



City of Tacoma
Public Works Department

October 30, 2007

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1200 Sixth Avenue, Suite 900
Seattle, WA 98101

Subject: Draft Olympic View Resource Area Year 5 Annual Monitoring Report

Dear Ms. Keeley:

Please find enclosed the City's draft Year 5 Annual Monitoring Report submitted in accordance with the Long-Term Monitoring and Reporting Plan.

If you have any questions about this, please contact me at 253-502-2108.

Sincerely,

John O'Loughlin, P.E.
Assistant Division Manager
Environmental Services Science & Engineering

JO:sh (Draft Y5AR Tran)

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Ed Woodfield, Foss Maritime Co.
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File: NRD-OVRA

OLYMPIC VIEW RESOURCE AREA

YEAR 5
ANNUAL MONITORING REPORT
2007



City of Tacoma
October 30, 2007



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1.0 INTRODUCTION

This document presents the Year 5 Annual Monitoring Report for the Olympic View Resource Area (OVRA) Removal Action located in Tacoma, Washington (Figure 1). The City of Tacoma (City) conducted the Year 5 physical and chemical monitoring activities in the spring and summer of 2007.

The OVRA is located within the boundaries of the Commencement Bay Nearshore/Tideflats Superfund Site and includes approximately 12.9 acres of intertidal and subtidal area. The Removal Action involved excavation, backfilling, and capping of approximately 2.3 acres of contaminated marine sediments within the OVRA site. Chemical constituents of concern included dioxins (polychlorinated dibenzodioxins and dibenzofurans), metals (arsenic, copper, mercury, and zinc), polycyclic aromatic hydrocarbons (PAHs), and polychlorinated biphenyls (PCBs).

To evaluate alternatives for the Removal Action, the City prepared an Engineering Evaluation/Cost Analysis (EE/CA) in April 2001. The EE/CA summarized results of previous environmental investigations at the OVRA site. Following a public comment period, the EPA published an Action Memorandum in July 2001, which documented the selected alternative for the OVRA Non-Time-Critical Removal Action. Final Design Documents describing site construction activities for the Removal Action were completed in January 2002. The City completed sediment excavation and capping for the OVRA Removal Action in October 2002, and submitted a Removal Action Completion Report (RACR) to the U.S. Environmental Protection Agency (EPA) in March 2003. All design, construction, and reporting tasks for the OVRA Removal Action were completed in accordance with requirements of an Administrative Order on Consent (AOC – Docket Number CERCLA 10-2001-0069, dated July 2001) between the City and EPA. The City submitted the final Long-Term Monitoring and Reporting Plan (LMRP) to EPA in August 2003.

The Year 1 Annual Report was submitted to EPA in final form on April 20, 2004, and approved by EPA on April 21, 2004. The Year 2 Annual Report was submitted to EPA in final form on November 30, 2004, and approved by EPA on December 14, 2004. The Year 3 Annual Report was submitted to EPA in final form on February 23, 2006, and approved by EPA on March 6, 2006. The Year 4 Annual Report was submitted to EPA in final form on September 1, 2006, and approved by EPA September 6, 2006.

In 2007, the Washington State Department of Natural Resources (DNR) directed construction of an intertidal habitat restoration project they call "Olympic View Triangle". It is situated south and west of Area B. Tim Goodman is the project manager for DNR and can be reached at 360-902-1057 or timothy.goodman@dnr.wa.gov. The City and EPA were given the opportunity to comment on the project. The City visited the project at various stages of construction and it appeared to be managed and implemented according to plan.

2.0 PROJECT OBJECTIVES

The removal action objective for the OVRA, as described in the 2001 AOC and EPA's 2001 Action Memorandum, is to:

- Significantly reduce the potential risk to human health and/or marine ecological receptors resulting from potential exposure to contaminants present in sediments by

removing and disposing of the contaminated sediments at an acceptable disposal site, or capping contaminated sediments in the project area.

The goals of the long-term monitoring program for the OVRA are to ensure that the selected cleanup action continues to be protective of human health and the environment. The specific objectives of the long-term monitoring program are to ensure that:

- The sediment cap continues to isolate toxic concentrations of previously identified chemicals of concern (COCs) in underlying sediments from marine biota and other biological receptors; and
- The sediment cap is not recontaminated with COCs from underlying sediments.

The integrity of the capped area is fundamental to achieving these objectives. Cap integrity depends upon maintaining the designed cap thickness to avoid potential contaminant releases, and to attain the performance standards. To ensure cap integrity, monitoring activities included the following:

- **Physical Integrity Monitoring.** Physical integrity monitoring was used to ensure that erosion is not occurring to an extent that would compromise the ability of the cap to physically isolate contaminated sediments from environmental receptors. As a result of comments by EPA on the Year 1 Annual Report, conventional transect surveys were conducted in April to monitor and document any potential for erosion.
- **Surface Sediment Quality Monitoring.** In Year 5, sediment quality monitoring was conducted to confirm that contaminants are not moving upward to the top of the cap via diffusion or other transport mechanisms.

3.0 MONITORING ACTIVITIES

3.1 Physical Integrity Monitoring

Physical integrity monitoring consisted of topographic surveys (both conventional, shore based and hydrographic) and visual inspections.

Crews from the City of Tacoma Public Works Department Survey Section, under the direction of the City's Licensed Professional Land Surveyor, conducted the conventional topographic survey transects (T0 through T4) in April 2007. The locations of these transects are shown in Appendix A, Sheet 1 and the data is listed in Table 1. These field activities were scheduled around the low tide events. Shore based surveys for vertical elevations have an accuracy of ± 0.01 foot, and for horizontal control are accurate to ± 0.01 feet.

Environmental professionals from the City of Tacoma Science and Engineering Division conducted visual inspections in April 2007 and again in September 2007.

Manson Construction Company (MCC) conducted hydrographic survey transects (T5 and T6) over Area E in June 2007. The locations of these transects are shown in Appendix A, Sheet 1 and the data is listed in Table 2.

Survey equipment included Electronic Positioning System (EPS) for horizontal control and a high resolution depth sounder with radio tide gauge for vertical control. Accuracy standards are ± 0.25 feet in the vertical and ± 3.0 feet in the horizontal. MCC quality control procedures include a pre-survey check of vertical accuracy on their radio tide gauge located at Petrich Marine Dock in the Foss Waterway. MCC has several tide gauge boards on pilings at the Petrich Marine Dock that were surveyed in with conventional survey techniques. The pre-survey check involves comparing the radio tide gauge with the conventionally surveyed tide gauge boards and recalibrating the radio tide gauge if there is a 0.1 foot difference or greater.

3.2 Surface Sediment Quality Monitoring

The LMRP requires surface sediment chemistry sampling to ensure the cap continues to isolate toxic concentrations of previously identified chemicals of concern (COCs) in underlying sediments and that the cap is not recontaminated with COCs from underlying sediments. The samples and analyses called out in the LRMP for Year 5 sediment chemistry monitoring are listed in Table 3.

Sampling for surface sediment chemistry was accomplished on June 1, 2007. This date was two months earlier than envisioned in the LMRP in order to complete OVRA field work prior to the beginning of construction activities associated with DNR's Olympic View Triangle project. The City requested and was granted permission from EPA to conduct the field work early.

The sample in area E (E-3) was collected by van Veen from a boat and the rest of the samples (A-1, A-2, B-1, B-2, C-5, C-9, C-10, and D-1) were obtained from the beach at low tide. An Electronic Positioning System (EPS) was used to document the locations of the grab samples. Sampling techniques were consistent with the requirements of the LRMP. Each sample was the composite of three individual grab samples from within the sampling grid (i.e., grabs A1A, A1B and A1C were composited to form sample A-1). These sample locations are shown in Appendix A, Sheet 1 and are listed in Table 4. Qualitative sample characteristics were recorded for each sample and these forms are presented in Appendix B.

Samples were transported under chain of custody to the laboratory for analysis. Analyses for PCBs were analyzed by Severn Trent Laboratories-Seattle, Dioxins were analyzed by Severn Trent Laboratories-Sacramento, and metals were analyzed by the City of Tacoma's Science and Engineering Laboratory. All labs are Washington State Department of Ecology-accredited for the analyses performed. All analyses were conducted in accordance with the LMRP.

In addition to the field samples listed in Table 4, Quality Control samples were collected in the field as well. The field duplicates for samples A-2 and B-2 were prepared by homogenizing sediment for the composite sample and filling two separate containers. The duplicate was submitted as a separate sample to the lab for analysis. An equipment rinseate blank was collected in the field by rinsing sampling equipment with deionized water. The rinseate water was submitted to the lab for analysis of all constituents.

