Purging and sampling equipment that came directly into contact with the sampling media was either single use disposable equipment such as, ASTM type D 2239, drinking water grade polyethylene pipe; or, lab cleaned equipment dedicated to each well, such as the foil wrapped teflon bailers with teflon coated stainless leaders and Watera foot valves used with the polyethylene tubing. The sampling or purging equipment which was not single use but was reused after decontamination was the following; one Grundfos, two inch Rediflo pump and wires; five teflon and stainless steel QED two inch bladder pumps with six sections of paired teflon tubing; and one Slope water level indicator.

The procedure for decontamination of the bladder pumps was as follows:

-Disassemble the pump into its component parts.
-Wash parts in a solution of Alconox and potable tap water
-Tap water rinse

-Rinse with ASTM type II grade deionized water.
-Rinse with 10% Nitric acid (trace metal grade).
-Rinse with deionized water.
-Rinse with acetone (pesticide grade).
-Total air dryout.
-Final rinse with deionized water.
-Store in a clean polyethylene bag.

The procedure for decontamination of the Rediflo pump was as follows:

-Wash external parts of the pump and wires with alconox and tap water.
-Tap water rinse.
-Place pump in plastic trash can lined with a clean polyethylene bag. Fill with tap water.
-Start pump and flush with 25 gal tap water.
-Store on a free standing hose reel.

The procedure for cleaning the teflon tubing was as follows:

-Coil tubing an place in lab sink. Wash with alconox and tap water remove visible staining or organic material.
-Rinse with tap water.
-Fill tubing with alconox wash solution then flush with tap water (total approx 5 gal.)
-Drain water from tubing and place in a clean trash bag.

The procedure for cleaning the water level indicator between wells is as follows:

-Wipe wire with DI soaked paper towel.
-Wash tip in alconox solution.
-Rinse with DI water and pat dry with a paper towel.
-Store in a polyethylene lined box.

The procedure for cleaning the top filling stainless steel bailer and stainless steel hose clamps is as follows:

-Wash in alconox solution.
-Tap water rinse.
-Deionized water rinse.
-10% Nitric acid rinse.
-Deionized water rinse.
-Acetone rinse.
-Air dry.
-DI water rinse.
-Wrap in aluminum foil.

Teflon bailers and Watera foot valves were precleaned and wrapped in foil by the cleaning procedure above and were supplied in sufficient quantity so all were dedicated to each well. No field cleaning was necessary.

FIELD METER CALIBRATION

Terra Nova Associates is a certified lab in New Jersey for the USEPA "analyze immediately" parameters (pH, Temperature, Dissolved Oxygen, Residual Chlorine, and Sulfide) and specific conductance. In order to maintain certification, successful completion of EPA Water Pollution Study proficiency samples, maintenance of field and calibration logs, and maintenance of calibration and sample analysis SOP's. Copies of Terra Nova's current SOP's and latest results of EPA Water Pollution Study 033 are found in the Appendix III.

pH Meter Calibration

The YSI 3500 pH meter is calibrated at the beginning of each day and every four hours thereafter (or every ten samples). If the analyst suspects an erroneous result the meter will be recalibrated at any time and then at the end of the day. Several backup pH probes are carried as spares in case of probe poisoning.

Specific Conductance

The YSI 3500 Meter also measures specific conductance and is calibrated at the beginning of each day, every four hours (or ten samples), and at the end of the day with a two- point calibration (either 100 um/cm and 1,000 um/cm or 1,000 um/cm and 10,000 um/cm) whichever applies so that samples fall within range.

ORP Measurement

The YSI 3500 meter also measures oxidation-reduction potential in +/-mv. Calibration is at the beginning of each day's sampling, every four hours (or ten samples) and at the end of the day.

Dissolved Oxygen

DO is measured with the YSI model 57 meter with Clark-type probe. The meter is calibrated once per week by the Winkler Method and daily by the saturated water method. Calibration is also conducted daily at the beginning of the day, every four hours (or ten samples) and at the end of the day.

WELL PURGE METHODS

Bladder Pump: The bladder pump connected to paired teflon tubing was lowered to midpoint in the well screen. The air line was connected to the controller and the discharge line to a container (calibrated in liters). The compressor was turned on. The pressure was adjusted along with the refill and discharge time to get a smooth even flow of 0.25 to 0.45 liters/min. Initial flow was timed by the bucket and stopwatch method. Thereafter flow was totaled and the actual clock time recorded. The water level was also monitored. If water level was dropping significantly the purge rate was slowed by reducing pressure or increasing the refill time. See the Field Parameter Measurement Section for information on determination of purge completion. When purging was completed, flow was further reduced to 0.10 liters/min., or the lowest possible flow rate, for sampling. Upon completion of sampling and collection of field parameters the pump was removed from the well and placed in a plastic trash can for holding until decontamination.

Grundfos Rediflo: The Rediflo pump was lowered into the well to just below the air/water interface. The tubing used in purging was 1/2 inch ASTM type D 2239 Drinking Water Grade Polyethylene. The tubing and wires were wiped with a paper towel soaked in DI water to remove any dust as the pump is lowered. An extra 5 to 7 feet of tubing is left out of the well in case the pump has to be lowered further during purging. When the controller is turned on the flow rate is adjusted to 0.25 to 0.40 liters/min. (calculated using a bucket and stopwatch). The water level is monitored periodically over the purge cycle to observe any drop in the water level. When purging is completed the pump is withdrawn, the tubing discarded and the pump is retired for cleaning. Sampling of these wells is performed with a laboratory cleaned, dedicated bailer.

Diaphragm Pump: The diaphragm pump used for this project was a Wilden air operated double diaphragm pump model M.025 (polypropylene with teflon diaphragm). An 110 V/ AC oil-less compressor was utilized for an air supply to activate the switching valve. Diaphragm pumps are dual chambered self-priming suction lift pumps with four check valves to prevent reverse flow. The compressed air switching system is isolated

from the pumping chambers thus air and water do not mix. The pump can be regulated by a needle valve on the air switch intake and a gate valve on the water discharge line. Flow rates can be adjusted down to 0.25 liters/min. ASTM Drinking Water Grade polyethylene with a Watera foot valve is lowered into the well (while being wiped to remove dust) to just below the air/water interface. Flow is initially measured by the bucket and stopwatch method. Then a running total is measured vs. clock time. When purging is complete the tubing is removed with the pump still in operation. The tubing is then discarded. This pump does not require decontamination between samples since sampling is not conducted through the pump and there is a check valve and foot valve in the system to prevent water from flowing into the well. Sampling is conducted with a lab cleaned dedicated teflon bailer.

SAMPLING PROCEDURE, GENERAL

Wells were unlocked and inspected for damage and problems were noted in the log. A water level measurement was taken and recorded. Calculations were made as to the volume of water in the well (a two-inch well contains 0.163 gal./ft. and a four-inch well as 0.652 gal./ft.). At the beginning of the day the field meters were standardized and rechecked every four hours. The purge method was selected and the pump or tubing was lowered to the proper depth within the well. Bladder pumps are lowered mid-way in the screen. Rediflo or diaphragm pumps are lowered and maintained just below the air/water interface. Purging was begun and flow was measured by stopwatch and graduated bucket. Flows were adjusted to approx. 0.25 to 0.45 gal/min to allow for a low stress purging and sampling environment to keep turbidity and disturbance to a minimum. Field Parameters are monitored on a liter by liter frequency. When successive measurements are within 10%, sampling may begin.

The Rediflo pump was removed upon completion of well purging. Sampling was conducted utilizing a lab cleaned, dedicated teflon bailer. When utilizing the diaphragm pump, the tubing and check valve are removed upon completion of well purging. Sampling was conducted utilizing a lab cleaned, dedicated teflon bailer. When using a bladder pump the flow was slowed to approx. 0.1 liter/min. A final water level measurement was taken prior to sampling.

BOTTOM FILL BAILER

Sufficient lab cleaned, dedicated teflon bailers were on hand to allow dedication to each well without field decontamination. Bailers utilized were the Norton "Norwell" 1.5 inch, single

check valve, with 5 ft. teflon leaders. Bailers were gently lowered into the well until completely submerged, then slowly recovered to the surface. Sample containers were filled by pouring down the side of the container as not to create bubbles. The order of parameter collection is found in table I. Final field parameter measurements were collected when all other parameters have been collected. Nylon line was attached to the teflon leader. As the line was pulled up it was allowed to drop into a 35 gallon trash can lined with a clean trash bag. Samplers wore powder-free vinyl gloves to handle all field sampling equipment as it was placed into or removed from the well.

All expendables were placed in trash bags for disposal.

BLADDER PUMP

The QED - 2 inch Stainless steel bladder pump (LP1 0.65 liter) with teflon bladder was operated with the QED Model 350 electronic-timed controller and oil-free air compressor. The flow of the pump was adjusted down to about 0.1 liters/min to collect the sensitive parameters of methane in water, volatiles and hexavalent chromium. When sampling was completed the pump was removed and placed in a container for later decontamination. The paired teflon tubing was coiled for later decon. Five pumps and six tubing sets were available for sampling.

FIELD QUALITY CONTROL - TRIP BLANKS

Trip blanks were provided by the lab (Pace Mid-Pacific Labs of Mountainview, Ca.). One trip blank was included in each day's shipment of volatile organic samples to the lab. Trip blanks are left unopened through the sampling event. The trip blank for the second day's sampling was inadvertently left on the lab bench and not included in the shipment of March 30, 1995.

FIELD QUALITY CONTROL - FIELD BLANKS

The field blank sample in this event was treated as a rinsate blank of the field equipment used for sampling. Pace Mid-Pacific Labs provided field blank water in sufficient quantity. The field blank was collected for all parameters collected during that days sampling. On March 29, 1995, a lab decontaminated teflon bailer was used as the rinsate device. Water was poured into the top of the bailer and the bailer was used to fill the sample containers. On March 30 and 31 field decontaminated bladder pumps were used as rinsate devices to act as a check on field decontamination procedures. Water was poured into the top of the pump and the pump was inverted to collect the sample.

DUPLICATES

Field duplicates were collected at the rate of one per twenty samples collected. Thus two duplicate samples were collected for this project. Duplicates were collected by alternating filling parameter bottles at the well being duplicated until both sets of containers were filled. Duplicates were collected at wells A-2 and DM-7. Duplicate samples labeled A-2D and DM-7D, respectively.

FIELD PARAMETER MEASUREMENTS

Field measurements were taken for temperature in centigrade, pH in standard units (neg. log of hydrogen ion conc.), specific conductance in micromho/cm, dissolved oxygen in ppm, and ORP in +/-mv. In most cases readings began were collected within 5 to 10 minutes of the start of purging and roughly every 5 minutes thereafter. This testing frequency translated to an initial purge volume of 4 to 6 liters prior to the first field parameter measurement. Field parameter measurements were made at least every two liters thereafter. Terra Nova utilized this field parameter measurement interval based on recommendations in the RCRA Draft TGD, Nov. 1992, which states that field parameter measurements for low flow purging field measurements should be at least 3 minutes apart. Additionally, the sampling procedures document (Superfund Groundwater Issue: Groundwater Sampling for Metals Analysis, 1989) given to Rhone-Poulenc, Inc. by Tom Post of USEPA stated that field parameter measurements should be spaced apart by a minimum of one pump tubing volume. For the Rediflo and diaphragm pumps the average tubing volume has been calculated at 50 ml/ft. at an average depth of 35 ft. of tubing (about 1.5 liters). The bladder pump tubing contained 20 ml/ft., or 2 liters/100 ft. of tubing. All time/volume intervals between successive field parameter measurements were greater than one tubing volume of the pumping system being utilized. Purging was considered complete when successive readings of all parameters were within 10%. See Table 3, Field Parameters and Purge Data for specific readings and flow rates for each well. See the section on field meters for standardization frequency and the Appendix III for SOP's for standardization.

SAMPLE HANDLING

Upon collection of samples for each well the bottles were placed in a cooler with bagged wet ice and brought back to the staging area when each cooler was full. At the end of the day's sampling the hex chrome samples were segregated from other samples. All containers were placed into their respective coolers packed with bagged wet ice. The Chain of Custody documentation was sealed in a plastic bag and the cooler was custody sealed and hand carried to Federal Express for overnight shipment. Copies of air bills are in Appendix IV.

Description of Sampling Event; Sampling Notes

Product (LNAPL Phase)

Wells H-10 and MW-18

Product was detected floating on the surface of the water in both wells. In order to collect a sample of the aqueous phase of the groundwater column, prior to sample collection product was removed from well with top-filling, stainless steel bailers until the product layer was no longer visible.

Effervescence

At several wells, the sample was added to the VOA vials preserved with HCl and excessive foaming was encountered. A bubble-free seal on the VOA vials was not obtainable. Refilling the vials was futile as effervescing continued to occur after the vials were sealed. After consultation with Edwin Liu of Rhone-Poulenc, Inc. it was decided the any trace of HCl preservative must be removed from the vials prior to sample collection. Vials were emptied of contents. The vials and lids were triple rinsed with ASTM type II grade deionized water to remove any trace of preservative. The vials were then rinsed once with sample then filled. Foaming decreased thereby allowing sample collection to occur. Wells where effervescence was encountered include the following:

DM-5	MW-14
DM-8	MW-17
H-11	

Polyethylene Tubing

ASTM type D 2239 arrives from the manufacturer with capped or crimped ends. The tubing was rinsed with tap water prior to use and wiped down with DI-soaked paper towels to remove any accumulated dust.

Mislabeled Sample

On March 29, 1995, well H-1 was sampled but mislabeled H-10 on the chain of custody shipped to all three labs used for sample analysis. All laboratories were contacted by Terra Nova Associates and instructed change the chain of custody forms and sample container labels to reflect sample H-1 rather than H-10. Well H-10 was sampled on March 30, 1995, at 1315.

Description of Sampling Event; Sampling Notes

Product (LNAPL Phase)

Product was detected floating (LNAPL) on the surface of the water in wells H-10 and MW-18. Both the LNAPL and Aqueous phases were sampled from each well. The LNAPL Phase was also analyzed for content of Penetech Oil. In order to purge the well with the equipment avaiable the LNAPL phase must first be removed. Lowering pumping equipment through the LNAPL may aloww the pumping equipment to become contaminanted with product and carry this contamination into the aqueous phase In order to collect an undisturbed sample of the aqueous phase of the groundwater column, product was removed from well with top-filling, stainless steel bailers until the product layer was no longer visible.

Effervescence

At several wells, the sample was added to the VOA vials preserved with HCl and excessive foaming was encountered. A bubble-free seal on the VOA vials was not obtainable. Refilling the vials was futile as effervescing continued to occur after the vials were sealed. After consultation with Edwin Liu of Rhone-Poulenc, Inc. it was decided the any trace of HCl preservative must be removed from the vials prior to sample collection. Vials were emptied of contents. The vials and lids were triple rinsed with ASTM type II grade deionized water to remove any trace of preservative. The vials were then rinsed once with sample then filled. Foaming decreased thereby allowing sample collection to occur. Wells where effervescence was encountered include the following:

DM-5	MW-14
DM-8	MW-17
H-11	

Polyethylene Tubing

ASTM type D 2239 arrives from the manufacturer with capped or crimped ends. The tubing was rinsed with tap water prior to use and wiped down with DI-soaked paper towels to remove any accumulated dust.

Mislabeled Sample

On March 29, 1995, well H-1 was sampled but mislabeled H-10 on the chain of custody shipped to all three labs used for sample analysis. All laboratories were contacted by Terra Nova Associates and instructed change the chain of custody forms and sample container labels to reflect sample H-1 rather than H-10. Well H-10 was sampled on March 30, 1995, at 1315.

TABLE I

Sample Parameter Collection Order

- Volatile organics
- Methane in water and TOC
- SVOC
- Metals
- Water quality cations and anions

TABLE 2
RHONE-POULENC SEATTLE
Field Parameters and Purge Data

Well ID	Date	Well Depth (feet)	DTW (feet)	Purge Time	Purge Volume (liters)	Temp. (C)	pH	Spec. Conduct. (um/cm)	Dissol. Oxygen (ppm)	ORP (mv)	Comments
A-2	3/30/95	21.5	12.64	1110	0	---	---	---	---	---	
				1120	4	15.9	7.09	909	2.60	+001	cloudy, no odor
				1125	6	16.1	7.17	909	2.95	-029	
				1130	8	15.9	7.16	895	2.65	-52	
				1136	10	15.9	7.2	874	2.70	-59	clear, no odor
	3/30/95	---	13.30	1140	sample	15.9	7.19	880	2.70	-61	clear, no odor
A-4	3/31/95	20.0	13.09	1430	0	---	---	---	---	---	cloudy, odor
				1443	4	14.3	6.75	395	3.10	-061	
				1447	6	14.3	6.6	482	2.95	-049	
				1451	8	14.2	6.54	548	2.70	-037	
				1457	10	14.2	6.49	563	2.75	-037	slight cloudiness
	3/31/95	---	13.40	1500	sample	14.2	6.47	565	2.75	-035	sl. cloudiness, odor
A-9	3/30/95	21.5	14.36	957	0	---	---	---	---	---	
				1003	2	14.4	6.42	285	2.45	+032	cloudy, odor
				1009	4	14.4	6.38	270	1.95	+027	
				1014	6	14.4	6.38	276	2.00	+026	
	3/30/95	---	14.49	1015	sample	14.4	6.38	272	2.00	+025	clear, odor
B-1A	3/31/95	17.0	8.25	1505	0	---	---	---	---	---	
				1518	4	11.1	6.98	788	1.90	-070	sl. cloudy, no odor
				1524	6	11.1	6.86	777	1.85	-038	
				1530	8	11.1	6.78	719	1.90	-035	
				1535	10	11.1	6.76	751	1.95	-034	clear, no odor
	3/31/95	---	8.30	1540	sample	11.1	6.76	745	1.90	-032	clear, no odor
B-1B	3/31/95	97.5	8.24	1505	0	---	---	---	---	---	dk. yellow tint,
				1526	8	13.5	8.24	785	1.10	-088	some odor
				1530	10	13.5	8.50	815	1.20	-102	
				1534	12	13.5	8.54	823	1.10	-121	
				1538	14	13.5	8.55	832	1.10	-124	
				1542	16	13.5	8.60	835	1.05	-126	
	3/31/95	---	8.39	1550	sample	13.5	8.61	838	1.05	-125	clear, yellow tint, slight odor

TABLE 2 (continued)
RHONE-POULENC SEATTLE
Field Parameters and Purge Data

Well ID	Date	Well Depth (feet)	DTW (feet)	Purge Time	Purge Volume (liters)	Temp. (C)	pH	Spec. Conduct. (um/cm)	Dissol. Oxygen (ppm)	ORP (mv)	Comments
B-2	3/29/95	22.3	13.84	1518	0	---	---	---	---	---	dark black, turbid
				1528	4	16.2	7.23	1812	1.95	-018	
				1533	6	16.5	7.16	1612	1.45	-049	
				1538	8	16.5	7.16	1595	1.40	-062	
				1543	10	16.4	7.08	1606	1.40	-066	dark black
	3/29/95	---	13.72	1543	sample	16.4	7.06	1602	1.40	-065	clear, slight odor
B-4	3/31/95	54.0	13.70	1145	0	---	---	---	---	---	cloudy, odor
				1159	4	14.9	7.42	2170	2.05	+021	dark color
				1203	6	14.8	7.51	2200	1.90	+018	
				1207	8	14.7	7.54	2200	2.00	+014	
				1212	10	14.6	7.57	2220	1.95	+012	dark tint
	3/31/95	---	14.95	1215	sample	14.6	7.59	2224	2.00	+011	clear, odor
B-5	3/31/95	22.5	10.89	1250	0	---	---	---	---	---	
				1259	4	14.6	6.73	617	2.60	-001	cloudy, dark
				1305	6	14.5	6.68	588	2.65	-014	odor
				1310	8	14.4	6.68	581	2.60	-018	
				1315	10	14.4	6.65	584	2.60	-021	dark tint
	3/31/95	---	11.23	1315	sample	14.4	6.66	582	2.60	-022	clear, slight odor
B-6	3/31/95	23.0	12.59	1212	0	15.5	6.41	765	3.30	+002	cloudy, dark
				1223	4	15.5	6.85	737	3.80	-015	no odor
				1228	6	15.5	6.82	724	3.90	-022	
				1233	8	15.5	6.79	720	3.80	-024	dark tint
	3/31/95	---	14.44	1235	sample	15.5	6.78	722	3.80	-025	clear, no odor
C-1	3/30/95	23.0	10.71	759	0	---	---	---	---	---	cloudy, yellow
				804	2	14.2	6.36	478	1.85	+080	some odor
				809	4	14.6	6.53	492	1.85	+062	
				814	6	14.8	6.57	499	1.60	+050	
				824	10	15.2	6.59	494	1.40	+039	
				829	12	15.4	6.59	487	1.45	+038	clear, yellow tint
	3/30/95	---	10.8	830	sample	14.4	6.59	490	1.40	+039	no odor

TABLE 2 (continued)
RHONE-POULENC SEATTLE
Field Parameters and Purge Data

Well ID	Date	Well Depth (feet)	DTW (feet)	Purge Time	Purge Volume (liters)	Temp. (C)	pH	Spec. Conduct. (um/cm)	Dissol. Oxygen (ppm)	ORP (mv)	Comments
DM-1A	3/30/95	27.1	3.57	845	0	---	---	---	---	---	
				855	4	14.0	6.56	119	6.50	-018	cloudy, no odor
				900	6	13.9	6.57	118	6.50	-022	
				905	8	14.1	6.61	119	6.50	-022	
	3/30/95	---	3.80	905	sample	14.0	6.60	112	6.50	-021	clear, no odor
DM-2A	3/29/95	29.3	15.19	1100	0	---	---	---	---	---	cloudy, odor
				1110	4	15.8	7.27	1957	1.80	+091	dark color
				1115	6	15.7	7.31	1957	1.35	+071	
				1120	8	15.8	7.34	1960	1.35	+069	
	3/29/95	---	15.24	1122	sample	15.7	7.34	1957	1.35	+064	clear, dark, odor
DM-3A	3/30/95	27.0	13.19	1025	0	---	---	---	---	---	
				1035	4	13.9	6.87	225	3.50	+037	turbid, no odor
				1041	6	13.7	6.89	230	3.50	+009	
				1047	8	13.7	6.91	239	2.80	+001	
				1055	10	13.7	6.94	246	2.75	+002	
	3/30/95	---	13.27	1100	sample	13.7	6.92	244	2.75	+007	sl. cloudy, no odor
DM-3B	3/30/95	95	9.93	1025	0	---	---	---	---	---	cloudy, yellow
				1035	4	14.3	7.69	1302	1.90	+029	no odor
				1039	6	14.1	8.07	1350	1.55	+018	
				1044	8	14.1	8.09	1356	1.60	+012	
				1048	10	13.9	8.10	1358	1.50	+011	clear, yellow
	3/30/95	---	9.97	1055	sample	14.0	8.10	1361	1.50	+009	no odor
DM-4	3/29/95	36.0	12.41	1600	0	---	---	---	---	---	
				1606	2	15.6	6.74	1355	2.00	+044	cloudy, yellow
				1609	4	15.2	6.87	1320	1.80	+016	no odor
				1614	6	15.2	6.87	1291	1.80	-009	
				1619	8	15.1	6.87	1279	1.90	-037	
				1624	10	15.1	6.88	1273	1.90	-041	clear, yellow
	3/29/95	---	12.38	1624	sample	15.1	6.87	1272	1.85	-043	no odor

TABLE 2 (continued)
RHONE-POULENC SEATTLE
Field Parameters and Purge Data

Well ID	Date	Well Depth (feet)	DTW (feet)	Purge Time	Purge Volume (liters)	Temp. (C)	pH	Spec. Conduct. (um/cm)	Dissol. Oxygen (ppm)	ORP (mv)	Comments
DM-5	3/29/95	36.0	14.31	1432	0	---	---	---	---	---	
				1445	4	16.1	7.35	5110	3.60	+050	turbid, some odor
				1449	6	16.2	7.32	5160	2.70	+043	
				1453	8	16.1	7.31	5180	2.45	+031	
				1457	10	16.1	7.29	5180	2.50	+030	
	3/29/95	---	14.45	1500	sample	16.1	7.29	5170	2.45	+031	dark, slight odor *
DM-7	3/30/95	29.5	12.55	1635	0	---	---	---	---	---	
				1642	4	17.4	6.67	1067	1.30	+026	cloudy, odor
				1650	6	17.3	6.72	1066	1.50	-001	
				1656	8	17.3	6.72	1066	1.50	-004	
	3/30/95	---	12.60	1700	sample	17.3	6.72	1066	1.55	-006	clear, sl. odor
DM-8	3/29/95	36.0	16.29	1218	0	---	---	---	---	---	cloudy, odor
				1226	4	18.1	6.79	2370	0.85	+026	dark color
				1230	8	18.0	7.10	2530	0.60	+013	
				1234	10	17.8	7.02	2560	1.00	-054	
				1245	12	17.7	7.00	2550	0.95	-059	
	3/29/95	---	16.31	1245	sample	17.6	7.00	2540	0.95	-064	clear, dark, odor *
E-3	3/30/95	23.0	8.99	920	0	---	---	---	---	---	
				930	4	13.6	6.38	482	2.30	+037	cloudy, odor
				935	6	13.7	6.46	533	1.95	+026	
				940	8	13.8	6.47	542	2.05	+016	
				945	10	13.7	6.48	549	1.90	+015	
	3/30/95	---	9.90	945	sample	13.7	6.52	546	1.95	+014	clear, odor
G-1	3/31/95	20.0	11.15	1400	0	---	---	---	---	---	
				1408	4	14.2	6.70	917	1.95	-035	turbid, dark black, odor
				1412	6	14.2	6.73	917	1.75	-046	
				1424	8	14.2	6.70	947	1.80	-052	
	3/31/95	---	11.41	1425	sample	14.2	6.71	945	1.75	-055	clear, no odor

* Sample effervesces when added to acid

TABLE 2 (continued)
RHONE-POULENC SEATTLE
Field Parameters and Purge Data

Well ID	Date	Well Depth (feet)	DTW (feet)	Purge Time	Purge Volume (liters)	Temp. (C)	pH	Spec. Conduct. (um/cm)	Dissol. Oxygen (ppm)	ORP (mv)	Comments
MW-12	3/30/95	19.0	12.07	1440	0	---	---	---	---	---	dark color, sheen
				1450	4	16.8	6.82	1266	1.70	-082	strong odor
				1455	6	17.0	6.76	1212	1.65	-070	
				1500	8	17.0	6.70	1205	1.75	-070	clear, dark tint
	3/30/95	---	13.51	1505	sample	16.9	6.66	1198	1.65	-069	odor
MW-13	3/30/95	52.0	12.42	1310	0	---	---	---	---	---	
				1336	10	18.1	7.68	2890	0.75	+007	cloudy, dark color
				1341	12	18.4	7.68	2770	1.30	+006	odor
				1346	14	18.4	7.73	2780	0.65	+20	
				1352	16	18.4	7.72	2790	0.60	+17	clear, dark yellow
	3/30/95	---		1354	sample	18.4	7.75	2800	0.50	+16	odor
MW-14	3/31/95	24.0	14.88	1005	0	---	---	---	---	---	cloudy, dark color
				1020	6	16.4	6.62	1628	1.50	-082	slight odor
				1025	8	16.6	6.67	1623	1.25	-076	
				1030	10	16.7	6.67	1637	1.35	-074	
				1035	12	16.7	6.65	1649	1.30	-083	clear, yellow tint
	3/31/95	---	15.05	1040	sample	16.7	6.67	1645	1.30	-087	no odor *
MW-15	3/31/95	32.0	13.90	830	0	---	---	---	---	---	
				845	5	13.7	**	905	1.15	-020	cloudy, sheen
				852	7	13.6	**	1040	1.05	-035	strong odor of toluene
				858	9	13.6	**	1090	1.00	-038	
	3/31/95	---	14.00	900	sample	13.5	**	1095	1.15	-042	clear, dark tint, odor
MW-16	3/31/95	53.0	14.05	830	0	15.0	11.25	9780	0.35	---	cloudy, dark color
				848	6	15.0	11.26	9870	0.15	-300	odor
				854	8	15.0	11.30	10920	0.05	-310	
				900	10	15.0	11.20	11200	0.05	-303	clear, dark tint
	3/31/95	---	15.10	910	sample	15.0	11.24	11190	0.05	-295	some odor

* Sample effervesces when added to acid

** pH readings not stable

TABLE 2 (continued)
RHONE-POULENC SEATTLE
Field Parameters and Purge Data

Well ID	Date	Well Depth (feet)	DTW (feet)	Purge Time	Purge Volume (liters)	Temp. (C)	pH	Spec. Conduct. (um/cm)	Dissol. Oxygen (ppm)	ORP (mv)	Comments
G-3	3/31/95	20.0	12.78	1425	0	---	---	---	---	---	
				1435	4	15.0	7.05	432	2.60	+002	turdib, odor
				1441	6	15.0	7.18	430	2.70	+001	
				1446	8	14.9	7.20	440	2.70	000	
				1452	10	14.8	7.26	451	2.60	-002	
	3/31/95	---	13.51	1455	sample	14.8	7.25	450	2.55	-004	cloudy, slight odor
H-1	3/29/95	55.0	12.48	1645	0	---	---	---	---	---	
				1700	4	16.4	7.40	2560	0.65	+026	cloudy, yellow
				1708	6	16.4	7.54	2540	1.05	+021	slight odor
				1717	8	16.3	7.55	2520	0.95	+017	
				1726	10	16.3	7.60	2520	0.75	+019	clear, yellow tint
	3/29/95	---	15.30	1730	sample	16.3	7.61	2520	0.65	+021	no odor
H-6	3/29/95	20.0	16.00	1134	0	13.5	7.46	422	2.60	+077	cloudy, dark tint
				1138	1	13.4	7.49	424	2.40	+067	odor
				1143	3	13.4	7.57	439	2.45	+067	
				1148	4	13.3	7.56	449	2.45	+059	
	3/29/95	---	16.62	1150	sample	13.3	7.57	451	2.40	+059	clear, yellow, odor
H-9	3/29/95	19.3	12.43	1310	0	---	---	---	---	---	
				1328	6	13.4	7.00	6.90	2.60	+031	cloudy, dark, odor
				1334	8	13.4	7.11	6.89	2.75	+025	
				1340	10	13.4	7.19	7.13	2.75	+018	
	3/29/95	---	12.91	1340	sample	13.4	7.20	7.12	2.70	+016	clear, dark tint, odor
H-10	3/30/95	20.0	12.48	1230	0	---	---	---	---	---	
				1310	20	no readings taken due to emulsified					visible product , odor
	3/30/95	---	12.92	1315	sample	product in purge water; pH probe					
						contaminated					
H-11	3/30/95	20.0	12.8	1358	0	---	---	---	---	---	
				1408	2	17.3	6.91	3290	0.40	-122	cloudy, dark color
				1412	4	17.4	7.09	3370	0.25	-133	strong odor
				1416	6	17.4	7.04	3420	0.25	-135	
				1420	8	17.4	7.02	3430	0.25	-136	
	3/30/95	---	12.87	1425	sample	17.2	7.01	3410	0.30	-136	clear, dark yellow, odor *

* Sample effervesces when added to acid

TABLE 2 (continued)
RHONE-POULENC SEATTLE
Field Parameters and Purge Data

Well ID	Date	Well Depth (feet)	DTW (feet)	Purge Time	Purge Volume (liters)	Temp. (C)	pH	Spec. Conduct. (um/cm)	Dissol. Oxygen (ppm)	ORP (mv)	Comments
MW-17	3/31/95	24.0	14.27	940	0	---	---	---	---	---	cloudy, dark tint
				946	4	15.0	6.81	2480	0.75	-055	odor
				953	6	15.0	6.94	2220	0.80	-070	
				959	8	14.9	6.98	2305	0.75	-077	
				1005	10	14.9	6.98	2340	0.75	-079	clear, dark color
	3/31/95	---	14.73	1010	sample	14.9	6.97	2330	0.80	-072	slight odor *
MW-18	3/30/95	24.0	14.75	1558	0	---	---	---	---	---	
				1604	2	16.5	6.89	670	1.10	-020	sheen, dark tint
				1610	4	16.4	6.88	668	1.05	-026	strong odor
				1616	6	16.4	6.86	662	0.95	-030	
				1622	8	16.4	6.86	666	0.95	-034	clear, dark tint
	3/30/95	---	14.92	1625	sample	16.4	6.87	660	0.90	-035	strong odor
MW-19	3/30/95	24.0	11.85	1515	0	---	---	---	---	---	cloudy, dark color
				1535	6	16.2	6.95	567	1.85	-018	odor
				1541	8	16.2	6.82	604	1.95	-018	
				1547	10	16.2	6.73	660	1.85	-022	
				1553	12	16.2	6.75	693	1.80	-023	clear, dark tint
	3/30/95	---	11.88	1555	sample	16.1	6.72	699	1.80	-026	odor
MW-20	3/31/95	24.0	13.99	1050	0	---	---	---	---	---	
				1100	4	14.6	6.74	193	2.80	-054	cloudy, no odor
				1105	6	14.6	6.48	145	2.25	-044	
				1110	8	14.6	6.32	137	2.30	-028	
				1115	10	14.5	6.28	140	2.40	-032	
	3/31/95	---	14.20	1120	sample	14.5	6.31	138	2.35	-030	sl. cloudy, no odor

* Sample effervesces when added to acid

TABLE 3
RHONE-POULENC SEATTLE
Round 3 Groundwater Sampling

Well ID	Purge Method	Sample Method	Date Sampled	Volume Purged (liters)	Purge Rate (l/min.)	Analysis Groups
A-2	RP	TB	3/30/95	10	0.38	2,3,4
A-4	DP	TB	3/31/95	10	0.37	4
A-9	DP	TB	3/30/95	6	0.35	1,4
B-1A	BP	BP	3/31/95	10	0.33	4
B-1B	BP	BP	3/31/95	16	0.43	4
B-2	BP	BP	3/29/95	10	0.4	1,4
B-4	BP	BP	3/31/95	10	0.37	1,4
B-5	BP	BP	3/31/95	10	0.4	1,4,5
B-6	RP	TB	3/31/95	8	0.38	1,2,4,5
C-1	RP	TB	3/30/95	12	0.4	4
DM-1A	BP	BP	3/30/95	8	0.4	4
DM-2A	BP	BP	3/29/95	8	0.4	1,4,5
DM-3A	BP	BP	3/30/95	10	0.33	4
DM-3B	BP	BP	3/30/95	10	0.33	3
DM-4	BP	BP	3/29/95	10	0.42	1,4
DM-5	RP	TB	3/29/95	10	0.4	1,4,5
DM-7	BP	BP	3/30/95	8	0.32	1,4,5
DM-8	BP	BP	3/29/95	12	0.44	3,4,5
E-3	BP	BP	3/30/95	10	0.4	4
G-1	BP	BP	3/31/95	8	0.32	4
G-3	DP	TB	3/31/95	10	0.37	1,4,5

PURGE/SAMPLE METHODS
BP = Bladder Pump
DP = Diaphragm Pump
TB = Teflon Bailer
RP = Rediflo Pump

ANALYSIS GROUPS
1 = BTEX
2 = SVOC
3 = VOC
4 = Hexavalent Chromium and Metals
5 = General Water Quality Indicators:
phosphorous, nitrate, nitrite, total kjeldahl nitrogen, methane in water, sulfide, TDS, TOC, carbonate/bicarbonate, chloride, alkalinity as $CaCO_3$, sulfate

TABLE 3 (continued)
RHONE-POULENC SEATTLE
Round 3 Groundwater Sampling

Well ID	Purge Method	Sample Method	Date Sampled	Volume Purged (liters)	Purge Rate (l/min.)	Analysis Groups
H-1	BP	BP	3/29/95	10	0.24	1,4
H-6	DP	TB	3/29/95	4	0.36	1,4,5
H-9	DP	TB	3/29/95	10	0.33	1,4,5
H-10	DP	TB	3/29/95	16	0.40	2,3,4
H-11	DP	TB	3/30/95	8	0.36	2,3,4
MW-12	DP	TB	3/30/95	8	0.40	1,2,4,5
MW-13	BP	BP	3/30/95	16	0.38	1,4,5
MW-14	DP	TB	3/31/95	12	0.40	1,4,5
MW-15	BP	BP	3/31/95	9	0.32	1,4,5
MW-16	BP	BP	3/31/95	10	0.33	1,4,5
MW-17	BP	BP	3/31/95	10	0.40	1,4,5
MW-18	DP	TB	3/30/95	8	0.36	1,4,5
MW-19	BP	BP	3/30/95	12	0.32	1,4
MW-20	BP	BP	3/31/95	10	0.40	1,4,5

PURGE/SAMPLE METHODS
BP = Bladder Pump
DP = Diaphragm Pump
TB = Teflon Bailer
RP = Rediflo Pump

ANALYSIS GROUPS
1 = BTEX
2 = SVOC
3 = VOC
4 = Hexavalent Chromium and Metals
5 = General Water Quality Indicators:
phosphorous, nitrate, nitrite, total kjeldahl nitrogen, methane in water, sulfide, TDS, TOC, carbonate, bicarbonate, chloride, alkalinity as $CaCO_3$, sulfate

Appendix I
CHAIN OF CUSTODY FORMS

ETC

CHAIN-OF-CUSTODY RECORD

Form 00
Field Technical Servic
Rev. 11/

No. 111748

Environmental Testing and Certification Corp. • 284 Raritan Center Parkway • Edison, NJ 08818 • 908-225-6700

COMPANY: RAone Poulenc
FACILITY/SITE: 9229 E Marginal Way South
PROJECT CONTACT: EDWIN LIU
TELEPHONE NO.: 206 764-4450
Tuckwila Wa

FILT. (Y/N): N N N N N N N
PRESERV.: 1 1 3 0 3 2
ANALYSIS REQUIRED: BTEX, VOA, TOC, General, General, Metals, Sulfide, SVOA

LEGEND FOR PRESERVATIVE
0 - NONE
1 - HCL
2 - HNO_3
3 - H_2SO_4
4 - $Na_2SO_3 + H_2SO_4$

ITEM NO.	ETC JOB #	SOURCE CODE	SAMPLE POINT	START DATE YY/MM/DD	START TIME	NUMBER OF CONTAINERS	BTEX	VOA	TOC	General	General	Metals	Sulfide	SVOA	SAMPLER OBSERVATIONS
1		W	DM-2A	3/29/95	1122	9	3	-	2	1	1	1	1	-	
2		W	H-6		1150	9	3	-	2	1	1	1	1	-	
3		W	DM-8		1245	9	3	-	2	1	1	1	1	-	
4		N	H-9		1340	9	3	-	2	1	1	1	1	-	
5		W	DM-5		1457	9	3	-	2	1	1	1	1	-	
6		N	B-2		1543	4	3	-	-	-	-	1	-	-	
7		W	DM-4		1624	4	3	-	-	-	-	1	-	-	
8		W	H-1 ~~H-10~~ ap		1730	6	-	3	-	-	-	1	-	2	
9		-	~~FB-01~~		1600 ap	-									

Source Codes:
Well (W) Outfall (O)
Soil (S) River/Stream (R)
Bottom Sediment (B)
Generation Point (G)
Surface Impoundment (I)
Treatment Facility (T)
Leachate Collection Sys (C)
Lake/Ocean (L)
Other (X)
Specify

CHAIN OF CUSTODY CHRONICLE

Shuttle Opened By: (print) _____ Date: _____ Time: _____
Signature: _____ Seal #: _____ Intact: _____

I have received these materials in good condition from the above person.
Name: _____ Signature: _____
Date: _____ Time: _____ Remarks: _____

I have received these materials in good condition from the above person.
Name: _____ Signature: _____
Date: _____ Time: _____ Remarks: _____

Shuttle Sealed By: (print) A Pierra Date: 3/29/95 Time: 1800
Signature: [signature] Seal #: _____ Intact: Y

USE ONLY Opened By: _____ Date: _____ Time: _____

REMARKS

SAMPLER'S SIGNATURE: [signature]

SAMPLER COPY

ALL 3 PARTS MUST BE READABLE.