4.0 MONITORING RESULTS

4.1 Physical Integrity Monitoring Results

Results of survey transects are presented in Tables 1 and 2 and graphically depicted in Appendix A, Sheets 2 and 3. Early warning levels are set at a loss of cap material of 0.5 feet

between the as-built survey and the monitoring results in Areas A, B, and D, and again at a loss of 1 foot of material in these areas. The early warning value is set at the loss of 1 foot of cap material in Area E. Early warning levels are not performance standards, but are set at more stringent levels to assess whether performance standards could be exceeded in the future. The performance standards are set at minimum cap thickness in Table 1 of the LMRP.

The survey monitoring results show no exceedance of the Performance Standards. Additionally, Year 5 results show no exceedance of the Early Warning Values.

Visual inspections were conducted during April and September 2007. Photos and notes from the inspections are presented in Appendix C. Areas with erosion protection material were probed to confirm the presence of this larger rock. The erosion protection material appears to have remained stable and is covered in areas with a sandy gravel – likely the habitat mix from the construction activities. The erosion protection material is estimated to be several inches thick, with a minimum of 3 to 4 inches. It appears from the visual inspections and the elevation surveys that the erosion protection material coverage is similar to the post construction condition. There are no apparent signs of significant erosion. Close up photos of the erosion protection materials were taken as requested in EPA comments on the Year 1 Annual Report and are included in Appendix C. This is also demonstrated by the data in the second to last column in Table 1. This column compares the Year 5 (2007) elevations along the beach transects with the as built elevations. From a review of that column, it is clear that the typical condition is a change of a few tenths of a foot in elevation.

There have been no exceedances of the performance standards for physical integrity monitoring. Therefore, the removal action has been successful, to date, in the physical isolation of contaminated sediments from environmental receptors.

4.2 Surface Sediment Quality Monitoring Results

Laboratory results from the sampling described in Section 3.2 are presented in Table 5. None of the chemical analytes have exceeded the early warning values or the performance standards. Laboratory analysis was conducted according to the provisions of Appendix A of the LMRP. The data reports, QA/QC information, and data validation reports for the Year 5 monitoring samples are presented in Appendix D of this report. Data, as reported, was of an acceptable quality.

All metals concentrations were significantly less than the OVRA Sediment Quality Criteria (SQC), provided in Table 2 of the LMRP. All PCB analyses were non-detect at concentrations well below the OVRA SQC.

Dioxin Toxic Equivalents (TEQs) ranged from 0.7 to 2.6 ng/Kg, substantially less than the SQC of 20 ng/Kg. TEQs were calculated from the individual congener concentrations using the Toxic Equivalence Factors developed by the World Health Organization (WHO) for humans and mammals [Van den Berg, et al. (1998). "Toxic Equivalency Factors (TEFs) for PCBs, PCDDs, PCDFs for Humans and for Wildlife". *Environmental Health Perspectives* 106:775]. The WHO recently re-evaluated these TEFs and adjusted 4 factors – two increased and two decreased. [Van den Berg, et al. (2006). The 2005 World Health Organization Reevaluation of Human and Mammalian Toxic Equivalency Factors for Dioxins and Dioxin-Like Compounds" *Toxicological Science* 93:2, 223–241] However, these changes would not alter the currently calculated

TEQs. Therefore the decision was made in consultation with EPA to maintain consistency with previous reports and to keep the WHO 1998 TEFs.

All chemical concentrations are non-detect or low level and are less than the early warning value (EWV) of one half of the SQC. Therefore, sediment quality monitoring has confirmed that contaminants are not moving upward to the top of the cap via diffusion or other transport mechanisms.

The field duplicate results showed generally good agreement between the splits. Several dioxin and furan congeners (see page 2 of EcoChem data report in Appendix D) showed higher than anticipated variability between field duplicates, however, the TEQ results for both samples were very low compared to the EWV. The rinseate blank had no detections.

5.0 CONTINGENCY PLANNING AND RESPONSE

Year 5 monitoring results have confirmed the continuing success of the Removal Action at the OVRA. Based on Year 5 monitoring results, no contingency actions are required.

6.0 SITE ACCESS AND INSTITUTIONAL CONTROLS

6.1 Restricted Navigation Buoys

During site visits the buoys were present and accounted for in accordance with the institutional controls required by EPA.

7.0 FUTURE MONITORING

Per the LMRP, Year 5 represents the final planned monitoring event. The five years of physical integrity and surface sediment quality monitoring data have consistently shown that the sediment cap has isolated toxic concentrations of previously identified COCs in underlying sediments from marine biota and other biological receptors; and that it has not recontaminated with COCs from underlying sediments.

EPA will conduct a five year review with the primary purpose of determining whether the cleanup continues to be protective of human health and the environment. EPA will also evaluate the need for additional monitoring as a part of its review. Given the excellent performance documented in the five monitoring reports, the City recommends continuing the annual visual inspections in accordance with the LMRP with subsequent electronic mail reports to EPA.

Table 1 – Conventional Survey Transect Elevations (elevations in feet MLLW unless noted otherwise)

Transect	Capped Area	As built Elevation	Year 1 Monitoring	Diff. ¹ b/w Year 1 & As built	Year 2 Monitoring	Diff b/w Year 1&2	Diff b/w Year 2 & As built	Year 3 Monitoring	Diff b/w Year 2&3
T0 ²	B				6.1			6.8	0.7
T0	B				3.4			3.8	0.4
T0	B				1.2			1.2	0.0
T0	No Cap				0.3			0.5	0.2
T0	No Cap				0.1			0.0	-0.1
T0	No Cap				0.1			0.0	-0.1
T0	No Cap				-0.3			-0.1	0.2
T0	No Cap				-0.6			-0.5	0.1
T0	No Cap				-0.8			-0.9	-0.1
T0	No Cap				-1.2			-1.4	-0.2
T0	No Cap				-1.7			-1.7	0.0
T0	No Cap				-1.8			-1.8	0.0
T1	B	6.8	7.8	1.0	8.3	0.5	1.5	8.5	0.2
T1	B	4.8	5.2	0.4	5.4	0.2	0.6	6.0	0.6
T1	B	3.0	2.8	-0.2	2.5	-0.3	-0.5	3.3	0.8
T1	B	1.8	0.9	-0.9	0.8	-0.1	-1.0	3.0	2.2
T1	No Cap	1.0	0.7	-0.3	0.6	-0.1	-0.4	1.1	0.5
T1	No Cap	0.6	0.5	-0.1	0.5	0.0	-0.1	0.6	0.1
T1	No Cap	0.3	0.4	0.1	0.4	0.0	0.1	0.6	0.2
T1	No Cap	-0.1	0.2	0.3	0.1	-0.1	0.2	0.2	0.1
T1	No Cap	-0.2	-0.1	0.1	0.0	0.1	0.2	0.3	0.3
T1	No Cap	-0.5	-0.7	-0.2	-0.7	0.0	-0.2	-0.2	0.5
T1	No Cap	-1.0	-1.0	0.0	-0.9	0.1	0.1	-0.7	0.2
T1	No Cap	-0.9	-1.5	-0.6	-1.4	0.1	-0.5	-1.5	-0.1
T2	No Cap	13.1	13.5	0.4				12.8	
T2	No Cap	11.3	10.6	-0.7				10.0	
T2	No Cap	7.3	7.6	0.3				7.6	
T2	No Cap	4.5	4.6	0.1				5.3	
T2	No Cap	3.1	3.0	-0.1				3.3	
T2	D	2.3	2.2	-0.1				2.6	
T2	D	2.0	1.8	-0.2				1.9	
T2	D	1.0	1.0	0.0				0.9	
T2	No Cap	0.1	-0.3	-0.4				-0.8	
T2	No Cap	-1.7	-1.2	0.5				-1.2	
T3	A	15.0	14.9	-0.1				15.0	
T3	A	12.3	12.3	0.0				12.0	
T3	A	9.4	9.6	0.2				9.6	
T3	A	8.2	8.3	0.1				7.7	
T3	A	6.4	6.3	-0.1				6.0	
T3	No Cap	4.5	4.4	-0.1				4.6	
T3	D	2.5	2.5	0.0				2.8	
T3	D	1.8	1.9	0.1				2.1	
T3	C5	1.3	0.9	-0.4				1.2	
T3	C5	0.5	0.1	-0.4				0.3	
T3	C5	0.0	-0.1	-0.1				-0.3	