ETC

CHAIN-OF-CUSTODY RECORD

Form 0019
Field Technical Services
Rev. 11/91

No. 111747

Environmental Testing and Certification Corp. • 284 Raritan Center Parkway • Edison, NJ 08818 • 908-225-6700

COMPANY: Rhone Poulenc
FACILITY/SITE: 9229 E Marginal way South
PROJECT CONTACT:
TELEPHONE NO.: 206-764-4450
Tuckwila Wa

ITEM NO.	ETC JOB #	SOURCE CODE	SAMPLE POINT	START DATE YY/MM/DD	START TIME	NUMBER OF CONTAINERS	VOA	BTEX	TOC	Metals	General	General	SVOC	Surfide	SAMPLER OBSERVATIONS
1		X	TB-01	3/29/95			2	2	-	-	-	-	-		
2		X	FB-01	"	1600		3	3	2	1	1	1	2		
3															
4															
5															
6															
7															

FILT. (Y/N): N N N N N N N N
PRESERV.: 1 1 3 2 0 3 0 +
ANALYSIS REQUIRED: VOA, BTEX, TOC, Metals, General, General, SVOC, Surfide

LEGEND FOR PRESERVATIVE
0 - NONE
1 - HCL
2 - HNO_3
3 - H_2SO_4
4 - $Na_2SO_3 + H_2SO_4$
other

Source Codes:
Well (W) Outfall (O)
Soil (S) River/Stream (R)
Bottom Sediment (B)
Generation Point (G)
Surface Impoundment (I)
Treatment Facility (T)
Leachate Collection Sys (C)
Lake/Ocean (L)
Other (X)
Specify

CHAIN OF CUSTODY CHRONICLE

Shuttle Opened By: (print) _____ Date: _____ Time: _____
Signature: _____ Seal #: _____ Intact: _____

We received these materials in good condition from the above person:
Name: _____ Signature: _____
Date: _____ Time: _____ Remarks: _____

We received these materials in good condition from the above person:
Name: _____ Signature: _____
Date: _____ Time: _____ Remarks: _____

Sealed By: (print) [signature] A Pierce Date: _____ Time: _____
Signature: [signature] Seal #: _____ Intact: _____

Shuttle Opened By: _____ Date: _____
TEMP: _____ SEAL: _____ COND: _____

REMARKS

[illegible]

SAMPLER'S SIGNATURE: [signature]

SAMPLER COPY

pace INCORPORATED THE ASSURANCE OF QUALITY

Maxwell ... 08890

CHAIN-OF-CUSTODY RECORD
Analytical Request

ent: Rhone Poulenc
dress: 9229 E Marginal Way South
Tukwila Wa 98108
one: 206 764 4450

Report To: EDWIN LIV
Bill To:
P.O. # / Billing Reference
Project Name / No.

Pace Client No.
Pace Project Manager
Pace Project No.
*Requested Due Date:

mpled By (PRINT): A Plein
mpler Signature: [signature] Date Sampled: 3/29/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA			ANALYSES REQUEST: Chrome 1st, Metals, Sw 8	2177						REMARKS
1	DM-2A	1122	Ag		1	1						1							Also one FB (FB-01
2	H-6	1150			1	1						1							
3	DM-8	1245			1	1						1							
4	H-9	1340			1	1						1							
5	DM-5	1457			1	1						1							
6	B-2	1543			1	1						1							
7	DM-4	1624			1	1						1							
8	~~H-10~~ H-1	1720	Ag		1	1						1							

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	RETURNED / DATE	ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME

Additional Comments

RE[illegible]RSE [illegible]DE [illegible] INS[illegible]UC[illegible]NS

4

pace INCORPORATED
ENVIRONMENTAL LABORATORIES

Peak Analytical

CHAIN-OF-CUSTODY RECORD
Analytical Request

Client: Rhone Poulenc
Address: 9209 E Marginal Way South
Tukwila Wash 98108
Phone: 206 764 4450

Report To: EDWIN LIV
Bill To:
P.O. # / Billing Reference
Project Name / No.

Pace Client No.
Pace Project Manager
Pace Project No.
*Requested Due Date:

Sampled By (PRINT): Al Plegin
Sampler Signature: [signature] Date Sampled: 3/29/95

ITEM NO.	SAMPLE DESCRIPTION	TIME	MATRIX	PACE NO.	NO. OF CONTAINERS	UNPRESERVED	H_2SO_4	HNO_3	VOA			ANALYSES REQUEST: Chrome Hex							REMARKS
1	DM-2A	1122	Ag		1	1						1							Also 1-FB
2	H-6	1150	"		1	1						1							FB-01
3	DM-8	1245	"		1	1						1							
4	H-9	1340	"		1	1						1							
5	DM-5	1457	"		1	1						1							
6	B-2	1543	"		1	1						1							
7	DM-4	1624	"		1	1						1							
8	~~H-10~~ H-1	1730	"		1	1						1							

COOLER NOS.	BAILERS	SHIPMENT METHOD OUT / DATE	SHIPMENT METHOD RETURNED / DATE	ITEM NUMBER	RELINQUISHED BY / AFFILIATION	ACCEPTED BY / AFFILIATION	DATE	TIME

Additional Comments

4

SEE REVERSE SIDE FOR INSTRUCTIONS

ETC

CHAIN-OF-CUSTODY RECORD

Form
Field Technical Se
Rev.

No. 111750

Environmental Testing and Certification Corp. • 284 Raritan Center Parkway • Edison, NJ 08818 • 908-225-[illegible]700

COMPANY: Rhone Poulenc

FACILITY/SITE: 9229 E Marginal Way South

PROJECT CONTACT: EDWIN LIU

TELEPHONE NO.: 609 860 3305

ITEM NO.	ETC JOB #	SOURCE CODE	SAMPLE POINT	START DATE YY/MM/DD	START TIME	NUMBER OF CONTAINERS	FILT. (Y/N)	PRESERV.	BTEX	VOC	SVOC	METALS	General*			SAMPLER OBSERVATIONS
1			G-1	3/30/95	0830	1	–	–	–	4	X	–				
2			DM-1A	"	0905	1	–	–	–	4	X	–				
3			E-3	"	0945	1	–	–	–	4	X	–				
4			A-9	"	1015	4	3	–	–	4	X	–				
5			DM-3B	"	1055	3	–	3	–	–	–	–				
6			DM-3A	"	1100	1	–	–	–	4	X	–				
7			A-2	"	1140	6	–	3	2	1	–					
8			A-2D	"	1140	6	–	3	2	1	–					
9			H-10	"	1315	6	–	3	2	1	–					

Source Codes:
Well .... (W) Outfall ..... (O)
Soil .... (S) River/Stream .... (R)
Bottom Sediment ..... (B)
Generation Point ..... (G)
Surface Impoundment ..... (I)
Treatment Facility ..... (T)
Leachate Collection Sys ..... (C)
Lake/Ocean ..... (L)
Other ..... (X)
Specify _____

LEGEND FOR PRESERVATIVE
0 - NONE
1 - HCL
2 - HNO_3
3 - H_2SO_4
4 - $Na_2SO_3 + H_2SO_4$

CHAIN OF CUSTODY CHRONICLE

Shuttle Opened By: (print) _____ Date: _____ Time: _____
Signature: _____ Seal #: _____ Intact: _____

I have received these materials in good condition from the above person.
Name: _____ Signature _____
Date: _____ Time: _____ Remarks: _____

I have received these materials in good condition from the above person.
Name: _____ Signature _____
Date: _____ Time: _____ Remarks: _____

Shuttle Sealed By: (print) A Pleva Date: 3/30/95 Time: _____
Signature _____ Seal #: _____ Intact: Y

Shuttle ONLY Opened By: _____ Date: _____ Time: _____

REMARKS

* General includes following
2 - 40 ml TOC w/ H_2SO_4
1 - 1L unpres plastic
1 - 1L plastic w/ H_2SO_4
1 - 1L Sulfide pl. ZnAc/NaO
2 - 40 ml Methane in H_2O unpr
TOT 7

SAMPLER'S SIGNATURE

SAMPLER COPY

AND ALL 3 PARTS MUST BE READABLE

Monsanto 2A001104

Monsanto Company 104(e) Response

ETC

CHAIN-OF-CUSTODY RECORD

Form 0019
Field Technical Services
Rev. 11/91

No. 119518

Environmental Testing and Certification Corp. • 284 Raritan Center Parkway • Edison, NJ 08818 • 908-225-6700

COMPANY: Rhone Poulenc
FACILITY/SITE: 9229E Marginal
PROJECT CONTACT: EDWIN Liu
TELEPHONE NO.: 609 860 3305

LEGEND FOR PRESERVATIVE
0 - NONE
1 - HCL
2 - HNO_3
3 - H_2SO_4
4 - $Na_2SO_3 + H_2SO_4$

ITEM NO.	ETC JOB #	SOURCE CODE	SAMPLE POINT	START DATE YY/MM/DD	START TIME	NUMBER OF CONTAINERS	BTEX	VOC	SVOC	Metals	General*				SAMPLER OBSERVATIONS
1			MW-13	3/30/95	1354	4	3	–	–	1	–	–			
2			MW-11	"	1425	6	–	3	2	1	–				
3			MW-12	"	1505	13	3	–	2	1	7				
4			MW-19	"	1555	4	3	–	–	1	–				
5			MW-18	"	1625	4	3	–	–	1	–				
6			DM-7	"	1700	11	3	–	–	1	7				
7			DM-7D	"	1700	11	3	–	–	1	7				
8			FB-02	"	1715	13	2	2	1	1	7				
9															

Source Codes:
Well ... (W) Outfall ... (O)
Soil ... (S) River/Stream ... (R)
Bottom Sediment ... (B)
Generation Point ... (G)
Surface Impoundment ... (I)
Treatment Facility ... (T)
Leachate Collection Sys ... (C)
Lake/Ocean ... (L)
Other ... (X)
Specify

CHAIN OF CUSTODY CHRONICLE

1. Shuttle Opened By: (print) _____ Date: _____ Time: _____
Signature: _____ Seal #: _____ Intact: _____

2. I have received these materials in good condition from the above person.
Name: _____ Signature _____
Date: _____ Time: _____ Remarks: _____

3. I have received these materials in good condition from the above person.
Name: _____ Signature _____
Date: _____ Time: _____ Remarks: _____

4. Shuttle Sealed By: (print) A Pena Date: 3/30/95 Time: 1800
Signature [signature] Seal #: _____ Intact: Y

LAB USE ONLY Opened By: _____ Date: _____ Time: _____
SHUTTLE # _____ TEMP. °C _____ SEAL # _____ COND. _____

REMARKS
* General includes the following
2 - 40 ml TOC w/ H_2SO_4
1 - 1L unpres plastic
1 - 1L plastic w/ H_2SO_4
1 - 1L Sulfide pH > 2 ZnAc / NaOH
2 - 40 ml Methanol in H_2O unpres
TOT 7

SAMPLER'S SIGNATURE [signature]

Monsanto 2A001105

Monsanto Company 104(e) Response

ETC

CHAIN-OF-CUSTODY RECORD

to: Peak Analytical

Form 0019
Field Technical Services
Rev. 11/91

No. 111749

Environmental Testing and Certification Corp. • 284 Raritan Center Parkway • Edison, NJ 08818 • 908-225-6700

COMPANY: Rhone Poulenc

FACILITY/SITE: 9229E Marginal Way South

PROJECT CONTACT: EDNN Liu

TELEPHONE NO.: 609 860 3305

FILT. (Y/N)

PRESERV.

ANALYSIS REQUIRED: Hex Cr

LEGEND FOR PRESERVATIVE
0 - NONE
1 - HCL
2 - HNO_3
3 - H_2SO_4
4 - $Na_2SO_3 + H_2SO_4$

Source Codes:
Well .... (W) Outfall ..... (O)
Soil .... (S) River/Stream .... (R)
Bottom Sediment ..... (B)
Generation Point ..... (G)
Surface Impoundment ..... (I)
Treatment Facility ..... (T)
Leachate Collection Sys ..... (C)
Lake/Ocean ..... (L)
Other ..... (X)
Specify _____

ITEM NO.	ETC JOB #	SOURCE CODE	SAMPLE POINT	START DATE YY/MM/DD	START TIME	NUMBER OF CONTAINERS		SAMPLER OBSERVATIONS
1		W	C-1	3/30/95	0830	1	1	
2		W	DM-1A		0905	1	1	
3		W	E-3		0945	1	1	
4		W	A-9		1015	1	1	
5		—	~~DM-3B DM-B3~~		~~1055~~	—	—	No Sample
6		W	DM-3A		1100	1	1	
7		W	A-2		1140	1	1	
8		W	A-2D		1140	1	1	
9		W	H-10		1315	1	1	

[redacted]

CHAIN OF CUSTODY CHRONICLE

Shuttle Opened By: (print) _____ Date: _____ Time: _____

Signature: _____ Seal #: _____ Intact: _____

I have received these materials in good condition from the above person.

Name: _____ Signature _____

Date: _____ Time: _____ Remarks: _____

I have received these materials in good condition from the above person.

Name: _____ Signature _____

Date: _____ Time: _____ Remarks: _____

Shuttle Sealed By: (print) A Pena Date: 3/30/95 Time: 1800

Signature [signature] Seal #: _____ Intact: Y

USE ONLY Opened By: _____ Date: _____ Time: _____

LE # _____ TEN _____ SEAL _____ COI _____

REMARKS

SAMPLER'S SIGNATURE [signature]

SAMPLER COPY

Monsanto 2A001106

Monsanto Company 104(e) Response

ETC

CHAIN-OF-CUSTODY RECORD

Form 0019
Field Technical Services
Rev. 08/90

No. 93012

Environmental Testing and Certification Corp. • 284 Raritan Center Parkway • Edison, NJ 08818 • 908-225-6700

COMPANY: RHone Poulenc

FACILITY/SITE: 9229 E Marginal Way South

PROJECT CONTACT: ED WIN LIV

TELEPHONE NO.: 609 860 3305

FILT. (Y/N)

PRESERV.

ANALYSIS REQUIRED: Ha Cl

LEGEND FOR PRESERVATIVE
0 - NONE
1 - HCL
2 - HNO_3
3 - H_2SO_4
4 - Na_2SO_3 + H_2SO_4

ITEM NO.	ETC JOB #	SOURCE CODE	SAMPLE POINT	START DATE YY/MM/DD	START TIME	Source Codes: Well (W), Outfall (O), Soil (S), River/Stream (R), Bottom Sediment (B), Generation Point (G), Surface Impoundment (I), Treatment Facility (T), Leachate Collection Sys. (C), Lake/Ocean (L), Other (X), Specify	NUMBER OF CONTAINERS	Ha Cl						SAMPLER OBSERVATIONS	LAB OBSERVATIONS
1			MW-13	3/30/95	1354		1	1							
2			H-11	"	1425		1	1							
3			MW-12	"	1505		1	1							
4			MW-19	"	1555		1	1							
5			MW-18	"	1625		1	1							
6			DM-7	"	1700		1	1							
7			DM-7D	"	1700		1	1							
8			FB-02	"	1715		1	1							
9															

CHAIN OF CUSTODY CHRONICLE

1. Shuttle Opened By: (print) K Date: Time:
Signature: Seal #: Intact:

2. I have received these materials in good condition from the above person.
Name: Signature:
Date: Time: Remarks:

3. I have received these materials in good condition from the above person.
Name: Signature:
Date: Time: Remarks:

4. Shuttle Sealed By: (print) A Pleva Date: 3/30/95 Time: 1
Signature: [signature] Seal #: Intact: Y

LAB USE ONLY Opened By: Date: Time:
SHUTTLE # TEMP. °C SEAL # COND.

REMARKS

SAMPLER'S SIGNATURE: [signature]

SAMPLER COPY

Monsanto Company 104(e) Response

Monsanto 2A001107

ETC

CHAIN-OF-CUSTODY RECORD

S-Cubed

Form 0019
Field Technical Services
Rev. 08/90

No. 93013

Environmental Testing and Certification Corp. • 284 Raritan Center Parkway • Edison, NJ 08818 • 908-225-6700

COMPANY: Rhone Poulenc

FACILITY/SITE: 9229 E Marginal Way South

PROJECT CONTACT: EDWIN LIU

TELEPHONE NO.:

FILT. (Y/N): N

PRESERV.: O

ANALYSIS REQUIRED: Hex Cr

LEGEND FOR PRESERVATIVE
0 - NONE
1 - HCL
2 - HNO_3
3 - H_2SO_4
4 - $Na_2SO_3 + H_2SO_4$

ITEM NO.	ETC JOB #	SOURCE CODE	SAMPLE POINT	START DATE YY/MM/DD	START TIME	Source Codes: Well (W) Outfall (O) Soil (S) River/Stream (R) Bottom Sediment (B) Generation Point (G) Surface Impoundment (I) Treatment Facility (T) Leachate Collection Sys (C) Lake/Ocean (L) Other (X) Specify	NUMBER OF CONTAINERS	Hex Cr						SAMPLER OBSERVATIONS	LAB OBSERVATIONS
1			C-1	3/30/95	0830		1	1							
2			DM-1A		0905		1	1							
3			E-3		0945		1	1							
4			A-9		1015		1	1							
5		Aup	~~DM-3B~~		~~1055~~		1	1	No sample						
6			DM-3A		1100		1	1							
7			A-2		1140		1	1							
8			A-2D		1140		1	1							
9			H-10		1315		1	1							

CHAIN OF CUSTODY CHRONICLE

1. Shuttle Opened By: (print) _____ Date: _____ Time: _____
   Signature: _____ Seal #: _____ Intact: _____

2. I have received these materials in good condition from the above person.
   Name: _____ Signature: _____
   Date: _____ Time: _____ Remarks: _____

3. I have received these materials in good condition from the above person.
   Name: _____ Signature: _____
   Date: _____ Time: _____ Remarks: _____

4. Shuttle Sealed By: (print) A Pleva Date: 3/30/95 Time: _____
   Signature: [signature] Seal #: _____ Intact: _____

REMARKS:

SAMPLER'S SIGNATURE: [signature]

LAB USE ONLY Opened By: _____ Date: _____ Time: _____

SHUTTLE # _____ TEMP. °C _____ SEAL _____ CO _____

SAMPLER COPY

ETC

CHAIN-OF-CUSTODY RECORD

Form 0019
Field Technical Services
Rev. 11/91

No. 119508

Environmental Testing and Certification Corp. • 284 Raritan Center Parkway • Edison, NJ 08818 • 908-225-6700

COMPANY: Rhone Poulenc

FACILITY/SITE: 9229 E Marginal Way South

PROJECT CONTACT: EDWIN LIU

TELEPHONE NO.: 609-860 3305

FILT. (Y/N): N N

PRESERV.: HCL

ANALYSIS REQUIRED

LEGEND FOR PRESERVATIVE
0 - NONE
1 - HCL
2 - HNO_3
3 - H_2SO_4
4 - $Na_2SO_3 + H_2SO_4$

ITEM NO.	ETC JOB #	SOURCE CODE	SAMPLE POINT	START DATE YY/MM/DD	START TIME	NUMBER OF CONTAINERS		SAMPLER OBSERVATIONS
1			MW-13	3/30/95	1351	1	1	
2			H-11	"	1425	1	1	
3			MW-12	"	1505	1	1	
4			~~MW-15~~	dup	—	—	—	
5			MW-19	3/30/95	1555	1	1	
6			MW-18	"	1625	1	1	
7			DM-7	"	1700	1	1	
8			DM-7D	"	"	1	1	
9			FB-02	"	1715	1	1	

Source Codes:
Well ... (W) Outfall ... (O)
Soil ... (S) River/Stream ... (R)
Bottom Sediment ... (B)
Generation Point ... (G)
Surface Impoundment ... (I)
Treatment Facility ... (T)
Leachate Collection Sys ... (C)
Lake/Ocean ... (L)
Other ... (X)
Specify

CHAIN OF CUSTODY CHRONICLE

1. Shuttle Opened By: (print) _____ Date: _____ Time: _____
Signature: _____ Seal #: _____ Intact: _____

2. I have received these materials in good condition from the above person.
Name: _____ Signature _____
Date: _____ Time: _____ Remarks: _____

3. I have received these materials in good condition from the above person.
Name: _____ Signature _____
Date: _____ Time: _____ Remarks: _____

4. Shuttle Sealed By: (print) A. Plena Date: 3/30/95 Time: 1800
Signature: [signature] Seal #: _____ Intact: Y

LAB USE ONLY Opened By: _____ Date: _____ Time: _____
SHUTTLE # _____ TEMP. °C _____ SEAL # _____ COND. _____

REMARKS: ~~782125~~

SAMPLER'S SIGNATURE: [signature]

Monsanto Company 104(e) Response

Monsanto 2A001109

pace
INCORPORATED
ENVIRONMENTAL LABORATORIES

MID-PACIFIC
CHAIN OF CUSTODY

PAGE 1 OF 2

COMPANY NAME: Rhone Poulenc Seattle	PROJECT MANAGER: EDWIN CIV					ANALYSES							P.O.#:
PROJECT NUMBER:	PROJECT NAME: Rhone Poulenc Seattle				NUMBER OF CONTS.	BTEX - H_2SO_4	Metals HNO_3	SVOC	General - unpres	General - H_2SO_4	Sulfide		REPORT FORMAT/ QC REQUIREMENTS:
RECEIVING LAB:	CONTACT: 509-860 3305												
SAMPLE ID	DATE	TIME	MATRIX	MID-PACIFIC RECEIPT DATE									DUE DATE:
MW-15	3/31/95	0900			11	3	1	1	3	3	1		
MW-16	"	0910			4	3	1	–	1	–	–		
MW-17		1010			11	3	1	–	3	3	1		
MW-19		1040			11	3	1	–	3	3	1		
MW-20		1120			11	3	1	–	3	3	1		
B-4		1215			4	3	1	–	–	–	–		
B-6		1235			13	3	1	2	3	3	1		
B-5		1315			11	3	1	–	3	3	1		
G-1		1425			1	–	1	–	–	–	–		
G-3		1455			11	3	1	–	3	3	1		
A-4		1500			1	–	1	–	–	–	–		
B-1A		1540			1	–	1	–	–	–	–		
B-1B		1550			1	–	1	–	–	–	–		

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	REMARKS:
[illegible]	3/31/95	1700				General unpres = 1 1L plus 2-40ml General H_2SO_4 = 1 1L plus 2-40ml
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LAB BY:	TIME	DATE	MID-PACIFIC (415)964-0844 625B CLYDE AVENUE MOUNTAIN VIEW, CA 94043

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MID-PACIFIC
CHAIN OF CUSTODY

PAGE 2 OF 2

COMPANY NAME: Rhone Poulenc		PROJECT MANAGER: EDWIN LIU			NUMBER OF CONTS.	ANALYSES							P.O.#:
PROJECT NUMBER:		PROJECT NAME: Rhone Poulenc Seattle				BTEX/~~VOC~~	Metals	SVOC	General unpro	General H_2SO_4	Sulfide		REPORT FORMAT/ QC REQUIREMENTS:
RECEIVING LAB:		CONTACT: 609 860 3305											
SAMPLE ID	DATE	TIME	MATRIX	MID-PACIFIC RECEIPT DATE									DUE DATE:
FB-03	3/31/95	0830	Ag		12	2	1	2	3	3	1		
TB-03	"	–	Ag		3	3	–	–	–	–	–	–	

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	REMARKS:
[signature]	3/31/95	1700				
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LAB BY:	TIME	DATE	/MID-PACIFIC (415)964-0844 625B CLYDE AVENUE MOUNTAIN VIEW, CA 94043

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ENVIRONMENTAL LABORATORIES

Peak

MID-PACIFIC
CHAIN OF CUSTODY

PAGE 1 OF 2

COMPANY NAME: Rhone Poulenc	PROJECT MANAGER: EDWIN LIU	NUMBER OF CONTS.	ANALYSES	P.O.#:
PROJECT NUMBER:	PROJECT NAME: Rhone Poulenc Seattle Plant		Hex Chrome	REPORT FORMAT/ QC REQUIREMENTS:
RECEIVING LAB:	CONTACT: 609 860 3305			

SAMPLE ID	DATE	TIME	MATRIX	MID-PACIFIC RECEIPT DATE	NUMBER OF CONTS.	Hex Chrome							DUE DATE:
MW-15	3/31/95	0900	Aq.		1	1							
MW-16		0910											
MW-17		1010											
MW-14		1040											
MW-20		1120											
B-4		1215											
B-6		1235											
B-5		1315											
G-1		1425											
G-3		1455											
A-4		1500											
B-1A		1540											
B-1B		1550											

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	REMARKS:
[illegible]	3/31/95	1700				
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LAB BY:	TIME	DATE	MID-PACIFIC (415)964-0844 625B CLYDE AVENUE MOUNTAIN VIEW, CA 94043

Monsanto Company 104(e) Response

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ENVIRONMENTAL LABORATORIES

Peak

MID-PACIFIC
CHAIN OF CUSTODY

PAGE 2 OF 2

COMPANY NAME: Rhone Poulenc	PROJECT MANAGER: EDWIN LIU				NUMBER OF CONTS.	ANALYSES							P.O.#:
PROJECT NUMBER:	PROJECT NAME: Rhone Poulenc Seattle												REPORT FORMAT/ QC REQUIREMENTS:
RECEIVING LAB:	CONTACT: 609 860 3305												
SAMPLE ID	DATE	TIME	MATRIX	MID-PACIFIC RECEIPT DATE		Hex Cr							DUE DATE:
FB-03	3/31	0830	Ag		1	1							

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	REMARKS:
[illegible]	3/31/95	1700				
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LAB BY:	TIME	DATE	MID-PACIFIC (415)964-0844 625B CLYDE AVENUE MOUNTAIN VIEW, CA 94043

S Sulva

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ENVIRONMENTAL LABORATORIES

MID-PACIFIC
CHAIN OF CUSTODY

PAGE 1 OF 2

COMPANY NAME: Rhone Poulenc	PROJECT MANAGER: Edwin Liu	NUMBER OF CONTS.	ANALYSES	P.O.#:
PROJECT NUMBER:	PROJECT NAME: Rhone Poulenc Seattle			REPORT FORMAT/ QC REQUIREMENTS:
RECEIVING LAB:	CONTACT: 609 860 3305			

SAMPLE ID	DATE	TIME	MATRIX	MID-PACIFIC RECEIPT DATE	NUMBER OF CONTS.	Hex Chrome							DUE DATE:
MW-15	3/31/95	0900	Liq		1	1							
MW-16		0910			1	1							
MW-17		1010			1	1							
MW-14		1040			1	1							
MW-20		1120			1	1							
~~A4~~ B-4		1215			1	1							
B-6		1235			1	1							
B-5		1315			1	1							
G-1		1425			1	1							
G-3		1455			1	1							
A-4		1500			1	1							
B-1A		1540			1	1							
B-1B		1550			1	1							

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	REMARKS:
[illegible]	3/31/95	1700				
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LAB BY:	TIME	DATE	MID-PACIFIC (415)964-0844 625B CLYDE AVENUE MOUNTAIN VIEW, CA 94043

Monsanto Company 104(e) Response

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MID-PACIFIC
CHAIN OF CUSTODY

ENVIRONMENTAL LABORATORIES

PAGE 2 OF 2

COMPANY NAME: Rhone Poulenc	PROJECT MANAGER: Edwin Liu	NUMBER OF CONTS.	ANALYSES	P.O.#:
PROJECT NUMBER:	PROJECT NAME: Rhone Poulenc Seattle			REPORT FORMAT/ QC REQUIREMENTS:
RECEIVING LAB:	CONTACT: 609 860 3305			

SAMPLE ID	DATE	TIME	MATRIX	MID-PACIFIC RECEIPT DATE	NUMBER OF CONTS.	Hg Chem							DUE DATE:
FB-03	3/31/95	0830	Ag		1	1							

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	REMARKS:
[signature]	3/31/95	1700				
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LAB BY:	TIME	DATE	MID-PACIFIC (415)964-0844 625B CLYDE AVENUE MOUNTAIN VIEW, CA 94043

pace
ENVIRONMENTAL LABORATORIES

MID-PACIFIC
CHAIN OF CUSTODY

PAGE 1 OF ___

COMPANY NAME: Rhone Poulenc	PROJECT MANAGER: Edwin Liu				NUMBER OF CONTS.	ANALYSES							P.O.#:
PROJECT NUMBER:	PROJECT NAME:												REPORT FORMAT/ QC REQUIREMENTS:
RECEIVING LAB:	CONTACT:												
SAMPLE ID	DATE	TIME	MATRIX	MID-PACIFIC RECEIPT DATE		Toluene/BEX	Toluene/BEX						DUE DATE:
MW-18PH1	4/1/95	1207	Liquid		2	X	X						
MW-18PH2	4/1/95	1210	Liquid		2	X	X						

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	REMARKS:
[signature]	4/1/95	1230				
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LAB BY:	TIME	DATE	MID-PACIFIC (415)964-0844 625B CLYDE AVENUE MOUNTAIN VIEW, CA 94043

Monsanto Company 104(e) Response

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ENVIRONMENTAL LABORATORIES

MID-PACIFIC
CHAIN OF CUSTODY

PAGE 1 OF 1

COMPANY NAME: Rhone-Poulenc, Inc	PROJECT MANAGER: Edwin Liu					ANALYSES							P.O.#:
PROJECT NUMBER:	PROJECT NAME: Seattle Plant				NUMBER OF CONTS.	* mineral oil Fingerprinting	PCB						REPORT FORMAT/ QC REQUIREMENTS:
RECEIVING LAB: Gulf South	CONTACT: Craig												
SAMPLE ID	DATE	TIME	MATRIX	MID-PACIFIC RECEIPT DATE									DUE DATE:
H-10 LNAPL	4/1/95	1040	Liquid		1	X							*
MW-18 LNAPL	4/1/95	1030	Liquid		1	X							
TANK	4/1/95	1110	Wipe		1		X						
Wipe Blank	4/1/95	1120	Wipe		1		X						

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	REMARKS:
[signature]	4/1/95	1100				* LNAPL suspect of being Penetech mineral oil. 40ml vial of neat Penetech oil is enclosed. Also see documents (Packing list) for information on Penetech oil.
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LAB BY:	TIME	DATE	MID-PACIFIC (415)964-0844 625B CLYDE AVENUE MOUNTAIN VIEW, CA 94043

ENVIRONMENTAL LABORATORIES

MID-PACIFIC
CHAIN OF CUSTODY

PAGE____OF____

COMPANY NAME: Rhone-Poulenc, Inc	PROJECT MANAGER: Edwin Liu					ANALYSES							P.O.#:
PROJECT NUMBER:	PROJECT NAME: Seattle Plant				NUMBER OF CONTS.								REPORT FORMAT/ QC REQUIREMENTS:
RECEIVING LAB:	CONTACT:												
SAMPLE ID	DATE	TIME	MATRIX	MID-PACIFIC RECEIPT DATE		Toluene/8020							DUE DATE:
RPSB1	4/1/95	1130	Soil			X							18-24" bgs
RPSB2	↓	1107	↓			↓							18-24" bgs
RPSB3		1145											18-24" bgs
RPSB4		1157											18-24" bgs

RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	REMARKS:
[signature]	4/1/95	1200				Results to Edwin Liu RPI PO Box CN7500 Cranbury NJ, 08512
RELINQUISHED BY:	DATE	TIME	RECEIVED BY:	TIME	DATE	
RELINQUISHED BY:	DATE	TIME	RECEIVED FOR LAB BY:	TIME	DATE	MID-PACIFIC (415)904-0844 625B CLYDE AVENUE MOUNTAIN VIEW, CA 94043

Monsanto Company 104(e) Response

Monsanto 2A001118

Appendix II
LABORATORY/ FIELD PARAMETER LIST

03/24/95 07:53 609 860 0160 TO: R.P./HS&EA 609 860 0160 MAR 23, 1995 7:43PM #993 P.09 003/003

Attachment 2
Sampling Matrix for Round 3 Groundwater Sampling
Rhone-Poulenc Seattle Facility

Well	Analyte: BTEX	SVOCs	VOCs	Chromium and Metals	General Water Quality[1] and Biological Activity[2] Indicators	Comments
DM-1A				X		chromium above SWS
DM-2A	X			X	X	near toluene area, beryllium and chromium above MCL in Round 1
DM-3A				X		chromium above SWS
DM-3B			X			acetone detected in Round 1
DM-4	X			X		near toluene area, chromium above SWS
DM-5	X			X	X	near toluene area, beryllium and chromium above MCL in Round 1
DM-7	X			X	X	near toluene area, chromium above SWS
DM-8			X	X	X	near toluene area, beryllium and chromium above MCL in Round 1, phenol detected in Round 1
MW-12	X	X		X	X	in toluene area, SVOCs detected in Round 1, chromium above SWS
MW-13	X			X		sampled once (Round 2 well), in toluene area, chromium above SWS
MW-14	X			X	X	sampled once (Round 2 well), in toluene area, chromium above SWS
MW-15	X			X	X	sampled once (Round 2 well), in toluene area, chromium above SWS
MW-16	X			X		sampled once (Round 2 well), in toluene area, chromium above SWS
MW-17	X			X	X	sampled once (Round 2 well), in toluene area, chromium above SWS
MW-18	X			X		sampled once (Round 2 well), in toluene area, chromium above SWS
MW-19	X			X		sampled once (Round 2 well), in toluene area, chromium above SWS
MW-20	X			X	X	sampled once (Round 2 well), in toluene area, chromium above SWS
A2		X	X	X		1,1-dichloroethane and bis(chloroethyl)ether detected in Round 1, chromium above SWS
A4				X		chromium above SWS
A9	X			X		near toluene area, chromium above SWS
B1A				X		chromium above SWS
B1B				X		chromium above SWS
B2	X			X		near toluene area, chromium above SWS
B4	X			X		near toluene area, chromium above SWS
B5	X			X	X	near toluene area, chromium above SWS
B6	X	X		X	X	near toluene area, SVOCs detected in Round 1, chromium above SWS
C1				X		chromium above SWS
E3				X		antimony above MCL in Round 2, chromium above SWS
G1				X		chromium above SWS
G3	X			X	X	near toluene area, chromium above SWS
H1	X			X		in toluene area, chromium above SWS
H10		X	X	X		in toluene area, SVOCs and BTEX above MCLs, 2-butanone detected in Round 1, chromium above SWS
H11		X	X	X		in toluene area, SVOCs, VOCs, and BTEX above MCLs, other VOCs detected in Round 1, chromium above SWS
H6	X			X	X	near toluene area, chromium above SWS
H9	X			X	X	near toluene area, chromium above SWS

[1] General water quality indicators include sodium, potassium, magnesium, calcium, sulfate, chloride, alkalinity as $CaCO_3$, carbonate/bicarbonate, total dissolved solids, and total organic carbon.