Diff b/w Year 3 & As built	Year 5 Monitoring	Diff b/w Year 2&5	Diff b/w Year 5 & As built	> Early Warning
	6.9	0.8		No
	5.2	1.8		No
	2.0	0.8		No
	0.6	0.3		
	0.2	0.1		
	0.2	0.1		
	-0.2	0.1		
	-0.7	-0.1		
	-1.0	-0.2		
	-1.4	-0.2		
	-1.6	0.1		
	-1.7	0.1		
1.7	8.9	0.6	2.1	No
1.2	6.5	1.1	1.7	No
0.3	3.8	1.3	0.8	No
1.2	3.4	2.6	1.6	No
0.1	1.3	0.7	0.3	
0.0	0.6	0.1	0.0	
0.3	0.5	0.1	0.2	
0.3	0.7	0.6	0.8	
0.5	0.4	0.4	0.6	
0.3	-0.3	0.4	0.2	
0.3	-0.6	0.3	0.4	
-0.6	-1.5	-0.1	-0.6	
-0.3	12.4		-0.7	
-1.3	9.9		-1.4	
0.3	7.4		0.1	
0.8	5.1		0.6	
0.2	3.6		0.5	
0.3	2.6		0.3	No
-0.1	1.7		-0.3	No
-0.1	0.7		-0.3	No
-0.9	0.1		0.0	
0.5	-1.6		0.1	
0.0	14.6		-0.4	No
-0.3	11.9		-0.4	No
0.2	9.3		-0.1	No
-0.5	7.9		-0.3	No
-0.4	6.2		-0.2	No
0.1	4.5		0.0	
0.3	3.0		0.5	No
0.3	2.2		0.4	No
-0.1	1.2		-0.1	No
-0.2	0.2		-0.3	No
-0.3	-0.5		-0.5	No

Transect	Capped Area	As built Elevation	Year 1 Monitoring	Diff. ¹ b/w Year 1 & As built	Year 2 Monitoring	Diff b/w Year 1&2	Diff b/w Year 2 & As built	Year 3 Monitoring	Diff b/w Year 2&3
T4	A	14.5	14.6	0.1				14.5	
T4	A	11.6	11.5	-0.1				11.5	
T4	A	8.3	8.3	0.0				9.0	
T4	A	6.3	6.4	0.1				6.7	
T4	No Cap	4.2	4.0	-0.2				4.7	
T4	No Cap	2.3	2.6	0.3				3.2	
T4	No Cap	1.8	1.6	-0.2				2.3	
T4	No Cap	1.5	1.3	-0.2				1.6	
T4	No Cap	1.2	1.3	0.1				1.5	
T4	No Cap	0.7	1.1	0.4				1.4	
T4	No Cap	0.2	0.5	0.3				0.6	
T4	No Cap	0.1	-0.2	-0.3				-0.3	

1 – Survey accuracy is +/- 0.01 feet in the horizontal and the vertical.

2 – Transect 0 was added for the first time in year 2 monitoring. Year 2 will be the baseline for comparison in future monitor

Diff b/w Year 3 & As built	Year 5 Monitoring	Diff b/w Year 2&5	Diff b/w Year 5 & As built	> Early Warning
0.0	14.4		-0.1	No
-0.1	11.4		-0.2	No
0.7	8.7		0.4	No
0.4	6.7		0.4	No
0.5	6.3		2.1	
0.9	3.2		0.9	
0.5	2.2		0.4	
0.1	1.7		0.2	
0.3	2.0		0.8	
0.7	1.3		0.6	
0.4	0.9		0.7	
-0.4	-0.4		-0.5	

ing events.

Table 2 – Hydrographic Survey Transect Elevations (in feet MLLW unless otherwise noted)

Transect	Capped Area	As built Elevation	Year 1 Monitoring	Diff. ¹ (feet)	Year 3 Monitoring	Diff b/w Year 3 & As built	Year 5 Monitoring	Diff b/w Year 5 & As built
T5	No Cap	-2.0	-3.0	-1.0	-2.1	-0.1	-2.1	-0.1
T5	E	-1.0	-1.5	-0.5	-1.9	-0.9	-2.0	-1.0
T5	E	-3.5	-3.5	0.0	-2.9	0.6	-3.0	0.5
T5	E	-2.9	-2.5	0.4	-2.7	0.2	-2.9	0.0
T5	E	-4.0	-5.1	-1.1	-4.6	-0.6	-4.5	-0.5
T5	E	-4.0	-4.0	0.0	-4.5	-0.5	-4.4	-0.4
T5	E	-4.0	-5.1	-1.1	-4.7	-0.7	-4.4	-0.4
T5	E	-3.6	-3.5	0.1	-3.3	0.3	-3.3	0.3
T5	No Cap	-2.8	-3.2	-0.4	-2.9	-0.1	-2.8	0.0
T6	No Cap	-4.1	-5.1	-1.0	-4.4	-0.3	-4.5	-0.4
T6	E	-4.0	-3.6	0.4	-3.7	0.3	-4.4	-0.4
T6	E	-4.4	-4.0	0.4	-3.9	0.5	-4.1	0.3
T6	E	-5.0	-5.6	-0.6	-5.4	-0.4	-5.1	-0.1
T6	E	-5.0	-6.9	-1.9	-5.8	-0.8	-5.8	-0.8
T6	E	-5.0	-4.6	0.4	-4.0	1.0	-4.9	0.1
T6	E	-3.2	-3.7	-0.5	-2.9	0.3	-3.2	0.0
T6	E	-3.0	-3.8	-0.8	-3.3	-0.3	-3.3	-0.3
T6	No Cap	-3.0	-3.4	-0.4	-3.1	-0.1	-3.4	-0.4

1 – Survey accuracy is +/- 3 feet in the horizontal and +/- 0.25 feet in the vertical.

> Early
Warning

No
No
No
No
No
No
No

No
No
No
No
No
No
No

Table 3 – Samples and Analyses

Sampling Area	Analyses
A-1	Arsenic, Copper, Lead, Mercury and Zinc
A-2	Arsenic, Copper, Lead, Mercury and Zinc
B-1	PCBs and Dioxins
B-2	PCBs and Dioxins
C-5	Dioxins
C-9	Arsenic, Copper, Lead ¹ , Mercury and Zinc
C-10	Arsenic, Copper, Lead ¹ , Mercury and Zinc
D-1	Dioxins
E-3	Dioxins

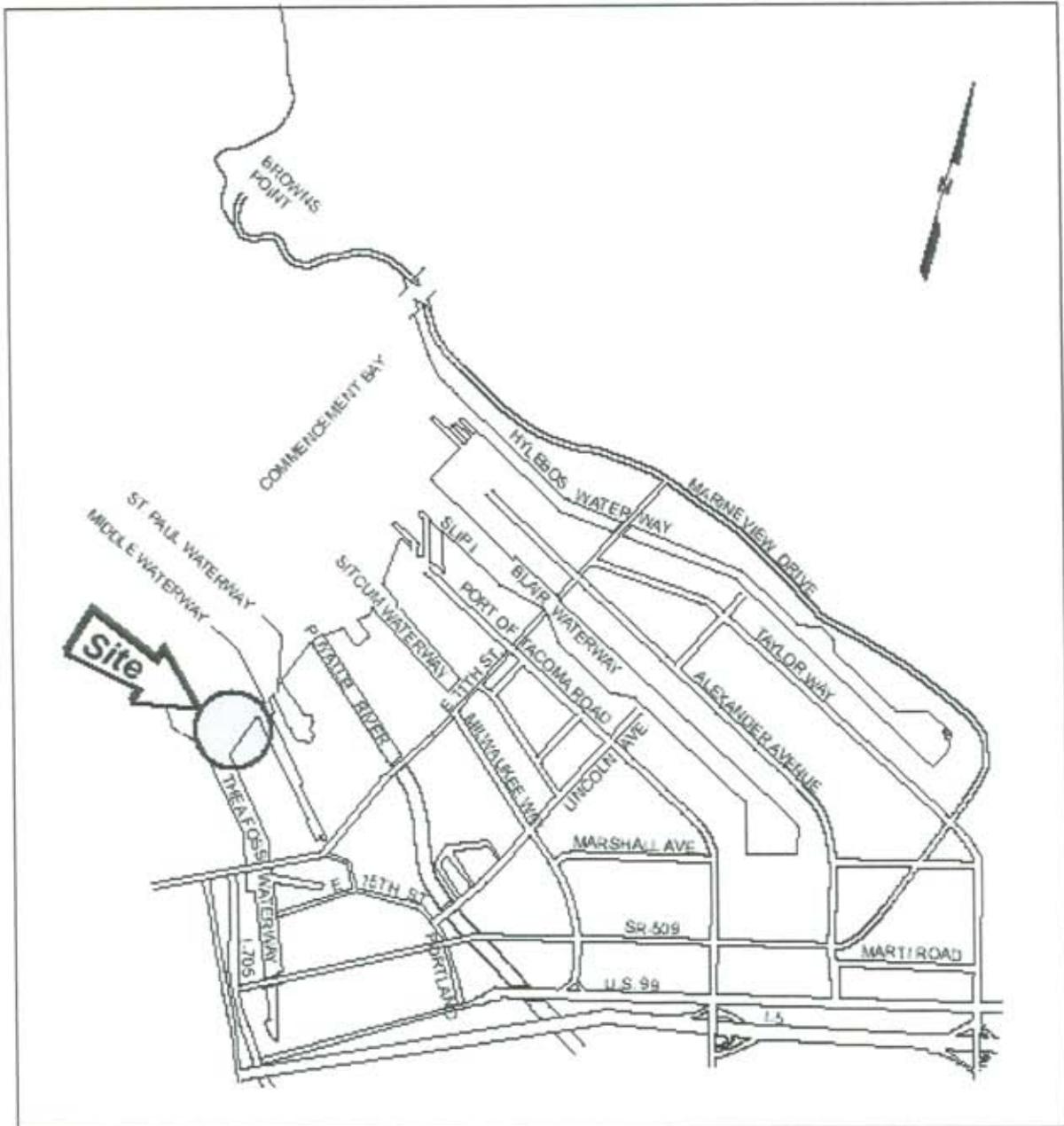
1 – Lead was not an analysis required by the LMRP for Sample Areas C-9 and C-10, but the analysis was conducted and reported by the laboratory, so it is reported here, too.