[2] Biological activity indicators include phosphorus, nitrate, nitrite, total Kjeldahl nitrogen, methane in water, dissolved oxygen (field parameter), and redox potential (field parameter). Sulfide

Attachment 2
Sampling Matrix for Round 3 Groundwater Sampling
Rhone-Poulenc Seattle Facility

	Analyte					
Well	BTEX	SVOCs	VOCs	Chromium and Metals	General Water Quality[1] and Biological Activity[2] Indicators	Comments
DM-1A				X		chromium above SWS
DM-2A	X			X	X	near toluene area, beryllium and chromium above MCL in Round 1
DM-3A				X		chromium above SWS
DM-3B			X			acetone detected in Round 1
DM-4	X			X		near toluene area, chromium above SWS
DM-5	X			X	X	near toluene area, beryllium and chromium above MCL in Round 1
DM-7	X			X	X	near toluene area, chromium above SWS
DM-8			X	X	X	near toluene area, beryllium and chromium above MCL in Round 1, phenol detected in Round 1
MW-12	X	X		X	X	in toluene area, SVOCs detected in Round 1, chromium above SWS
MW-13	X			X		sampled once (Round 2 well), in toluene area, chromium above SWS
MW-14	X			X	X	sampled once (Round 2 well), in toluene area, chromium above SWS
MW-15	X			X	X	sampled once (Round 2 well), in toluene area, chromium above SWS
MW-16	X			X		sampled once (Round 2 well), in toluene area, chromium above SWS
MW-17	X			X	X	sampled once (Round 2 well), in toluene area, chromium above SWS
MW-18	X			X		sampled once (Round 2 well), in toluene area, chromium above SWS
MW-19	X			X		sampled once (Round 2 well), in toluene area, chromium above SWS
MW-20	X			X	X	sampled once (Round 2 well), in toluene area, chromium above SWS
A2		X	X	X		1,1-dichloroethane and bis(chloroethyl)ether detected in Round 1, chromium above SWS
A4				X		chromium above SWS
A9	X			X		near toluene area, chromium above SWS
B1A				X		chromium above SWS
B1B				X		chromium above SWS
B2	X			X		near toluene area, chromium above SWS
B4	X			X		near toluene area, chromium above SWS
B5	X			X	X	near toluene area, chromium above SWS
B6	X	X		X	X	near toluene area, SVOCs detected in Round 1, chromium above SWS
C1				X		chromium above SWS
E3				X		antimony above MCL in Round 2, chromium above SWS
G1				X		chromium above SWS
G3	X			X	X	near toluene area, chromium above SWS
H1	X			X		in toluene area, chromium above SWS
H10		X	X	X		in toluene area, SVOCs and BTEX above MCLs, 2-butanone detected in Round 1, chromium above SWS
H11		X	X	X		in toluene area, SVOCs, VOCs, and BTEX above MCLs, other VOCs detected in Round 1, chromium above SWS
H6	X			X	X	near toluene area, chromium above SWS
H9	X			X	X	near toluene area, chromium above SWS

[1] General water quality indicators include sodium, potassium, magnesium, calcium, sulfate, chloride, alkalinity as $CaCO_3$, carbonate/bicarbonate, total dissolved solids, and total organic carbon.

[2] Biological activity indicators include phosphorus, nitrate, nitrite, total Kjeldahl nitrogen, methane in water, dissolved oxygen (field parameter), and redox potential (field parameter). Sulfide.

609 860 0160 MAR 23, 1995 7:43PM #993 P.02

Appendix III
FIELD PARAMETER SOP's

STANDARD OPERATING PROCEDURE FOR CALIBRATION OF FIELD THERMOMETERS

1.0 Scope and Application

1.1 It is essential that all field thermometers utilized in environmental measurements are properly calibrated prior to use and annually thereafter. The following procedure is to be utilized in calibration of all thermometers.

1.2 Field thermometers are calibrated upon initial use and (at minimum) once per year against a NBS certified thermometer near the temperature that the thermometer is actually used (i.e., refrigerator thermometers at 4 degrees C, total solids at 103 degrees C). Field thermometers calibrated at 6 degrees C and 20 degrees C.

2.0 Apparatus and Materials

2.1 NBS Certified Thermometer (Caution - very expensive)

2.2 Thermometers to be calibrated should be total immersion type, organic liquid (not mercury) with a temperature range suitable for the measurement application. Thermometers should have 1-degree increments unless greater accuracy is required by the specific methodology or process.

2.3 Tags to be utilized for labelling thermometers (available from Network QA if desired).

3.0 Calibration Procedure

3.1 Low Temperature Applications - Refrigerators (4 degrees C.)
- Field (6 degrees C.)

3.1.1 A volume of water @ 500 ml is placed in a refrigerator and allowed to reach constant temperature (near 4 degrees C.). As an alternative, ice water can be utilized (near 0 degrees C.).

3.1.2 Once the temperature of the water has stabilized, the NBS thermometer and the thermometer to be calibrated are placed in the water. The calibration takes place inside a refrigerator rather than on a lab bench to simulate actual in-use conditions as much as possible.

3.1.3 Thermometers must be allowed to stabilize for 5 minutes and then temperature reading are compared and recorded in the thermometer calibration log (table 1).

3.1.4 See following sections for documentation requirements.

3.2 Ambient Temperature Applications - Environmental Samples

3.2.1 A volume of water @ 500 ml is placed on a lab bench and allowed to reach constant temperature (near 20 degrees C.).

3.2.2 The NBS thermometer and the thermometer to be calibrated are suspended in the water. The thermometers are not to touch the bottom of the container since inaccurate temperatures will be recorded and the NBS thermometer may be damaged.

3.2.3 The thermometers are allowed to stabilize for 5 minutes and then temperature readings are compared and recorded in the thermometer calibration log (Table 1).

3.2.4 See following sections for documentation requirements.

3.3 Documentation of Calibration

3.3.1 Table 1 presents information which must be contained in the thermometer calibration logbook as follows:

a. Number assigned to thermometer being calibrated.
b. Date of calibration.
c. Identification # of NBS certified thermometer.
d. Actual reading obtained with the NBS thermometer.
e. Actual reading obtained with thermometer undergoing

calibration.

f. Temperature correction if required (used only if temperatures do not agree). It is strongly advised that thermometers whose temperature does not agree with the NBS not be utilized. If they must be used, the temperature correction indicates the degrees C to be added or subtracted from the reading.

g. Signature of analyst performing the calibration.

h. Intended use or placement of the thermometer.

3.4 Labelling of Thermometer

3.4.1 Once the thermometer has been calibrated, it is labelled with the following information. A paper tag affixed to a string is useful for this purpose. Tags are available from Network QA if desired.

a. Thermometer number
b. Calibration date
c. Calibration temperature
d. Temperature correction
e. Analyst signature

3.4.2 Once the calibration, documentation and labelling has been performed, the thermometer is placed in service.

If the thermometer is for cold temperature application (refrigerator: 4 degrees C), it is placed in water. A volatile vial with the thermometer placed through the septum is useful for this purpose. The water is used to provide a stable temperature during daily measurement.

In very low temperature applications (freezers: normally -20 degrees C), the thermometer is immersed in sand. Using a volatile vial as described above is also useful for this purpose.

In high temperature applications, the thermometer is placed into the appropriate oven emersed in sand which is utilized to provide a stable temperature during daily measurement. If oven design allows, the thermometer may be partially located outside the oven for easier temperature measurement provided it is immersed in sand.

4.0 Required Format of Thermometer Calibration Logbook

Table 1
Thermometer Calibration Record

Ther. Number	Cal. Date	NBS Ther. Number	Temp. Reading New	Temp. Reading NBS	Temp. Corr.	Signature	Designated Use

DETERMINATION OF pH IN AQUEOUS SAMPLES

1.0 Scope and Application

1.10 This method is applicable to drinking, surface, ground and saline waters, domestic and industrial wastes.

1.11 This method is adapted from Method 150.1 EPA 600-4-020 "Methods for Chemical Analysis of Water and Wastes", and Method 9040 EPA SW-864 1986 "Test Methods for Evaluating Solid Waste".

2.0 Method Summary

2.10 The pH of the sample is measured electrometrically using an YSI 3500 pH meter equipped with a gel-filled glass combination electrode.

3.0 Interferences

3.10 Coatings of oily or particulate materials can impair electrode response. Remove films by gently cleaning the electrode with alconox soap solution and rinsing thoroughly with deionized water. If the electrode response is insufficient, then clean with (1+9) hydrochloric acid solution and re-calibrate.

3.11 Temperature effects can be controlled by bringing the temperature of the samples to within +/- 2.0 C of the certified buffer solutions used for calibration.

4.0 Apparatus

4.10 YSI Model 3500 pH meter

4.2 Orion glass or gel-filled combination electrode

4.3 YSI Thermistor 3510 ATC probe

5.0 Reagents

5.10 Certified secondary standard buffer solutions, pH 7.00, pH 4.00, pH 10.00 (commercially available).

5.11 Laboratory de-ionized water

6.0 Calibration Procedures

6.01 General Instructions

Each pH probe shall be cleaned after each use period and calibrated prior to usage using two (2) pH buffer standards which bracket the value to be measured. Buffer aliquots shall not be used more than once; buffer solutions shall be dated at the time of initial use.

YSI 3500 Calibration

6.10 Before connecting the pH electrode, zero the electronics with the shorting cap attached to the pH jack, turn on the instrument, set the pH function switch to pH ATC.

6.11 Adjust the CAL control to indicate 7.00 +/-0.01 on the display. Then disconnect the shorting cap and connect it to the MV input jack.

6.12 Rinse the pH probe and temperature probe with pH 7.00 buffer. Connect the pH probe to the pH input jack, the temperature probe to the temperature input jack and a second temperature probe to the pH ATC jack. Manual temperature is not necessary.

6.13 The pH meter will be fully calibrated using a "two-point calibration" (pH 7.00, pH 4.00) before each analytical run. (OR pH 7.00 and pH 10.00 if the sample lies in that range.)

6.14 Dispense approximately 20-50 mls of each of the following certified buffer solutions: (pH 7.00, pH 4.00) into two separate clean disposable polyethylene beakers. (Note: Temperature of the two buffers should not differ by more than +/- 0.01 degree C.)

6.15 Enter the manufacturer and the lot number of each solution on the "QC Data" section of the analysis book. Include all required information.

6.16 Measure the temperature of the pH 7.00 buffer solution and record the temperature (degrees C). The buffer should be near sample temperature +/- 2.0 degrees C.

6.17 Inspect the glass electrode. The "breather hole" must be open and free of accumulated salts. Check the inner body of the electrode. It must be free of accumulated salts. The internal filling solution level should be 1/2 inch below the breather opening. If the electrode contains salts, rinse the inner body thoroughly with deionized water. Rinse three (3) times with "internal filling solution" and refill the electrode. Allow to stabilize and re-calibrate.

6.18 Immerse the electrode and temperature probe into pH 7.00 buffer. Record

the value obtained. Adjust the "calibrate knob" to obtain the certified pH value (given by the manufacturer at the temperature measured). Record the value. Rinse the electrode and temperature probe thoroughly with deionized water.

6.19 Immerse the electrode and temperature probe into pH 4.00 buffer solution. Record the value obtained. Adjust the "slope knob" to obtain the certified pH value specified by the manufacturer at the temperature measured. Record the value. Rinse the electrode thoroughly.

6.20 Record the "new setting" of the temperature dial required to obtain the pH 4.00 calibration in degrees C.

6.21 Read the 7.00 and 4.00 buffers again. The values should be within 0.05 units of the buffer solution value.

6.22 Immerse the electrode into the pH 10.00 buffer solution, mix, allow the meter to stabilize and record the value obtained. The value should be 10.00 +/ 0.2 pH units.

7.0 Sample Analysis Procedure

7.11 Record sample temperature.

7.12 Dispense the samples into clean, disposable polyethylene beakers. Set the mode to ATC (Automatic Temperature Compensation). Analyze and record the pH and temperature of each sample. Use a TFE spinbar to gently mix the sample. Analyze sample(s) in duplicate or quadruplicate as required.

7.13 Rinse the electrode thoroughly with deionized water and blot dry between each sample.

8.0 Quality Control

8.11 Document the date, time, buffer lot number and the values obtained. If the difference between the expected value of the pH 7.00 check standard and the value measured is >0.20 pH units, re-calibrate the meter as per section 6.0 of this method.

8.12 All samples shall be analyzed in quadruplicate at a minimum.

8.13 Dispose of all buffers after expiration date.

9.0 Format for Calibration Logbook

Date _____ Site _____

Analysist _____ Meter Model/Make _____

	Buffer Lot #	Date Recieved	Expiration Date
pH 7.0			
pH 4.0			
pH 10.0			

Calibration Data

Buffer value	Tempera-ture	1st check/ time	2nd check/ time	3rd check/ time
pH 7.0				
pH 4.0				
pH 10.0				

Dissolved Oxygen

1.0 Scope and application

1.1 This method is applicable to most wastewaters, surface waters, ground and saline waters.

1.2 The Dissolved Oxygen (DO) Probe technique gives comparable results on all sample types and is an excellent method in polluted and highly colored waters as well as strong waste effluents.

2.0 Method Summary

2.1 The probes use Clark-type membrane-covered polarographic sensors with built in thermistors for temperature measurement and compensation. A thin permeable membrane stretched over the sensor isolates the sensor elements from the environment and allows oxygen and certain other gases to enter.

2.2 A polarizing voltage is applied across the sensor, oxygen that has passed through the membrane reacts at the cathode, causing a current to flow.

2.3 The membrane passes oxygen at a rate proportional to the pressure difference across it. Since oxygen is rapidly consumed at the cathode, it can be assumed that the oxygen pressure inside the membrane is zero. Hence, the force causing the oxygen to diffuse through the membrane is proportional to the absolute pressure of oxygen outside the membrane. If the oxygen pressure increases, more oxygen diffuses through the membrane and more current flows through the sensor. A lower pressure results in less current.

3.0 Interferences

3.1 This method is not subjected to the serious errors of other methods caused by interferences such as oxidizing, reducing agents, nitrate ion, ferrous iron and organic matter. The sensing element is protected by an oxygen-permeable plastic membrane which serves as a diffusion barrier against impurities.

3.2 H2S SO2, Halogens, Neon, Nitrous Oxide and CO are interfering gases. If you suspect erroneous readings, it may be necessary to determine if these are the cause.

4.0 Apparatus

4.1 YSI Model 57 Dissolved Oxygen Meter

4.2 YSI 5740-50 50' oxygen temperature probe

4.3 YSI 5791A submersible stirrer

4.4 YSI 5775 Membrane Kit

4.5 BOD bottle

5.0 Reagents

5.1 Deionized water

5.2 YSI Oxygen Probe Solution (5.25 gm KCl and 1/16 ml Kodak Photo-flo solution per 30 ml bottle)

5.3 Sodium Sulfite (Na2SO3) granular solid

5.4 Cobalt Chloride (CoCl2) granular solid

6.0 Calibration Procedure

6.1 Check Probe

6.11 Check the probe for air bubbles, damage to the membrane and replace the membrane if bubbles or damage is apparent.

6.12 Replace membrane if erratic readings are observed or calibration is not stable.
<u>See Operating Procedures: I Preparing the probe from Manual</u>

6.2 Prepare Instrument (Set instrument in its operating position; vertical or on its back.)

6.21 With instrument in OFF position, adjust meter pointer to zero with screw in center of meter panel.

6.22 Switch to RED LINE and adjust the Red Line Knob until the meter needle aligns with the red mark at 31 degrees C position.

6.23 Switch to ZERO and adjust to zero with Zero Control Knob.

6.24 Attach the prepared probe to the Probe Connector of the instrument

and adjust the retaining ring finger tight.

6.25 Before calibration, allow 15 minutes for optimum probe stabilization.

6.3 Air Calibration

6.31 Place the probe in moist air. BOD probes can be placed in partially filled BOD bottles. The probe can also be wrapped loosely in a damp cloth taking care the cloth does not touch the membrane. Wait approximately 10 minutes for temperature stabilization.

6.32 Switch to temperature and read. Refer to Table I Solubility of Oxygen in Fresh Water and determine value.

6.33 Determine altitude or atmospheric correction factor from Table II.

6.34 Multiply the calibration value from Table I by the correction factor from Table II.

6.35 Switch to the appropriate mg/l range, set the salinity knob to zero and adjust the calibrate knob until the meter reads the correct calibration value from Step 6.34. Wait two minutes to verify calibration stability. Readjust if necessary.

7.0 Sample Analysis Procedure

7.10 With the instrument prepared for use and the probe calibrated, place the probe in the sample to be measured and provide stirring.

7.20 If the submersible stirrer is not used, provide manual stirring by raising and lowering the probe about 1 foot per second or use a magnetic stirrer.

7.21 If the YSI 5791A Submersible Stirrer is used, provide a sample container large enough with enough sample to submerse both probe and stirrer.

7.3 Adjust the salinity knob to the salinity of the sample.

7.4 Allow sufficient time for probe to stabilize to sample temperature and dissolved oxygen. Read and record the dissolved oxygen.

8.0 Sources of Error

8.1 Bubbles under the membrane or wrinkled membrane, replace membrane every

2-4 weeks.

8.2 Do not allow membrane to dry out then re-wet, error can result.

8.3 If the fold cathode becomes tarnished (it is not bright) or plated with silver, recondition probe or sent it in for factory service.

8.4 The silver anode may become contaminated which will prevent successful calibration. Soak overnight in 3% ammonia solution.

9.0 Quality Control

9.10 Accuracy Check; recalibrate at the beginning of the sample run and every 4 hours or 10 samples, whichever is sooner. Also if system appears to be erratic, recalibrate before each sample.

9.11 A sample with zero DO should be prepared when analyzing samples with low DO. (Add excess sodium sulfite, Na2SO3, and a trace of Cobalt Chloride, CoCl2, to bring DO to zero.) Preferably calibrate with samples of water under test.

9.20 Precision Check; all samples are run in duplicate.

10.0 Format for Calibration Logbook for Dissolved Oxygen

Date _____ Site Name _____

Analyst _____ Instrument Model _____

Battery check _____ Membrane check _____

Calibration type: Air _____ Sat. Water _____

Salinity _____ Temperature _____ Altitude _____

Calibration, Table I _____

Correction Factor, Table II _____

Resulting Value _____

Zero DO result (add to running sample) _____
(add excess Na2SO3 Plus trace CoCl2)

DETERMINATION OF OXIDATION-REDUCTION POTENTIAL (ORP) IN AQUEOUS SAMPLES

1.0 Scope and Application

1.10 This method is applicable to drinking, surface, ground and saline waters, domestic and industrial waste waters.

2.0 Method Summary

2.10 The ORP measurement is measured in =/- MV (millivolts). There are no adjustments in this mode, so any sensor attached to the YSI 3500 MV input jack should be tested against known standard. If the unit does not calibrate, see cleaning instructions, Section 9.6.

ORP measurements are defined as the electromotive force between a noble metal electrode and a reference electrode. It essentially is a measurement of the ratio of the activities of the oxidized to reduced species in solution.

3.0 Interferences

3.1 ORP electrodes in general are not subject to solution interferences from color, turbidity, colloidal material and suspended matter.

3.2 The ORP of an aqueous solution is sensitive to changes in temperature and can be corrected.

3.3 The ORP of an aqueous solution is sensitive to pH variations when the oxygen-reduction reaction involves either H+ or OH- ions. ORP generally tends to increase with an increase in hydrogen ions and decrease with increase in hydroxyl ions.

3.4 Reproducible oxygen-reduction potentials cannot be obtained for chemical systems that are not reversible.

3.5 If the metallic portion of the ORP electrode is sponge-like, materials absorbed from solutions may not be washed away even by repeated rinsings. In such cases, the electrode may exhibit a memory effect. A brightly polished metal electrode surface is required for accurate measurements.