Table 4 – Grab Sample Locations

Grab Sample	Northing	Easting
A1A	709472.1	1160162.9
A1B	709505.9	1160179.2
A1C	709450.1	1160193.3
A2A	709506.3	1160218.9
A2B	709546.9	1160232.3
A2C	709494.8	1160267.1
B1A	709303.0	1159914.4
B1B	709322.0	1159954.3
B1C	709293.2	1159969.8
B2A	709359.5	1160000.7
B2B	709334.3	1160027.6
B2C	709322.1	1159990.6
C5A	709540.4	1160047.6
C5B	709583.5	1160086.0
C5C	709567.5	1160108.2
C9A	709685.5	1160155.3
C9B	709710.5	1160180.8
C9C	709676.4	1160190.2
C10A	709651.1	1160210.6
C10B	709702.8	1160234.7
C10C	709672.1	1160265.0
D1A	709501.3	1160059.8
D1B	709491.1	1160097.9
D1C	709541.9	1160107.8
E3A	709709.9	1160047.4
E3B	709715.9	1159990.2
E3C	709721.5	1159946.6

Figure 1

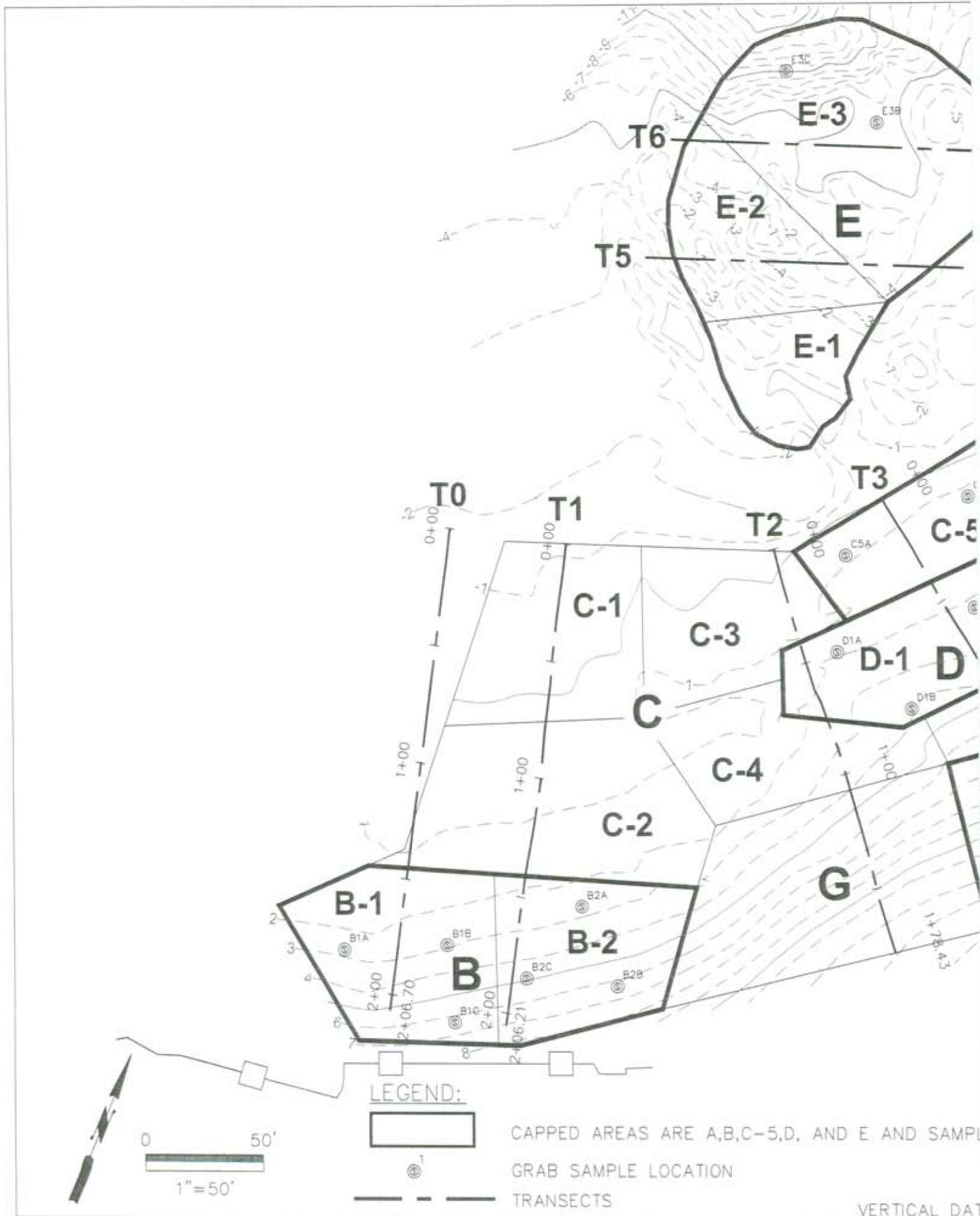
Vicinity Map



NOT TO SCALE

APPENDIX A

DRAWINGS



LEGEND:



CAPPED AREAS ARE A,B,C-5,D, AND E AND SAMPLE



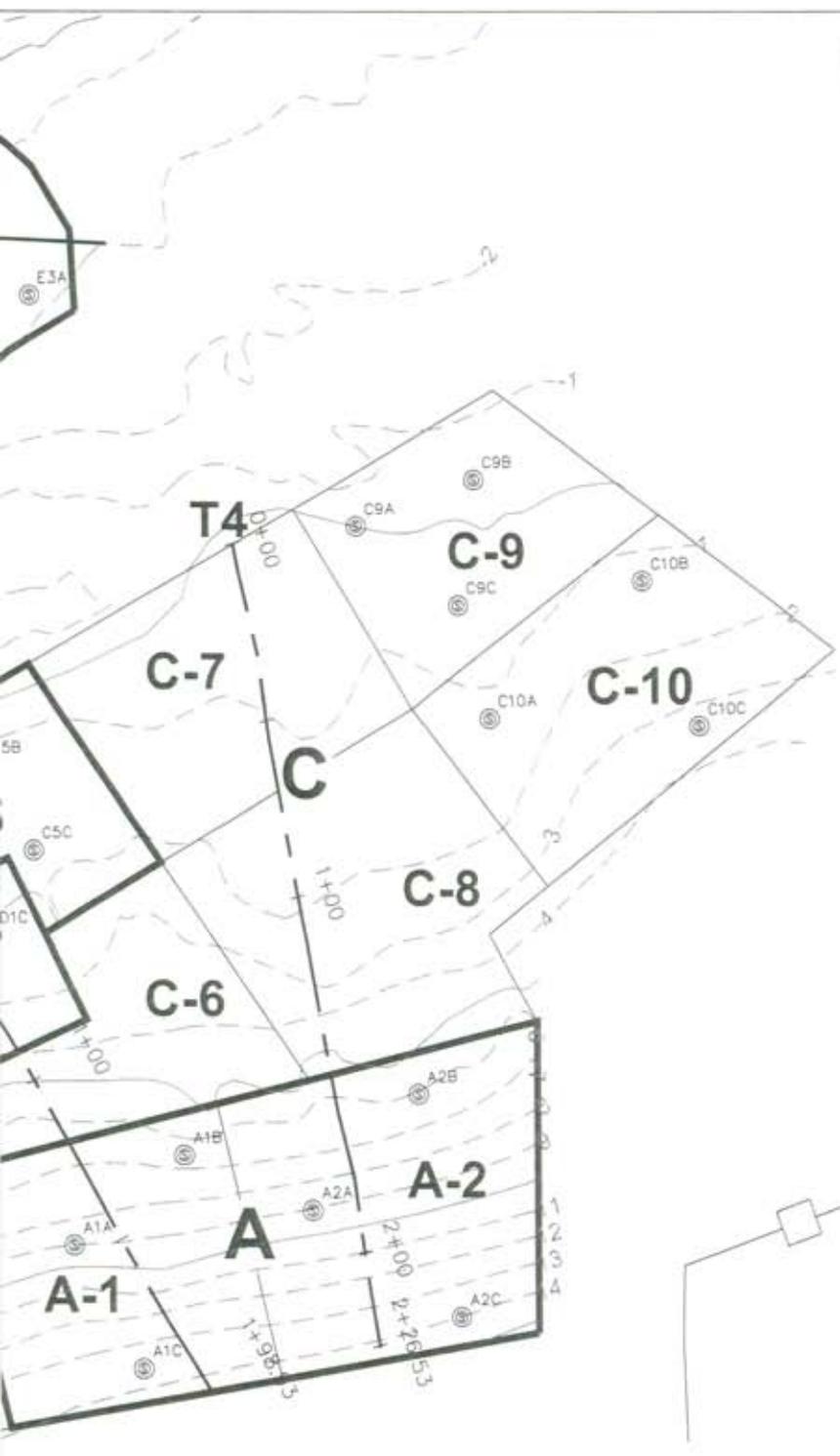
GRAB SAMPLE LOCATION



TRANSECTS



VERTICAL DATUM



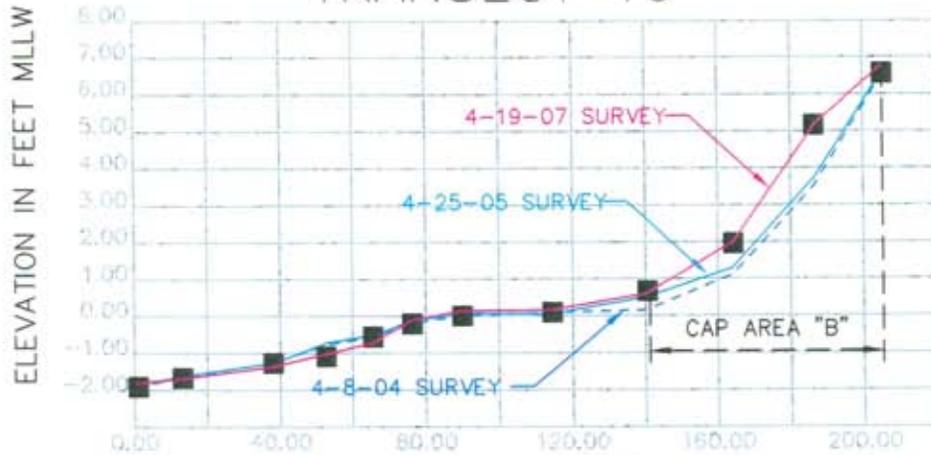
PNT #	NORTHING	EASTING
A1A	709472.1	1160162.9
A1B	709505.9	1160179.2
A1C	709450.1	1160193.3
A2A	709506.3	1160218.9
A2B	709546.9	1160232.3
A2C	709494.8	1160267.1
B1A	709303.0	1159914.4
B1B	709322.0	1159954.3
B1C	709293.2	1159969.8
B2A	709359.5	1160000.7
B2B	709334.3	1160027.6
B2C	709322.1	1159990.6
C5A	709540.4	1160047.6
C5B	709583.5	1160086.0
C5C	709567.5	1160108.2
C9A	709685.5	1160155.3
C9B	709710.5	1160180.8
C9C	709676.4	1160190.2
C10A	709651.1	1160210.6
C10B	709702.8	1160234.7
C10C	709672.1	1160265.0
D1A	709501.3	1160059.8
D1B	709491.1	1160097.9
D1C	709541.9	1160107.8
E3A	709709.9	1160047.4
E3B	709715.9	1159990.2
E3C	709721.5	1159946.6

E POINTS

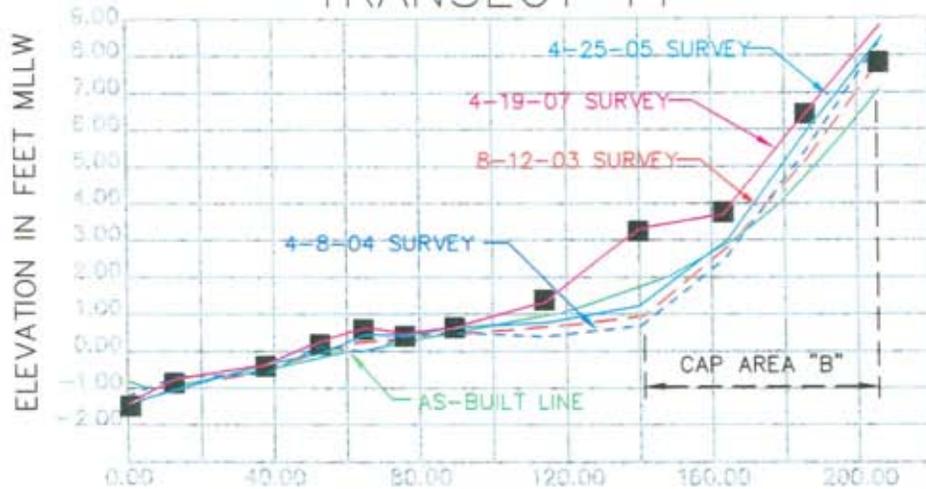
UM: MLLW ACOE

	DATE 10-5-07	SCALE 1"=50'	CITY OF TACOMA DEPARTMENT OF PUBLIC WORKS OLYMPIC VIEW RESOURCE AREA YEAR 5 MONITORING REPORT	AK80F6 SHEET NO. 1 of 3
	DR. PROJECT JD	DR. PROJECT JD		
	DR. CLIENT GC	PROJECT NAME AK80FE		

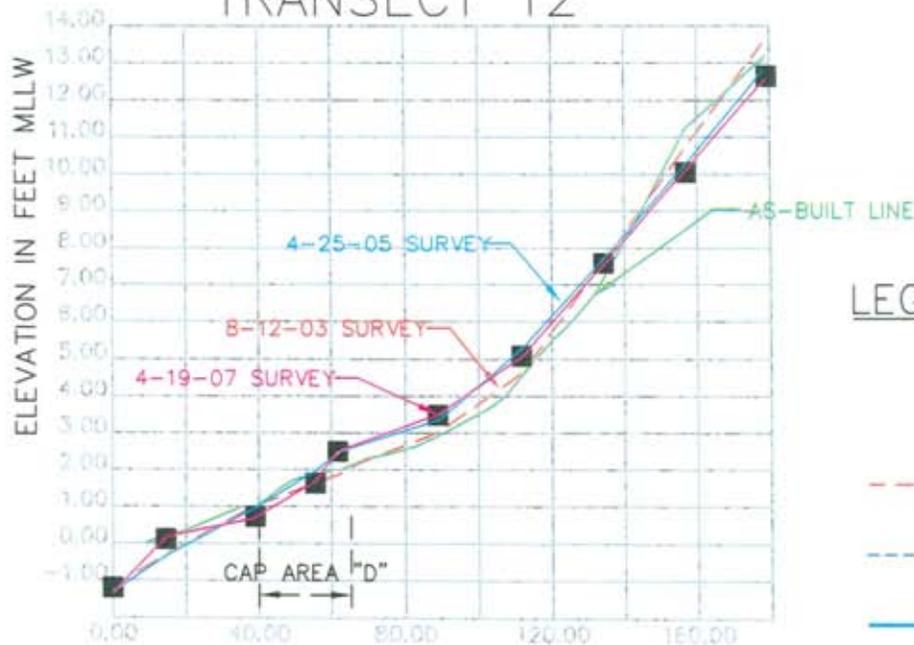
TRANSECT T0



TRANSECT T1



TRANSECT T2



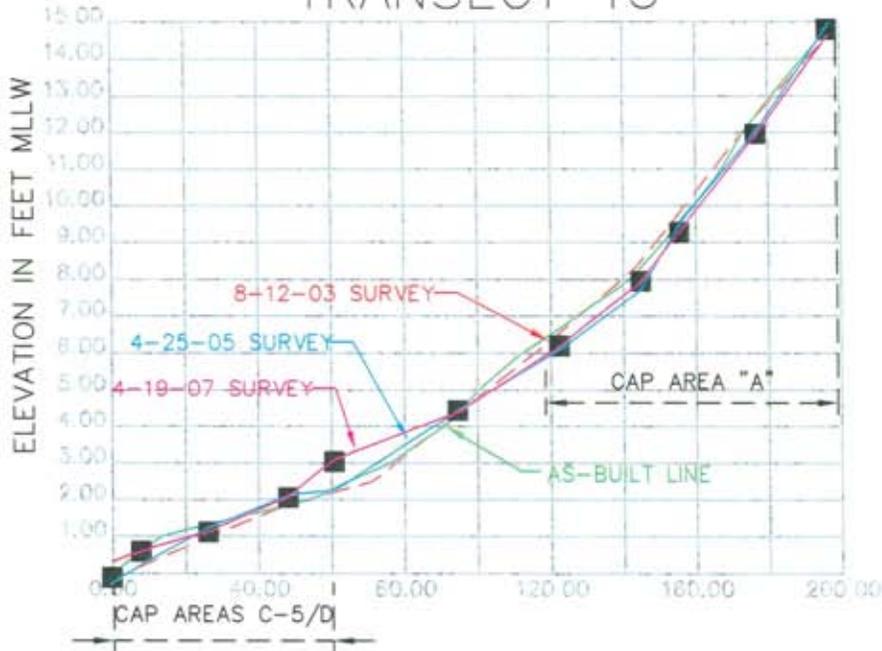
LEGEND:

- BASELINE MONITORING POINT
- 8-12-03 SURVEY
- 4-8-04 SURVEY
- 4-25-05 SURVEY
- 4-19-07 SURVEY
- AS-BUILT LINE

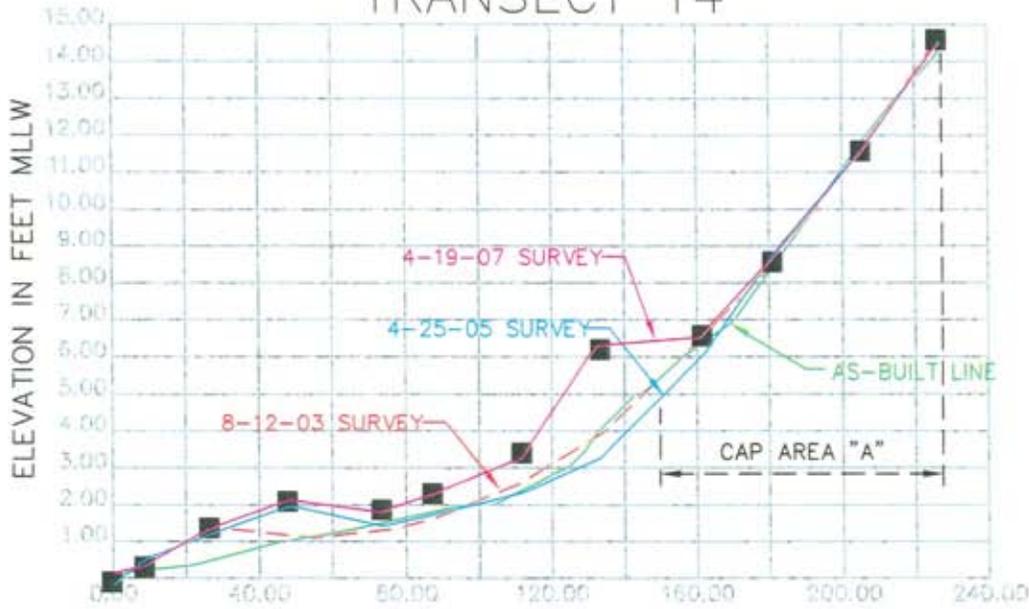


HORIZONTAL 1"=50' VERTICAL 1"=5'

TRANSECT T3



TRANSECT T4



MONITORING POINT
SURVEY FOR T0,
SURVEY FOR T1->T4)

GENERAL NOTES FOR SHEETS 2 & 3

1. SEE SHEET 1 FOR PLAN VIEW OF TRANSECT LOCATIONS
2. ELEVATIONS ALONG THE MONITORING TRANSECT LINES ARE INTERPOLATED BETWEEN THE DISCREET MONITORING POINTS WHICH ARE INDICATED BY BOXES ALONG THE LINES.

MONITORING LINE

MONITORING LINE

MONITORING LINE

MONITORING LINE

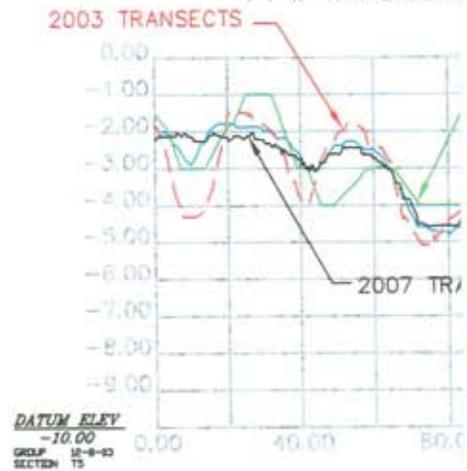
LINE

	DATE	6-4-07	SCALE	1"=50'
	DESIGNED	DP	CHECKED	JD
	DRAWN	REG	PROJECT NAME	AK80F6
	ISSUANCE DATE	4-25-05-BASE		

CITY OF TACOMA
DEPARTMENT OF PUBLIC WORKS
OLYMPIC VIEW
RESOURCE AREA
YEAR 5 MONITORING REPORT

AK80F6
SHEET NO.
DATE 2 OF 3

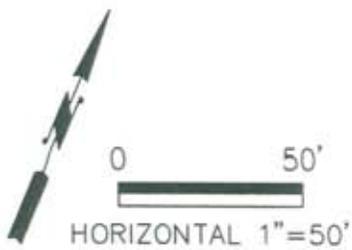
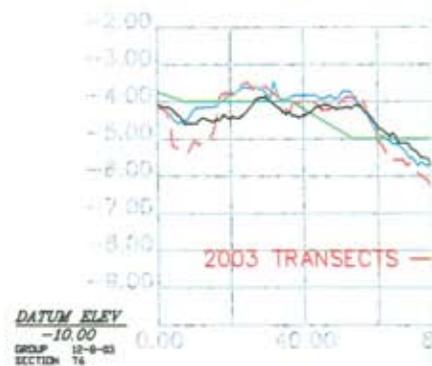
TRANSECT



LEGEND:

- - - 2003 TRANSECTS
- 2005 TRANSECTS
- 2007 TRANSECTS
- AS-BUILT LINE

TRANS



ECT T5



ECT T6



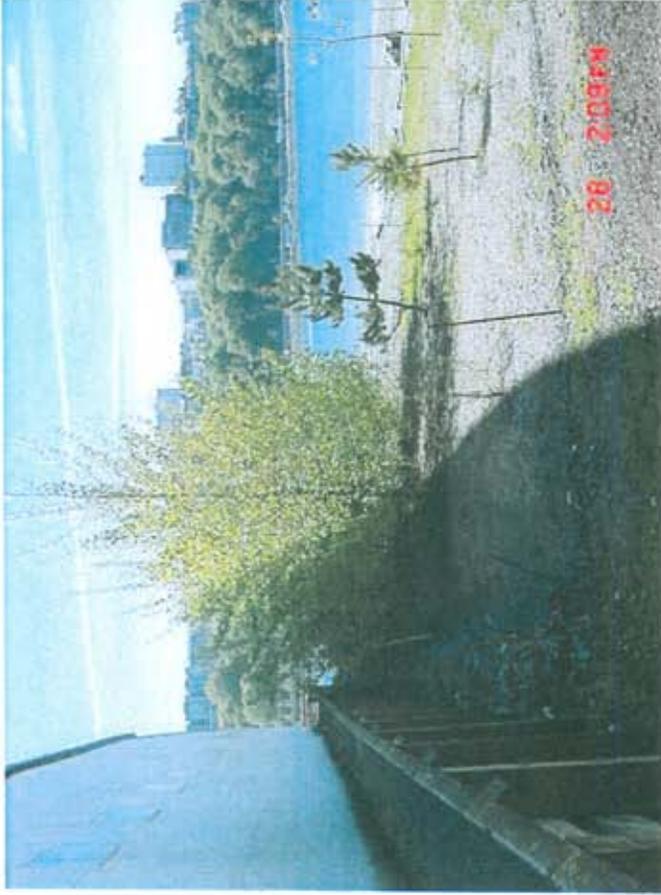
DATE	2-23-06	SCALE	1"=50'
DESIGNED	JO	DRAWN	JO
CHECKED	REG	PROJECT NO.	AK80F6
DRAWING NAME			
12-1-03-BASE			