4.0 Apparatus

4.10 YSI Model 3500 Meter

4.20 YSI ORP Electrode 3540

4.30 YSI Thermistor 3510

4.40 Graduated cylinder, 100 ml - 250 ml

5.0 Specifications

5.10 ORP Range: -1500 to +1500 MV

5.20 Temperature Range: -5 degrees C. to +50 degrees C.

5.30 Accuracy: +/- 1.0% full range

5.40 Response Time: 95% of reading in 19 sec.

6.0 Reagents

6.10 YSI 3682 Zobell Solution reference standard (dry form good for 24 months, store under 40 degrees C.)

6.20 Laboratory de-ionized water

6.30 Soaking solution: 10 ml pH4 buffer with 1/2 teaspoon of NaCl.

6.40 Cleaning Solution: any commercially available "low suds" liquid or solid detergent

6.50 Nitric Acid (1+1): mix equal volumes of concentrated nitric acid and water

6.60 Chromic Acid Cleaning Solutions: dissolve about 5 gm of potassium dichromate in 500 ml of concentrated sulfuric acid

6.70 Sodium Hydroxide Solution, 6 N

7.0 Calibration Procedures

7.0 General Instructions

Inspect the YSI 3540 ORP probe for coating on the platinum surface. The bulb guard can be removed to expose the platinum for cleaning. When the probe is clean,

9.4 Accuracy is based on response to a certified standard prepared every month with a precision check based on quadruplicate analysis every 10 samples or every four hours.

9.5 when response time drops off to 95% >30 sec., cleaning of the probe should be considered.

9.6 Cleaning Procedure and Storage

9.61 Electrode Treatment - Condition and maintain ORP electrodes as recommended by the manufacturer. If the assembly is in intermittent use, the immersible ends of the electrode should be kept in water between measurements. Cover the junctions and fill-holes of reference electrodes to reduce evaporation during prolonged storage.

9.62 ORP Electrode Cleaning - Remove traces of foreign matter. Immerse the oxidation-reduction electrode in warm aqua regia (70 C) and allow to stand for a period of about one minute. this solution dissolves the noble metal as well as any foreign matter so that the electrode should not be allowed to stand in it longer than the time specified. the above treatment in aqua regia may also be used cautiously to recondition an electrode that has become unreliable in its operation. It is also possible to clean the electrode in HNO3 (1+1). Warm the solution and electrode gradually to boiling. Maintain it just below the boiling point for about 5 min. and then allow the solution and electrode to cool. Wash the electrode in water several times. It is desirable to clean the electrode daily. An alternative cleaning procedure is to immerse the electrode at room temperature in chromic acid cleaning mixture and then rinse first with dilute hydrochloric acid and then thoroughly with water. Preliminary cleaning with detergent sometimes is desirable to remove some particulate matter. In these cleaning operations particular care must be exercised to protect the glass-metal seals from sudden changes of temperature, which might crack them.

9.7 Recalibration check: The instrument should be rechecked against the Zobel solution every ten samples or every four hours, whichever is sooner.

10.0 Format of Calibration Logbook

Date _____ Site _____

Analyst _____ Meter make/model _____

Lot # _____ Expiration date (dry) _____

Date prepared _____

Time Time	Temperature (degrees C)	Observed Reading (+/-mr)	Expected Reading (+/-mr)	Within Limits +/-10mv (Y/N)

Comments:

Method for Determination of Specific Conductance

1.0 Scope and application

1.1 This method is applicable for the determination of specific conductance in surface, drinking, ground and saline waters, also domestic and industrial wastes.

1.2 This method is adapted from EPA Method 120.1 from EPA 600 4-79-020 and EPA SW 846 Method 9050, 1986.

2.0 Method Summary

2.1 Specific Conductance is measured using a YSI Model 3560 conductance meter equipped with a 1.0 cm platinum conductivity cell. Results are reported as umho/cm at 25 degrees C.

2.2 It is preferable that samples be analyzed near 25 degrees C. This is usually not practical. With the YSI 3560 temperature compensated conductivity is automatically corrected to 25 degrees C with a temperature coefficient of 2% per degrees C.

3.0 Reagents

3.1 1.00 N KCl standard solution - dissolve 74.560 grams of anhydrous (pre-dried for 2 hours @ 105 degrees C). Potassium Chloride in 1000 ml of laboratory deionized water at 20 degrees C.

3.2 0.01 N KCl standard solution - prepare fresh weekly by diluting 10.0 ml of KCl stock solution to 1000 ml with deionized water. Mix thoroughly. This solution will be labelled and stored in a 1 liter amber bottle at room temperature.

3.3 Purchased certified standards can also be used with various standards prepared from stock standards (initial 5 point standard curve will be prepared from 100, 180, 1000, 1990 and 9989 umho/cm standards).

3.4 Lab deionized water

3.5 Conductivity cell cleaning solution - prepare 100 mls of 10 N HCL by carefully adding 83 ml of concentrated HCl to 17 ml of deionized water. Mix the 10 N HCl 1:1 with Isopropyl Alcohol. Clean the electrode in the cleaning solution for 2 minutes. Rinse thoroughly with deionized water. Air dry before use.

3.6 Date of preparation should be placed on each standard container and known value.

4.0 Apparatus

4.1 YSI Model 3560 conductivity meter

4.2 YSI Model 3520 conductivity cell (1.0 cm cell constant)

4.3 75 ml disposable polyethylene containers

4.4 500 ml serial rinsing flasks

4.5 YSI thermistor or laboratory thermometer (0.5 degrees C)

5.0 Calibration

5.1 The meter must be calibrated at the beginning of each analytical run, using the 0.01 N KCl standard (1413 umho/cm @ 25 degrees C) or other designated standard prepared from certified stock standards purchased from a lab supply company.

5.2 Analyze the standard using the procedure outlined in 6.0.

5.3 Calculate the results and the % recovery for the standard. If the results are not within 10% of the known value, re-analyze an additional aliquot of the standard. If this value is not within specifications, prepare a fresh calibration standard and analyze. If values fail to come within specifications, replace the conductivity probe (YSI 3520) and re-calibrate; also check batteries.

5.4 Analyze the standard every 10 samples or every 4 hours, whichever is sooner, and at the end of each analytical run. Record the values obtained and the % recovery.

6.0 Procedure

6.1 Allow samples and standards to equilibrate prior to analysis.

6.2 Set up 2 clean rinsing flasks, fill with deionized water. Dump and replace the rinse water every 10 determinations.

6.3 Mix the sample thoroughly prior to analysis.

6.4 Dispense an aliquot of the sample into a clean polyethylene container.

6.5 Rinse the thermometer thoroughly with deionized water. Blot dry with a clean paper towel. Measure and record the temperature of the sample in degrees C.

6.6 Rinse the conductivity cell thoroughly by serial rinsing in deionized water. Blot dry.

6.7 Immerse the cell into the sample several times expelling all air through the vent. Allow the solution to stabilize.

6.8 Rotate the range switch to the lowest range position that yields an "On scale" reading. Record the conductance value (Km).

6.9 Note: An over-range reading is indicated by a "1" followed by blanks.

6.10 Record the ranged (MV or UMV) used to obtain the Km value. Km = (measured conductance)

6.11 All samples are analyzed in duplicate or quadruplicate as required.

6.12 Rinse both the thermometer and the conductivity cell thoroughly between samples.

7.0 Quality Control

7.1 All samples are analyzed in duplicate or quadruplicate as required.

7.2 A 0.01 M KCl (1413 umho/cm @ 25 degrees C) or other prepared check standard is analyzed every 10 samples or every 4 hours, whichever is sooner, and at the end of the run. The percent recovery is also calculated.

where: % recovery = (observed umho/cm @ 25 C / check standard value @ 25 C)(100)

If the results of the check standard are not within 10% of the known value, re-analyze or prepare a new aliquot (see Section 5.3).

7.3 Prepare a 5 point calibration plot every three months preferably at the beginning of the quarter.

7.4 Check three points on the quarterly plot every month. If % recovery is out by more than 10%; re-calibrate, prepare new standards, check stock standard. Replace probe if necessary.

7.5 Standard Graph

8.0 Calculation

8.1 If the standards and check standards check out, report the results in whole numbers as follows:

umhos/cm	Report to nearest
1-100	1
101-2000	5
2001-5000	10
5001-20,000	100
> 20,000	1,000

9.0 Format of Calibration Logbook

Date _____ Site Name _____

Time initial calibration _____ Analyst _____

Analysis time _____

Standard known value _____

Standard prep. date _____

Temperature, degrees C _____

Instrument range _____

Value observed _____

Percent recovery* _____

Comments _____

* Percent recovery = (Observed um/cm / check standard value)(100)

Appendix IV
SHIPPING AIR BILLS

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SENDER'S COPY

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER — Date 3/29/95

From (Your Name) Please Print: Albert A Plesa — Your Phone Number (Very Important): (206) 764 9450

Company: Rhone Poulenc — Department/Floor No.

Street Address: 9229 E Marginal Way S.

City: Tukwila — State — ZIP Required: 98108

2 To (Recipient's Name) Please Print: Jeff Grover — Recipient's Phone Number (Very Important): (713) [illegible]

Company: Peak Analytical — Department/Floor No.

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 3401 E Broadway

City: Pasadena — State: Tx — ZIP Required: 77581

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here — Street Address — City — State — ZIP Required

3 PAYMENT 1 [ ] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [X] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check — Acct./Credit Card No. 1009-9942-8 — Exp. Date /

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Economy Two-Day (Delivery by second business day †): 30 [ ] ECONOMY** — *Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Government Overnight (Restricted for authorized users only): 46 [ ] GOVT LETTER; 41 [ ] GOVT PACKAGE

Freight Service (for packages over 150 lbs.): 70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required); 80 [ ] TWO-DAY FREIGHT**

†Delivery commitment may be later in some areas. *Declared Value Limit $500. **Call for delivery schedule.

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PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1		
Total	Total 27	Total

DIM SHIPMENT (Chargeable Weight): ~~X~~ 0 lbs. — 24 x 18 x 14

Received At: 1 [ ] Regular Stop; 2 [ ] On-Call Stop; 3 [ ] Drop Box; 4 [ ] B.S.C.; 5 [ ] Station

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Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

7 Release Signature: [illegible]

Federal Express: Base Charges; Declared Value Charge; Other 1; Other 2; Total Charges

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Company: Rhone Poulenc — Department/Floor No.

Street Address: 9229 E Marginal Way South

City: Tukwila — State: Wa — ZIP Required: 98108

2 To (Recipient's Name) Please Print: Sam Kerman — Recipient's Phone Number (Very Important): (619) [illegible]

Company: Maxwell 5 Cabot Lab — Department/Floor No.

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 8808 Miller Ave.

City: San Diego — State: Ca — ZIP Required: 92123-[illegible]

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here — Street Address — City — State — ZIP Required

3 PAYMENT 1 [ ] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [X] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check — Acct./Credit Card No. 1009-9942-8 — Exp. Date /

4 SERVICES (Check only one box)

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Freight Service (for packages over 150 lbs.): 70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required); 80 [ ] TWO-DAY FREIGHT**

†Delivery commitment may be later in some areas. *Declared Value Limit $500. **Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service: 1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H); 2 [X] DELIVER WEEKDAY

Saturday Service: 31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H); 3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations); 9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling: 4 [ ] DANGEROUS GOODS (Extra charge); 6 [ ] DRY ICE — Dangerous Goods Shipper's Declaration not required — Dry Ice, 9, UN 1845 ____ X ____ kg. 904 III; [ ] DESCRIPTION; 12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1		
Total	Total 30	Total

DIM SHIPMENT (Chargeable Weight): ~~X~~ 0 lbs. — 24 x 18 x 14

Received At: 1 [ ] Regular Stop; 2 [ ] On-Call Stop; 3 [ ] Drop Box; 4 [ ] B.S.C.; 5 [X] Station

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this airbill constitutes your agreement to the service conditions in our current Service Guide, available upon request. See back of sender's copy of this airbill for information. Service conditions may vary for Government Overnight Service. See U.S. Government Service Guide for details.

We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, and document your actual loss for a timely claim. Limitations found in the current Federal Express Service Guide apply. Your right to recover from Federal Express for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the declared value specified to the left. Recovery cannot exceed actual documented loss. The maximum Declared Value for FedEx Letter and FedEx Pak packages is $500.

In the event of untimely delivery, Federal Express will at your request and with some limitations refund all transportation charges paid. See Service Guide for further information.

Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

7 Release Signature: [illegible]

Federal Express: Base Charges; Declared Value Charge; Other 1; Other 2; Total Charges

REVISION DATE 4/94 PART #145413 FORMAT #160 — 160

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FedEx Federal Express

USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

PACKAGE TRACKING NUMBER 4886358374

4886358374

SENDER'S COPY

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER — Date 3/29/95

From (Your Name) Please Print: Albert Plena — Your Phone Number (Very Important): (206) 764 4450
Company: Rhone Poulenc — Department/Floor No.
Street Address: 9229 E Marginal Way South
City: Tukwila — State: Wa — ZIP Required: 98108

2 To (Recipient's Name) Please Print: Sample Receiving — Recipient's Phone Number (Very Imp: (415) 964-USC
Company: Pace Mid-Pacific — Department/Floor
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 625-B Clyde Ave
City: Mountainview — State: Ca — ZIP Required: 94043

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here: Street Address — City — State — ZIP Required

3 PAYMENT 1 [ ] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [X] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check
Acct./Credit Card No. 1209-9540-8 Exp. Date /

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning†)
11 [X] OTHER PACKAGING
16 [ ] FEDEX LETTER*
12 [ ] FEDEX PAK*
13 [ ] FEDEX BOX
14 [ ] FEDEX TUBE

Standard Overnight (Delivery by next business afternoon. No Saturday delivery†)
51 [ ] OTHER PACKAGING
56 [ ] FEDEX LETTER*
52 [ ] FEDEX PAK*
53 [ ] FEDEX BOX
54 [ ] FEDEX TUBE

Economy Two-Day (Delivery by second business day †)
30 [ ] ECONOMY*
* Economy Letter Rate not available. Minimum charge. One pound Economy rate.

Government Overnight (Restricted for authorized users only)
46 [ ] GOVT LETTER
41 [ ] GOVT PACKAGE

Freight Service (for packages over 150 lbs.)
70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required)
80 [ ] TWO-DAY FREIGHT**
† Delivery commitment may be later in some areas.
*Declared Value Limit $500.
**Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service
1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H)
2 [X] DELIVER WEEKDAY

Saturday Service
31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H)
3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations)
9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling
4 [ ] DANGEROUS GOODS (Extra charge)
6 [ ] DRY ICE Dangerous Goods Shipper's Declaration not required
Dry Ice 9 UN 1845 ____ X ____ kg. 904 III
[ ] DESCRIPTION
12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

6

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1	62	
1	58	
Total 2	Total	Total

DIM SHIPMENT (Chargeable Weight) [ ] ____ lbs. L x W x H

Received At: 1 [ ] Regular Stop 2 [ ] On-Call Stop 3 [ ] Drop Box 4 [ ] B.S.C. 5 [X] Station

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

Use of this airbill constitutes your agreement to the service conditions in our current Service Guide, available upon request. See back of sender's copy of this airbill for information. Service conditions may vary for Government Overnight Service. See U.S. Government Service Guide for details.

We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, and document your actual loss for a timely claim. Limitations found in the current Federal Express Service Guide apply. Your right to recover from Federal Express for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the declared value specified to the left. Recovery cannot exceed actual documented loss. The maximum Declared Value for FedEx Letter and FedEx Pak packages is $500.

In the event of untimely delivery, Federal Express will at your request and with some limitations refund all transportation charges paid. See Service Guide for further information.

Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

7 Release Signature: [signature]

Federal Express U: — Base Charges — Declared Value Char — Other 1 — Other 2 — Total Charges

REVISION DATE 4/94 PART #145413 FORMAT #160 160 © 1993-94 FEDEX PRINTED IN U.S.A.

FedEx Federal Express

USE THIS AIRBILL FOR SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL PACKAGE TRACKING NUMBER 4886358341

4886358341

SENDER'S COPY

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER — Date 3-30

From (Your Name) Please Print: Al Plena — Your Phone Number (Very Important): (206) 764-4450
Company: Rhone Poulenc — Department/Floor No.
Street Address: 9229 E Marginal Way South
City: Tukwila — State: Wa — ZIP Required: 98108

2 To (Recipient's Name) Please Print: John Dewald — Recipient's Phone Number (Very Imp: (619) 637-74
Company: Maxwell S-Cubed Lab — Department/Floor
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 8808 Balboa Ave
City: San Diego — State: Ca — ZIP Required: 92123-1506

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here: Street Address — City — State — ZIP Required

3 PAYMENT 1 [ ] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [X] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check
Acct./Credit Card No. 1209-9540-8 Exp. Date /

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning†)
11 [X] OTHER PACKAGING
16 [ ] FEDEX LETTER*
12 [ ] FEDEX PAK*
13 [ ] FEDEX BOX
14 [ ] FEDEX TUBE

Standard Overnight (Delivery by next business afternoon. No Saturday delivery†)
51 [ ] OTHER PACKAGING
56 [ ] FEDEX LETTER*
52 [ ] FEDEX PAK*
53 [ ] FEDEX BOX
54 [ ] FEDEX TUBE

Economy Two-Day (Delivery by second business day †)
30 [ ] ECONOMY*
* Economy Letter Rate not available. Minimum charge. One pound Economy rate.

Government Overnight (Restricted for authorized users only)
46 [ ] GOVT LETTER
41 [ ] GOVT PACKAGE

Freight Service (for packages over 150 lbs.)
70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required)
80 [ ] TWO-DAY FREIGHT**

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service
1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H)
2 [X] DELIVER WEEKDAY

Saturday Service
31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H)
3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations)
9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling
4 [ ] DANGEROUS GOODS (Extra charge)
6 [ ] DRY ICE Dangerous Goods Shipper's Declaration not required
Dry Ice 9 UN 1845 ____ X ____ kg. 904 III
[ ] HOLIDAY DELIVERY (If offered)

6

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1		
Total 1	Total 19	Total

DIM SHIPMENT (Chargeable Weight) [ ] ____ lbs. L x W x H

Received At: 1 [ ] Regular Stop 3 [ ] Drop Box 4 [ ] B.S.C.

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

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We will not be responsible for any claim in excess of $100 per package, whether the result of loss, damage, delay, non-delivery, misdelivery, or misinformation, unless you declare a higher value, pay an additional charge, and document your actual loss for a timely claim. Limitations found in the current Federal Express Service Guide apply. Your right to recover from Federal Express for any loss, including intrinsic value of the package, loss of sales, income interest, profit, attorney's fees, costs, and other forms of damage whether direct, incidental, consequential, or special is limited to the greater of $100 or the declared value specified to the left. Recovery cannot exceed actual documented loss. The maximum Declared Value for FedEx Letter and FedEx Pak packages is $500.

In the event of untimely delivery, Federal Express will at your request and with some limitations refund all transportation charges paid. See Service Guide for further information.

Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

7 Release

Federal Express — Base Charges — Declared Value Char — Other 1 — Other 2 — Total Charges

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FedEx Federal Express

USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

PACKAGE TRACKING NUMBER 4886358330

4886358330

SENDER'S COPY

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER — Date 3/30/95

From (Your Name) Please Print: Al Pleva — Your Phone Number (Very Important): (206) 764 4450

Company: Rhone Poulenc — Department/Floor No.