CITY OF TACOMA
DEPARTMENT OF PUBLIC WORKS

OLYMPIC VIEW
RESOURCE AREA
YEAR 3 MONITORING REPORT

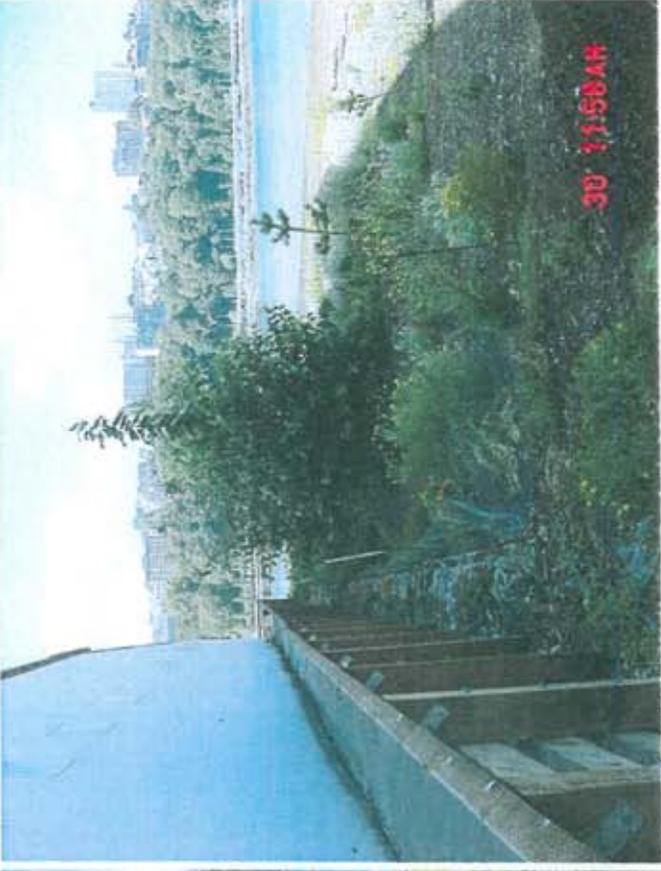
AK80F6
SHEET NO.
SHEET 3 OF 3

2007 Olympic View Monitoring Photos



Date: 04/28/2006

Photo Point: 1A



Date: 08/18/2006

Photo Point: 1A



Date: 04/19/2007

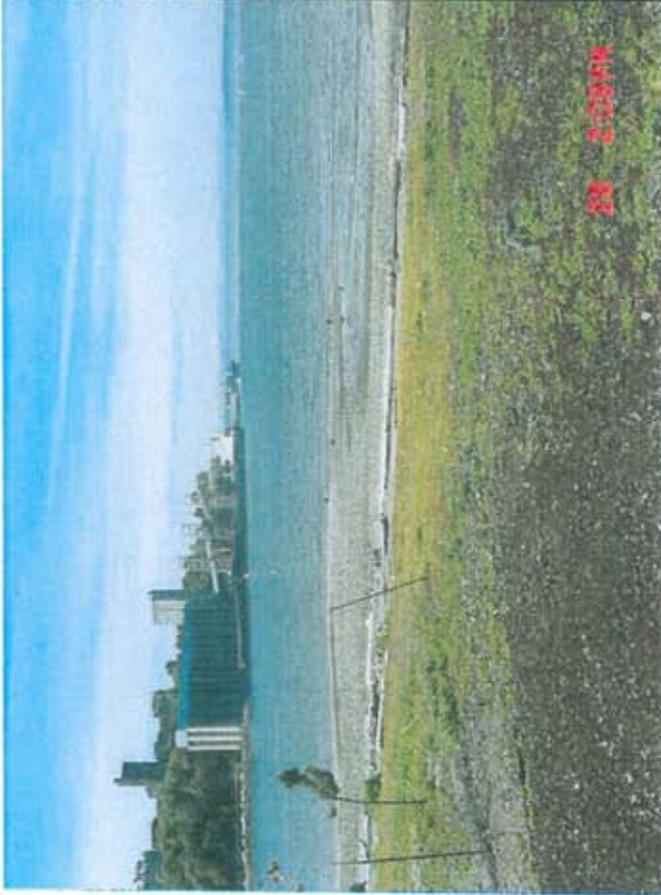
Photo Point: 1A



Date: 09/17/2007

Photo Point: 1A

2007 Olympic View Monitoring Photos



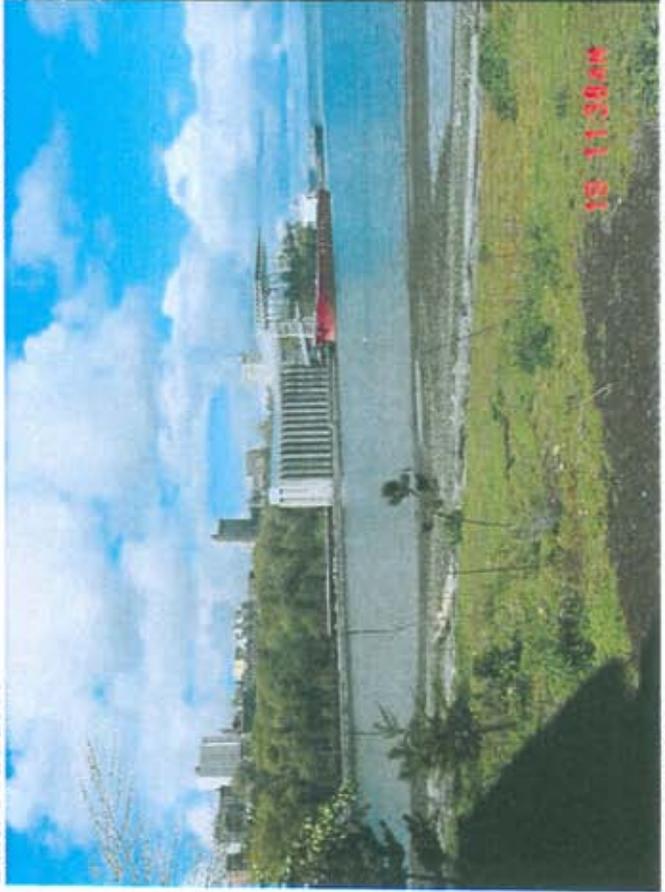
Date: 04/28/2006

Photo Point: 1B



Date: 08/18/2006

Photo Point: 1B



Date: 04/19/2007

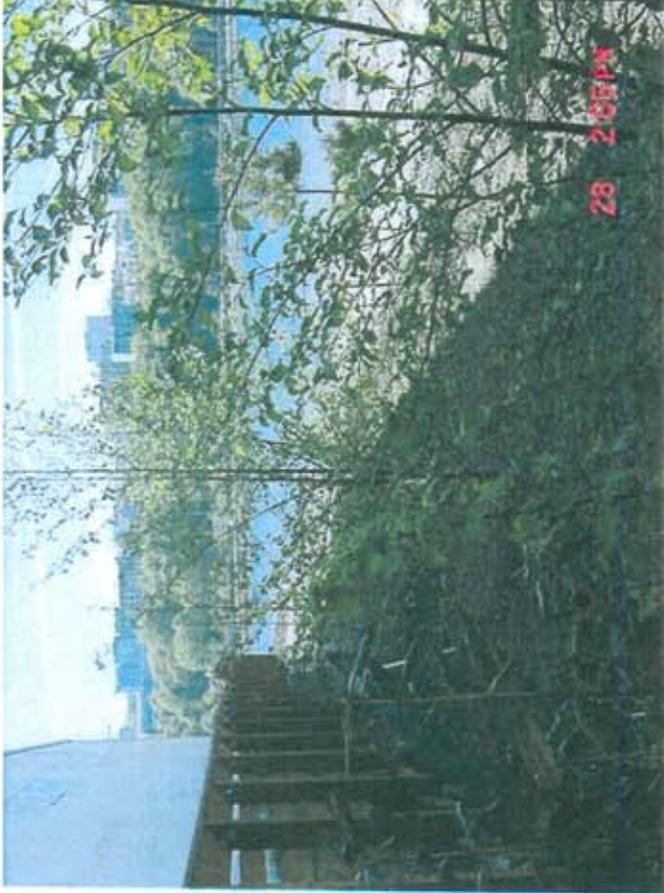
Photo Point: 1B