Street Address: 9229 E Marginal Way

City: Tukwila, Wa — State — ZIP Required: 98108

2 To (Recipient's Name) Please Print: Sample Receiving — Recipient's Phone Number (Very Important): (415) 964-084

Company: Pacc Mid Pacific — Department/Floor

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 625-B Clyde Ave

City: Mountainview — State: Ca — ZIP Required: 94043

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here — Street Address — City — State — ZIP Required

3 PAYMENT 1 [ ] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [X] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check — Acct./Credit Card No. 1009-9840-8 — Exp. Date

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning): 11 [X] OTHER PACKAGING; 16 [ ] FEDEX LETTER*; 12 [ ] FEDEX PAK*; 13 [ ] FEDEX BOX; 14 [ ] FEDEX TUBE

Standard Overnight (Delivery by next business afternoon. No Saturday delivery): 51 [ ] OTHER PACKAGING; 56 [ ] FEDEX LETTER*; 52 [ ] FEDEX PAK*; 53 [ ] FEDEX BOX; 54 [ ] FEDEX TUBE

Economy Two-Day (Delivery by second business day †): 30 [ ] ECONOMY*

* Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Government Overnight (Restricted for authorized users only): 46 [ ] GOVT LETTER; 41 [ ] GOVT PACKAGE

Freight Service (for packages over 150 lbs.): 70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required); 80 [ ] TWO-DAY FREIGHT**

† Delivery commitment may be later in some areas. *Declared Value Limit $500. **Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service: 1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H); 2 [X] DELIVER WEEKDAY

Saturday Service: 31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H); 3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations); 9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling: 4 [ ] DANGEROUS GOODS (Extra charge); 6 [ ] DRY ICE — Dangerous Goods Shipper's Declaration not required — Dry Ice, 9, UN 1845 ____ x ____ kg. 904 III — DESCRIPTION; 12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1	43	
1	71	
1	61	
Total 3	Total 172	Total

DIM SHIPMENT (Chargeable Weight) [ ] ____ lbs. L x W x H

Received At: 1 [ ] Regular Stop 2 [ ] On-Call Stop 3 [ ] Drop Box 4 [ ] B.S.C. 5 [ ] Station

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

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In the event of untimely delivery, Federal Express will at your request and with some limitations refund all transportation charges paid. See Service Guide for further information.

Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

7 Release Signature

Federal Express: Base Charges; Declared Value Char; Other 1; Other 2; Total Charges

REVISION DATE 4/94 PART #145413 FORMAT #160 160

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FedEx Federal Express

USE THIS AIRBILL FOR SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL PACKAGE TRACKING NUMBER 4886358352

4886358352

SENDER'S COPY

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER — Date 3/30/95

From (Your Name) Please Print: Al Pleva — Your Phone Number (Very Important): (206) 764 4450

Company: Rhone Poulenc — Department/Floor No.

Street Address: 9229 E Marginal Way South

City: Tukwila — State: Wa — ZIP Required: 98108

2 To (Recipient's Name) Please Print: Jeff Brewer — Recipient's Phone Number (Very I: (713) 485-8

Company: Peak Analytical — Department/Flo

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 3401 East Broadway

City: Pearland — State: Tx — ZIP Required: 77581

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.): Rhone Poulenc Seattle Hex Cr

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here — Street Address — City — State — ZIP Required

3 PAYMENT 1 [ ] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [X] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check — Acct./Credit Card No. 1009-9840-8 — Exp. Date

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning): 11 [X] OTHER PACKAGING; 16 [ ] FEDEX LETTER*; 12 [ ] FEDEX PAK*; 13 [ ] FEDEX BOX; 14 [ ] FEDEX TUBE

Standard Overnight (Delivery by next business afternoon. No Saturday delivery): 51 [ ] OTHER PACKAGING; 56 [ ] FEDEX LETTER*; 52 [ ] FEDEX PAK*; 53 [ ] FEDEX BOX; 54 [ ] FEDEX TUBE

Economy Two-Day (Delivery by second business day †): 30 [ ] ECONOMY*

* Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Government Overnight (Restricted for authorized users only): 46 [ ] GOVT LETTER; 41 [ ] GOVT PACKAGE

Freight Service (for packages over 150 lbs.): 70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required); 80 [ ] TWO-DAY FREIGHT**

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service: 1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H); 2 [X] DELIVER WEEKDAY

Saturday Service: 31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H); 3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations); 9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling: 4 [ ] DANGEROUS GOODS (Extra charge); 6 [ ] DRY ICE — Dangerous Goods Shipper's Declaration not required — Dry Ice, 9, UN 1845 ____ x ____ kg. 904 III; 12 [ ] HOLIDAY DELIVERY (If offered)

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1		
Total 1	Total 21	Total

DIM SHIPMENT (Chargeable Weight) [ ] ____ lbs. L x W x H

Received At: 1 [ ] Regular Stop 3 [ ] Drop Box 4 [ ] B.S.C.

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

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In the event of untimely delivery, Federal Express will at your request and with some limitations refund all transportation charges paid. See Service Guide for further information.

Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

7 Release

Federal Express: Base Charges; Declared Value Cha; Other 1; Other 2; Total Charges

REVISION DATE 4-9 PART #145413 FORMAT #160 160

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FedEx Federal Express

USE THIS AIRBILL FOR SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL PACKAGE TRACKING NUMBER 4886358304

4886358304

SENDER'S COPY

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER — Date: 3/31/95

From (Your Name) Please Print: Al Pleva — Your Phone Number (Very Important): ( )
Company: Rhone Poulenc — Department/Floor No.
Street Address: 9229 E Marginal Way South
City: Tukwila — State: Wa — ZIP Required: 98108

2 To (Recipient's Name) Please Print: JEFF Brewer — Recipient's Phone Number (Very Important): (713) 455-51
Company: Peak Analytical — Department/Floor
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 3401 E Broadway
City: PEARLAND, TX — State — ZIP Required: 77581

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.): Rhone Poulenc South - Hex Cr

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here: Street Address — City — State — ZIP Required

3 PAYMENT: 1 [ ] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [X] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check — Acct./Credit Card No. 1209-9340-8 — Exp. Date

4 SERVICES (Check only one box)
- Priority Overnight (Delivery by next business morning†): 11 [X] OTHER PACKAGING; 16 [ ] FEDEX LETTER*; 12 [ ] FEDEX PAK*; 13 [ ] FEDEX BOX; 14 [ ] FEDEX TUBE
- Standard Overnight (Delivery by next business afternoon. No Saturday delivery†): 51 [ ] OTHER PACKAGING; 56 [ ] FEDEX LETTER*; 52 [ ] FEDEX PAK*; 53 [ ] FEDEX BOX; 54 [ ] FEDEX TUBE
- Economy Two-Day (Delivery by second business day †): 30 [ ] ECONOMY* — * Economy Letter Rate not available. Minimum charge: One pound Economy rate.
- Government Overnight (Restricted for authorized users only): 46 [ ] GOVT LETTER; 41 [ ] GOVT PACKAGE
- Freight Service (for packages over 150 lbs.): 70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required); 80 [ ] TWO-DAY FREIGHT**
- † Delivery commitment may be later in some areas. *Declared Value Limit $500. **Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)
- Weekday Service: 1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H); 2 [ ] DELIVER WEEKDAY
- Saturday Service: 31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H); 3 [X] DELIVER SATURDAY (Extra charge) (Not available to all locations); 9 [ ] SATURDAY PICK-UP (Extra charge)
- Special Handling: 4 [ ] DANGEROUS GOODS (Extra charge); 6 [ ] DRY ICE Dangerous Goods Shipper's Declaration not required — Dry Ice 9, UN 1845 ____ X ____ kg. 904 III; [ ] DESCRIPTION
- 12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

6

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1	25	
Total 1	Total 25	Total

DIM SHIPMENT (Chargeable Weight): [ ] ____ lbs. L x W x H

Received At: 1 [ ] Regular Stop 2 [ ] On-Call Stop 3 [ ] Drop Box 4 [ ] B.S.C. 5 [X] Station

SERVICE CONDITIONS, DECLARED VALUE AND LIMIT OF LIABILITY

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In the event of untimely delivery, Federal Express will at your request and with some limitations refund all transportation charges paid. See Service Guide for further information.

7 Sender authorizes Federal Express to deliver this shipment without obtaining a delivery signature and shall indemnify and hold harmless Federal Express from any claims resulting therefrom.

Release Signature: Al Pleva

Federal Express Use: Base Charges; Declared Value Charge; Other 1; Other 2; Total Charges

REVISION DATE 4/94 PART #145413 FORMAT #160 — 160 — © 1993-94 FEDEX PRINTED IN U.S.A.

FedEx Federal Express

USE THIS AIRBILL FOR SHIPMENTS WITHIN THE CONTINENTAL U.S.A., ALASKA AND HAWAII.
USE THE INTERNATIONAL AIR WAYBILL FOR SHIPMENTS TO PUERTO RICO AND ALL NON U.S. LOCATIONS.
QUESTIONS? CALL 800-238-5355 TOLL FREE.

AIRBILL PACKAGE TRACKING NUMBER 4886358326

4886358326

SENDER'S COPY

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER — Date: 3/31/95

From (Your Name) Please Print: Al Pleva — Your Phone Number (Very Important): ( )
Company: Rhone Poulenc — Department/Floor No.
Street Address: 9229 E Marginal Way South
City: Tuckwila, Wa — State — ZIP Required: 98108

2 To (Recipient's Name) Please Print: Sample Receiving — Recipient's Phone Number (Very Important): (415) 964-
Company: Pace Mid Pacific — Department/Floor
Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 625 B - Clyde Ave
City: Mountain view — State: Ca — ZIP Required: 94043

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here: Street Address — City — State — ZIP Required

3 PAYMENT: 1 [ ] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [X] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check — Acct./Credit Card No. 1209-9840-8 — Exp. Date

4 SERVICES (Check only one box)
- Priority Overnight (Delivery by next business morning†): 11 [X] OTHER PACKAGING; 16 [ ] FEDEX LETTER*; 12 [ ] FEDEX PAK*; 13 [ ] FEDEX BOX; 14 [ ] FEDEX TUBE
- Standard Overnight (Delivery by next business afternoon. No Saturday delivery†): 51 [ ] OTHER PACKAGING; 56 [ ] FEDEX LETTER*; 52 [ ] FEDEX PAK*; 53 [ ] FEDEX BOX; 54 [ ] FEDEX TUBE
- Economy Two-Day (Delivery by second business day †): 30 [ ] ECONOMY* — * Economy Letter Rate not available. Minimum charge: One pound Economy rate.
- Government Overnight (Restricted for authorized users only): 46 [ ] GOVT LETTER; 41 [ ] GOVT PACKAGE
- Freight Service (for packages over 150 lbs.): 70 [ ] OVERNIGHT FREIGHT**; 80 [ ] TWO-DAY FREIGHT**

5 DELIVERY AND SPECIAL HANDLING (Check services required)
- Weekday Service: 1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H); 2 [ ] DELIVER WEEKDAY
- Saturday Service: 31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H); 3 [X] DELIVER SATURDAY (Extra charge) (Not available to all locations); 9 [ ] SATURDAY PICK-UP (Extra charge)
- Special Handling: 4 [ ] DANGEROUS GOODS (Extra charge); 6 [ ] DRY ICE Dangerous Goods Shipper's Declaration not required — Dry Ice 9, UN 1845 ____ X ____ kg. 904 III; [ ] DESCRIPTION

6

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1	71	
1	33	
1	70	
Total 3	Total 174	Total

DIM SHIPMENT (Chargeable Weight): [ ] ____ lbs. L x W x H

Received At: 1 [ ] Regular Stop 3 [ ] Drop Box

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PACKAGE TRACKING NUMBER 4886358315

4886358315

SENDER'S COPY

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER — Date: 3-31-95

From (Your Name) Please Print: Al [illegible] — Your Phone Number (Very Important): (206) 764 4450

Company: Rhone Poulenc — Department/Floor No.:

Street Address: 9229 E Marginal Way South

City: Tukwila — State: Wa — ZIP Required: 98108

2 To (Recipient's Name) Please Print: John Donald — Recipient's Phone Number (Very Imp): (619) 637.7

Company: Maxwell S-Cubed lab — Department/Flo

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 8808 Balboa Ave

City: SAN Diego — State: Ca — ZIP Required: 92123-15

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here — Street Address: — City: — State: — ZIP Required:

3 PAYMENT 1 [ ] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [X] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check — Acct./Credit Card No. 1009 9540-8 — Exp. Date

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning): 11 [X] OTHER PACKAGING; 16 [ ] FEDEX LETTER*; 12 [ ] FEDEX PAK*; 13 [ ] FEDEX BOX; 14 [ ] FEDEX TUBE

Standard Overnight (Delivery by next business afternoon. No Saturday delivery†): 51 [ ] OTHER PACKAGING; 56 [ ] FEDEX LETTER*; 52 [ ] FEDEX PAK*; 53 [ ] FEDEX BOX; 54 [ ] FEDEX TUBE

Economy Two-Day (Delivery by second business day †): 30 [ ] ECONOMY**
* Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Government Overnight (Restricted for authorized users only): 46 [ ] GOVT LETTER; 41 [ ] GOVT PACKAGE

Freight Service (for packages over 150 lbs.): 70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required); 80 [ ] TWO-DAY FREIGHT**
† Delivery commitment may be later in some areas. *Declared Value Limit $500. **Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service: 1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H); 2 [ ] DELIVER WEEKDAY

Saturday Service: 31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H); 3 [X] DELIVER SATURDAY (Extra charge) (Not available to all locations); 9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling: 4 [ ] DANGEROUS GOODS (Extra charge); 6 [ ] DRY ICE Dangerous Goods Shipper's Declaration not required — Dry Ice, 9, UN 1845 ____ X ____ kg. 904 III; [ ] DESCRIPTION; 12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1	25	
Total	Total	Total
1	25	

DIM SHIPMENT (Chargeable Weight) [ ] ____ lbs. L x W x H

Received At: 1 [ ] Regular Stop; 2 [ ] On-Call Stop; 3 [ ] Drop Box; 4 [ ] B.S.C.; 5 [X] Station

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AIRBILL PACKAGE TRACKING NUMBER 4886358385

4886358385

SENDER'S COPY

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER — Date: 3/29/95

From (Your Name) Please Print: Al [illegible] — Your Phone Number (Very Important): ( )

Company: Rhone Poulenc — Department/Floor No.:

Street Address: 9229 E Marginal way South

City: Tuckwila — State: Wa — ZIP Required: 98108

2 To (Recipient's Name) Please Print: Sample Receiving — Recipient's Phone Number (Very I: (504) 469-03

Company: PACE Inc — Department/Fl

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 161 James Drive West

City: ST Rose — State: La — ZIP Required: 70087

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here — Street Address: — City: — State: — ZIP Required:

3 PAYMENT 1 [ ] Bill Sender 2 [ ] Bill Recipient's FedEx Acct. No. 3 [X] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check — Acct./Credit Card No. 1009-9540-8 — Exp. Date

4 SERVICES (Check only one box)

Priority Overnight (Delivery by next business morning): 11 [X] OTHER PACKAGING; 16 [ ] FEDEX LETTER*; 12 [ ] FEDEX PAK*; 13 [ ] FEDEX BOX; 14 [ ] FEDEX TUBE

Standard Overnight (Delivery by next business afternoon. No Saturday delivery†): 51 [ ] OTHER PACKAGING; 56 [ ] FEDEX LETTER*; 52 [ ] FEDEX PAK*; 53 [ ] FEDEX BOX; 54 [ ] FEDEX TUBE

Economy Two-Day (Delivery by second business day †): 30 [ ] ECONOMY**
* Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Government Overnight (Restricted for authorized users only): 46 [ ] GOVT LETTER; 41 [ ] GOVT PACKAGE

Freight Service (for packages over 150 lbs.): 70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required); 80 [ ] TWO-DAY FREIGHT**

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service: 1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H); 2 [X] DELIVER WEEKDAY

Saturday Service: 31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H); 3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations); 9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling: 4 [ ] DANGEROUS GOODS (Extra charge); 6 [ ] DRY ICE Dangerous Goods Shipper's Declaration not required — Dry Ice, 9, UN 1845 ____ X ____ kg. 904 III; [ ] HOLIDAY DELIVERY (If offered)

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1		
Total	Total	Total
1	13	

DIM SHIPMENT (Chargeable Weight) [X] 13 lbs. L x W x H

Received At: 1 [ ] Regular Stop; 3 [ ] Drop Box; 4 [ ] B.S.C.

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7 Release [signature]

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PACKAGE TRACKING NUMBER 3962482904

3962482904

SENDER'S COPY

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER — Date 3/28/95

From (Your Name) Please Print: Albert Pleva — Your Phone Number (Very important): (206) 764 4450

Company: Rhone Poulenc — Department/Floor No.

Street Address: 9229 E Marginal Way South

City: Tukwila — State: WA — ZIP Required: 98108

2 To (Recipient's Name) Please Print: Sample Receiving — Recipient's Phone Number (Very Impo): (504) 469-033

Company: PACE Inc. — Department/Floor

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 161 James Drive West

City: St Rose — State: La — ZIP Required: 70087

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.): Rhone Poulenc Seattle PCBs

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here — Street Address — City — State — ZIP Required

3 PAYMENT 1 [ ] Bill Sender 2 [X] Bill Recipient's FedEx Acct. No. 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check — Acct./Credit Card No. 1009-9840-8 — Exp. Date /

4 SERVICES (Check only one box)

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Standard Overnight (Delivery by next business afternoon. No Saturday delivery†): 51 [ ] OTHER PACKAGING; 56 [ ] FEDEX LETTER*; 52 [ ] FEDEX PAK*; 53 [ ] FEDEX BOX; 54 [ ] FEDEX TUBE

Economy Two-Day (Delivery by second business day †): 30 [ ] ECONOMY*

Government Overnight (Restricted for authorized users only): 46 [ ] GOV'T LETTER; 41 [ ] GOV'T PACKAGE

*Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Freight Service (for packages over 150 lbs.): 70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required); 80 [ ] TWO-DAY FREIGHT**

†Delivery commitment may be later in some areas. *Declared Value Limit $500. **Call for delivery schedule.

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service: 1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H); 2 [X] DELIVER WEEKDAY

Saturday Service: 31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H); 3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations); 9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling: 4 [ ] DANGEROUS GOODS (Extra charge); 6 [ ] DRY ICE Dangerous Goods Shipper's Declaration not required — Dry Ice, 9, UN 1845 ____ X ____ kg. 904 III; [ ] DESCRIPTION; 12 [ ] HOLIDAY DELIVERY (If offered) (Extra charge)

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1	19	
Total	Total 19	Total

DIM SHIPMENT (Chargeable Weight) [ ] ____ lbs. L x W x H

Received At: 1 [ ] Regular Stop; 2 [ ] On-Call Stop; 3 [ ] Drop Box; 4 [ ] B.S.C.; 5 [ ] Station

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7 Release Signature: [signature]

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AIRBILL PACKAGE TRACKING NUMBER 4790523091

4790523091

3/28 9:10 AM R. Hernandez

SENDER'S COPY

1 SENDER'S FEDERAL EXPRESS ACCOUNT NUMBER — Date 3/27/95

From (Your Name) Please Print: Al Pleva — Your Phone Number (Very Important): (206) 764-4450

Company: Rhone Poulenc — Department/Floor No.

Street Address: 9229 E Marginal Way

City: Tukwila, — State: WA — ZIP Required:

2 To (Recipient's Name) Please Print: Sample Receiving — Recipient's Phone Number (Very Impo): (415) 961 0

Company: PACE Min Pacific — Department/Floor

Exact Street Address (We Cannot Deliver to P.O. Boxes or P.O. Zip Codes.): 625-B Clyde Ave

City: Mountainview — State: Ca — ZIP Required: 94043

YOUR INTERNAL BILLING REFERENCE INFORMATION (optional) (First 24 characters will appear on invoice.)

H IF HOLD AT FEDEX LOCATION, Print FEDEX Address Here — Street Address — City — State — ZIP Required

3 PAYMENT 1 [ ] Bill Sender 2 [X] Bill Recipient's FedEx Acct. No. 3 [ ] Bill 3rd Party FedEx Acct. No. 4 [ ] Bill Credit Card 5 [ ] Cash/Check — Acct./Credit Card No. 1009-9840-8 — Exp. Date /

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Priority Overnight (Delivery by next business morning†): 11 [X] OTHER PACKAGING; 16 [ ] FEDEX LETTER*; 12 [ ] FEDEX PAK*; 13 [ ] FEDEX BOX; 14 [ ] FEDEX TUBE

Standard Overnight (Delivery by next business afternoon. No Saturday delivery†): 51 [ ] OTHER PACKAGING; 56 [ ] FEDEX LETTER*; 52 [ ] FEDEX PAK*; 53 [ ] FEDEX BOX; 54 [ ] FEDEX TUBE

Economy Two-Day (Delivery by second business day †): 30 [ ] ECONOMY*

Government Overnight (Restricted for authorized users only): 46 [ ] GOV'T LETTER; 41 [ ] GOV'T PACKAGE

*Economy Letter Rate not available. Minimum charge: One pound Economy rate.

Freight Service (for packages over 150 lbs.): 70 [ ] OVERNIGHT FREIGHT** (Confirmed reservation required); 80 [ ] TWO-DAY FREIGHT**

5 DELIVERY AND SPECIAL HANDLING (Check services required)

Weekday Service: 1 [ ] HOLD AT FEDEX LOCATION WEEKDAY (Fill in Section H); 2 [X] DELIVER WEEKDAY

Saturday Service: 31 [ ] HOLD AT FEDEX LOCATION SATURDAY (Fill in Section H); 3 [ ] DELIVER SATURDAY (Extra charge) (Not available to all locations); 9 [ ] SATURDAY PICK-UP (Extra charge)

Special Handling: 4 [ ] DANGEROUS GOODS (Extra charge); 6 [ ] DRY ICE Dangerous Goods Shipper's Declaration not required — Dry Ice, 9, UN 1845 ____ X ____ kg. 904 III

PACKAGES	WEIGHT In Pounds Only	YOUR DECLARED VALUE (See right)
1		
Total 1	Total 7 lb	Total

DIM SHIPMENT (Chargeable Weight) [ ] ____ lbs. L x W x H

Received At: 1 [ ] Regular Stop; 3 [ ] Drop Box; 4 [ ] B.S.C.

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7 [signature]

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Appendix E
Seep Sampling Field Operations and Observations

Appendix E
Seep Sampling Field Operations and Observations

CH2M HILL staff conducted seep sampling at the Marginal Way Facility from April 18 to April 20, 1995. Sampling was conducted in accordance with the RFI Workplan (RPI, December 1993) and the seep sampling memorandum included in Appendix A. This appendix describes the seep sampling field operations and observations.

E.1 Preparation of Sampling Equipment

In addition to the standard equipment listed in the RFI Workplan, seep sampling equipment included foot-long sections of 2-inch-diameter polyvinyl chloride (PVC) pipe. These short pipe sections were used to collect and direct seep flow into the sample containers and to minimize the inclusion of sediments in the samples. Prior to sampling, PVC pipe sections were decontaminated using procedures for decontaminating aqueous sampling equipment with metals analyses, as outlined in the RFI Workplan. Each pipe section was decontaminated by sampling personnel in a staging area at the Facility. The pipe was wrapped in aluminum foil until use at the sampling station. Each pipe section was used only once.

E.2 Seep Reconnaissance

Prior to the collection of samples, a reconnaissance of Investigation Areas A11 (the Duwamish Waterway) and A12 (Slip No. 6) was performed to identify seeps suitable for sampling. The reconnaissance of Area A11 was conducted just before the minus-2-foot low tide on April 18, 1995, and that of Area 12 just before the minus-2-foot low tide on April 20, 1995. The reconnaissance of Area A11 consisted of walking over much of the intertidal area along the western portion of the Facility. Seep sampling stations in

Seep 3

Seep 3 was located at the base of the riprap approximately 40 feet east of seep 2. The location of this seep corresponds to the approximate location of Landau Associates' seep 3. The flow of seep 3 joined the flow of seep 2 and other seeps. Seep 3 was located downstream of seep 2 (and seep 4), although the measuring and sampling point of seep 3 was upstream of the confluence with other seeps. The elevation of seep 3 was slightly lower than the elevation of seep 2, at approximately elevation +1.5 feet. The water from seep 3 was slightly tinted light brown. The flow rate from seep 3 ranged from approximately 1 to 3 L/min.

Seep 4

Seep 4 was located at the base of the riprap approximately 20 feet north of seep 3. Flow from seep 4 joined with water from seeps 2, 3, and other seeps. The elevation of seep 4 was slightly higher than seeps 2 and 3, at approximately elevation +2.2 feet. The water flowing from seep 4 was clear. The flow rate from seep 4 was approximately 1 L/min.

Seep 5

Seep 5 was located at the base of riprap on Slip No. 6, approximately 10 feet west of the presumed location of former storm sewer outfall 5. The elevation of seep 5 was approximately 0 to +0.5 foot. The water flowing from seep 5 was clear. The flow rate from seep 5 was approximately 2 L/min.

Seep 6

Seep 6 was located at the base of riprap on Slip No. 6 approximately 20 feet east of the former location of a pier (no remains of the pier were observed). The elevation of seep 6 was

approximately 0 foot. The water flowing from seep 6 was clear. The flow rate from seep 6 was approximately 1 L/min.

Seep 7

Seep 7 was located at the base of riprap on Slip No. 6, approximately 15 feet west of the location of outfall 4. The elevation of seep 7 was approximately 0 foot. The water flowing from seep 7 was clear. The flow rate from seep 7 was approximately 0.5 L/min. A very large seep was located approximately 30 feet east of seep 7, between the locations of outfalls 3 and 4. This large seep appeared to have built a delta of fine sand out over the riprap.

E.4 Seep Sample Collection

Most of the seeps consisted of small rivulets seeping from a wider section of gently sloping bank material that consisted of either sediments or riprap. To sample this type of seep, a 1-foot section of PVC pipe was placed horizontally out from the bank so that seepage could be directed into sample containers. Seep samples 01-SP, 04-SP, 05-SP, 06-SP, and 07-SP were obtained using this technique.

Seep samples 02-SP and 03-SP were obtained by dipping sample containers directly into flow from the seep. Sample containers were dipped so that they received fresh flow from the seep and avoided pooled water from below the sampling area.

Sample collection at 02-SP was further modified because of the limited flow, as follows: after containers (VOAs) were filled directly from the seep, a small hole was dug and the remainder of the samples were obtained by dipping an unpreserved 250-ml polyethylene sample bottle into the water and then transferring the contents into the sample containers. A duplicate sample was taken from seep 2. Aliquots for volatile organics (volatiles), formaldehyde, and TOC were collected in VOAs. When the VOAs preserved with

hydrochloric acid (for volatiles analysis) were first filled with water from seep 2, they bubbled. Only the volatiles VOAs were preserved with hydrochloric acid. The four volatiles VOAs preserved with hydrochloric acid were emptied and refilled three times with seep water to rinse out the preservative. Some of the containers continued to have minor bubbling even after this rinsing. Four attempts were made to close the containers without incorporating bubbles by "topping off" the VOAs with seep water collected in the VOA cap. The field staff noted on the chain-of-custody sheet that some of the volatiles VOAs may have unavoidable bubbles so that the laboratory could carefully select the aliquots for volatiles analysis.

All samples were shipped by Federal Express to PACE Mid-Pacific Laboratories, Mountain View, California, on the day of sampling. The only exceptions were the hexavalent chromium samples that were shipped to Maxwell Laboratories, S-Cubed Division, San Diego, California.

E.5 Duwamish Waterway Sampling

Two water samples from the Duwamish Waterway were collected from a 12-foot rubber raft equipped with oars. The samples were collected from 12 feet below the water surface during an ebbing tide, so that freshwater flow was downstream. Mid-depth samples were obtained in the following manner: a precleaned amber glass bottle was attached to an extendable 15-foot fiberglass rod. The cap of the bottle was removed and a clean nitrile glove was stretched over the top of the bottle. A string was tied to the fingers of the glove and the assembly was lowered to a depth of approximately 12 feet below the water surface. The glove was then removed from the bottle by pulling on the string, and the bottle was allowed to fill completely with river water. The water was transferred from the amber bottle to the laboratory-prepared sample container. Sample 01-SW was obtained upstream of both the Facility and Slip No. 6, from approximately 30 feet offshore. Sample 02-SW was obtained at the downstream end of the Facility, approximately 30 feet offshore. The surface water sampling stations are shown in Figure 2-2 in Section 2 of this Memorandum.

E.6 Measurement of Field Parameters

Field samples were collected from seven seep and two surface water sampling sites and measured for the following parameters: salinity, dissolved oxygen, temperature, conductance, and pH. Salinity measurements were inadvertently missed for two samples (01-SP and 03-SP). Instruments were calibrated each morning before the start of sampling activities, as discussed in the RFI Workplan. Field instruments used included a salinity/conductivity/temperature meter (YSI model 3.3, serial number A795), a pH meter (Orion 250A, serial number 005298), and a dissolved oxygen meter (YSI model 151B, serial number 1372).

Field parameters were measured after sampling was complete. Seep parameters were measured directly in the seep or in a plastic cup placed in the flow stream of the seep as it poured from a PVC pipe section. Surface water field parameters were measured over the side of the boat by placing instrument probes directly in the water. The field parameter measurements are presented in Table 2-6 in Section 2 of this Memorandum.

sea1002B7A8.wp5

Appendix F
Sewer Sediment Sampling Field Operations and Observations

Appendix F

Sewer Sediment Sampling Field Operations and Observations

Initial reconnaissance for the sewer sediment sampling at the Marginal Way Facility took place on May 8, 1995. During that reconnaissance, locations for sampling the outfalls were confirmed. On May 19, 1995, an additional site visit determined which catch basins and manholes appeared to contain enough sediment to sample. The actual sewer sediment sampling occurred on May 24, May 25, and July 6, 1995. The following text describes the sewer sediment sampling in more detail.

F.1 Sampling Locations

The selection of sampling locations was based on the historical maps and drawings and on observations made during inspections of accessible catch basins and manholes in the sewer system. The sampling strategy for the storm sewer lines consisted of sampling as closely as possible to the outfall to obtain a representative sample of the sediments potentially discharged to surface water and nearby sediments. The sampling strategy for the other sewer lines consisted of obtaining at least one representative sample from a line or a series of lines that drained each process area. The process sewer lines previously operated as a closed system, with the ability to discharge from selected areas to the storm sewers during periods of high flow. Portions of the storm sewer piping were later incorporated into the process sewer system when the storm outfalls were closed. Plant personnel reversed the gradient in these lines by pumping through pipes that originally had gravity flow.

F.2 Sample Collection

Sewer sediment samples were obtained from residual sediments that had accumulated in the bottom of catch basins, manholes, or sewer pipes. Samples obtained directly from sewer pipes were accessed either through the manhole or from a broken pipe in a backhoe

excavation. The sampling points are listed in Table 2-7 in Section 2 of this Memorandum. Field descriptions of the sewer sediment samples are provided in Table F-1.

Sediment was removed from each catch basin, manhole, or pipe with a stainless-steel scoop. The scoop was attached to the end of a 12-foot-long extendable fiberglass pole to access sediment at depths greater than 2 feet below ground surface.

Sediment was placed in a decontaminated stainless-steel bowl and mixed with either the sampling scoop or a stainless-steel spoon until visibly homogeneous. Sediment submitted for the BTEX (benzene, toluene, ethylbenzene, and xylenes) aliquot was not homogenized but instead was placed directly from the sample point into the laboratory-prepared sample jar. Once mixed, the homogeneous sample material was transferred to laboratory-prepared, pre-labeled sample jars with Teflon-lined lids. All filled sample jars were stored in a chilled cooler at 4°C until delivered to the laboratory. After each sample was taken, the scoops, spoons, and bowls were decontaminated in the field following the procedures for decontaminating aqueous sampling equipment outlined in Section 5.6.4 of the RFI Workplan.

Air was monitored at the top of the catch basin, manhole, or in the excavation using an OVA (Foxboro 280, serial number A42183). All OVA readings were background readings.

F.3 Test Pits

RPI excavated two test pits in attempts to locate the pipe to outfall 2. A test pit extending to approximately 10 feet below the ground surface was excavated at the southern fence line above the anticipated location of outfall 2. No pipe was found, and the test pit was backfilled with the original material. A second test pit was excavated approximately 55 feet north of the first test pit at the northwest corner of the concrete foundation. The second test pit was extended to a depth of approximately 4 feet below the ground surface. At that depth, two intact pipes were found: a 4-inch-diameter cement concrete pipe trending approximately north-south, and a 4-inch-diameter clay pipe trending approximately east-west. The outfall pipe is indicated on historical maps as "8-inch V.C." (8-inch-diameter vitreous

clay) and is expected to trend northwest to southeast (see Figure 2-3 in Section 2 of this Memorandum). Therefore, the two pipes encountered in the second outfall 2 test pit did not correspond to the anticipated diameter, composition, and orientation of the outfall 2 pipe. The pipes were not broken, and the test pit was backfilled with the original material. The sample believed to be from outfall 2 was obtained from an 8-inch clay pipe exposed in a utility trench located upgradient from the test pit locations.

RPI also excavated two test pits in attempts to locate the pipe to outfall 3. This pipe also was expected to be composed of 8-inch-diameter vitreous clay and to trend northwest to southeast (see Figure 2-3). A test pit extending to a depth of approximately 12 feet below ground surface was excavated for a length of approximately 30 feet along the southern fence line in the anticipated location of outfall 3. The remains of a clay pipe and a 5-foot-long section of 10-inch-diameter cement concrete pipe were found out of place at various depths in the test pit. The test pit was backfilled with the same material. A second shallow test pit was excavated approximately 60 feet north of the first to a depth of approximately 5 feet, along the anticipated trend of the outfall 3 pipe in the location of a former manhole. The manhole was not found, and the test pit was backfilled with the original material. The sample from outfall 3 was obtained from a pipe in a manhole upgradient from the test pit locations.

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Table F-1
Field Descriptions of Sewer Sediment Samples

Sample Number (Date Sampled)	Field Description of Sample
01-SWO (5/24/95)	Sampled through 1 foot of water. Black organic-rich silt with sand. Leaves, sticks, plastic. Occasional gravel. Sheen on water.
02-SWO (5/25/95)	Pipe is exposed in trench cut for new utilities. Sample taken from broken 8-inch clay pipe. Sample is gray silt with trace of sand. Black flaky material (looks burned). Dry. Pale pink material, dust when ground (clay pipe), a little green layer. Glass shards. No macro-organics.
02-SWO-B (7/6/95)	Layered fines (clay or silt). Light brown with black layers, green specks. Moist.
02-SWO-C (7/6/95)	Dark, red-purple, brown sandy silt. Wet.
03-SWO (5/24/95)	Brown, silty fine sand or sandy silt. Moist to wet. Sheen. Not enough sediment in pipe for full sample. Filled second jar half-full.
04-SWO (5/24/95)	Black and gray silt with occasional sand. Wet.
05-SWO (5/24/95)	Sample taken from broken 8-inch cement pipe. Pipe had several inches of sediment and hardened resin-like substance.
06-SWO (5/24/95)	Medium-brown. Silty, fine to medium sand with gravel (angular, approximately 1-inch-diameter). Gravel appears to have fallen in manhole. Moist. No sheens, no odors.
07-SWO (5/24/95)	Fine to medium sand with silt, occasional gravel. Some macro-organics. sheen on water. Duplicate sample (08-SWO) taken.
10-SEW (5/24/95)	Sample taken from side of manhole above pipes. Homogenous brown/black silt. Stiff. Moist to wet.
14-SEW (5/24/95)	Sampled through dark-brown water with sheen. Mixture of silt (gray), black, fine to medium sand, occasional fine gravel. Abundant leaves, sticks. Heavy sheen on water. Wet. Duplicate sample (838-SEW) taken.
16-SEW (5/24/95)	Sampled through approximately 4 inches of water. Mostly angular gravel (large gravel removed during compositing). Fine gravel and sand with silt. Few organics. Brown silt and water.
26-SEW (5/24/95)	No sample in pipe. Sample taken from sediment accumulated on flat areas above pipe. No gravel. Dark gray/black. Fine organics and occasional roots. Wet to moist, just below liquid limit.
30-SEW (5/24/95)	Abundant sediment. Sediment has thin brown layer on top, black underneath. Silt with fine sand, no gravel. Fine organics and sticks. Wet.
38-SEW (5/24/95)	Very little sediment in manhole. Mostly leaves with fine to medium sand, occasionally fine gravel. Dark gray/black. Slight sheen. Wet.

Table F-1
Field Descriptions of Sewer Sediment Samples

Sample Number (Date Sampled)	Field Description of Sample
40-SEW (5/24/95)	Sampled in toluene tank farm. Sheen. 1 foot of water in catch basin. Fine to coarse sand silt, black with vermiculite. No macro-organics. Oily odor.
45-SEW (5/24/95)	Cattails in catch basin. Sediment in gray/black silt. Water with heavy sheen and oily feel. Decaying organics at 0.5 feet deep.
47-SEW (5/24/95)	Approximately 1 foot of stratified sediment; 4 layers (top to bottom): black, teal/gray, brown, and pink/rust. Bottom of sewer is dark rust. Water in lower half of the 1-foot layer of sediment. BTEX sample got top 3 of 4 layers only. Silt with sand, no gravel. Few plants growing in catch basin top.
68-SEW (5/24/95)	Sampled through water in catch basin. Gray-black, fine to medium sand with approximately 25 percent angular coarse gravel and concrete. Organic matter = roots and sticks. Other debris = plastic. Large gravel removed from sample. Slight sheen on water.
84-SEW (5/24/95)	Stiff black silt. Occasional sand (gritty). No noticeable (macro) organics. No sheen, no odor. Moist to wet.
88-SEW (5/24/95)	Gray-black, fine to medium sand with silt, very little gravel (5%), leaves, rusty oil-like sheen, sticks, other organics. Wet.
89-SEW (5/24/95)	Silty, fine to medium sand with macro-organics (sticks, reeds). Dark gray. Occasional gravel. Moist.

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