Date: 09/17/2007

Photo Point: 1B

2007 Olympic View Monitoring Photos



Date: 04/28/2006

Photo Point: 2A



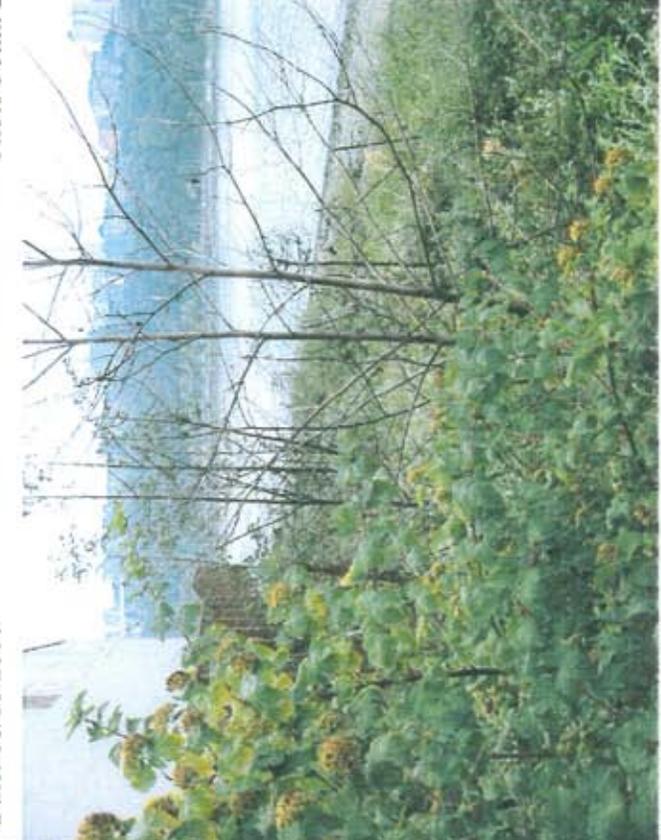
Date: 08/18/2006

Photo Point: 2A



Date: 04/19/2007

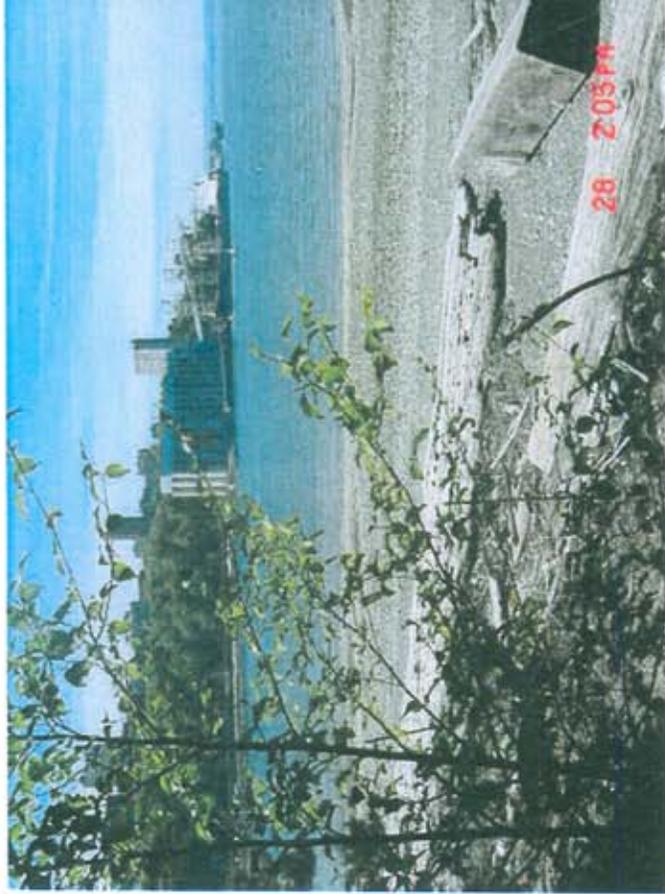
Photo Point: 2A



Date: 09/17/2007

Photo Point: 2A

2007 Olympic View Monitoring Photos



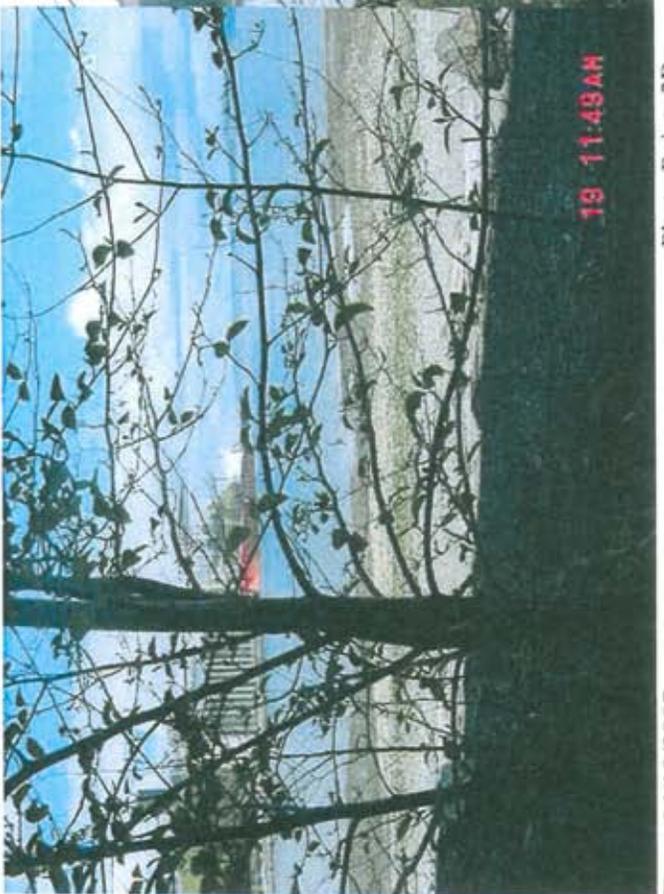
Date: 04/28/2006

Photo Point: 2B



Date: 08/18/2006

Photo Point: 2B



Date: 04/19/2007

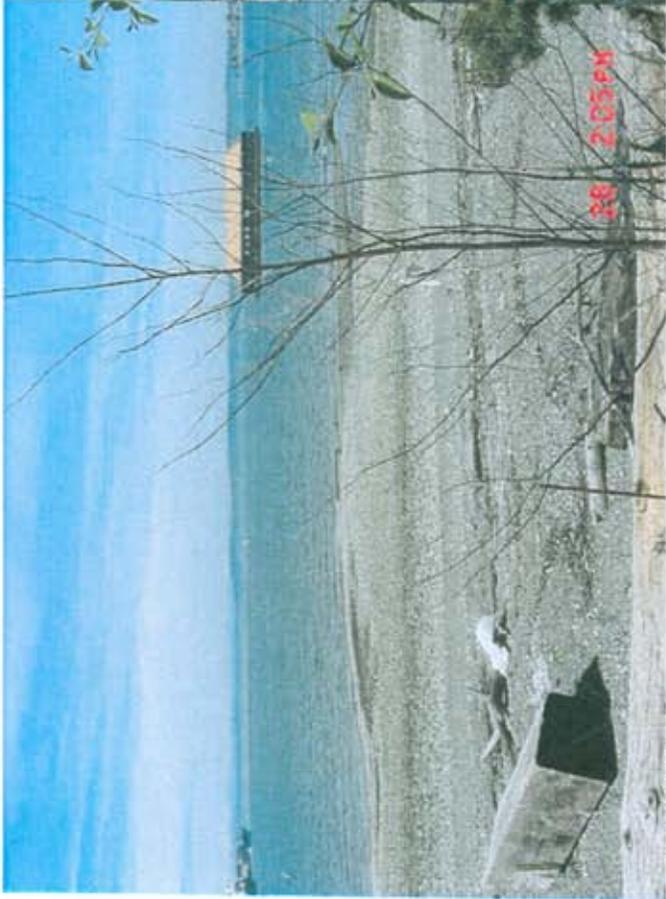
Photo Point: 2B



Date: 09/17/2007

Photo Point: 2B

2007 Olympic View Monitoring Photos



Date: 04/28/2006

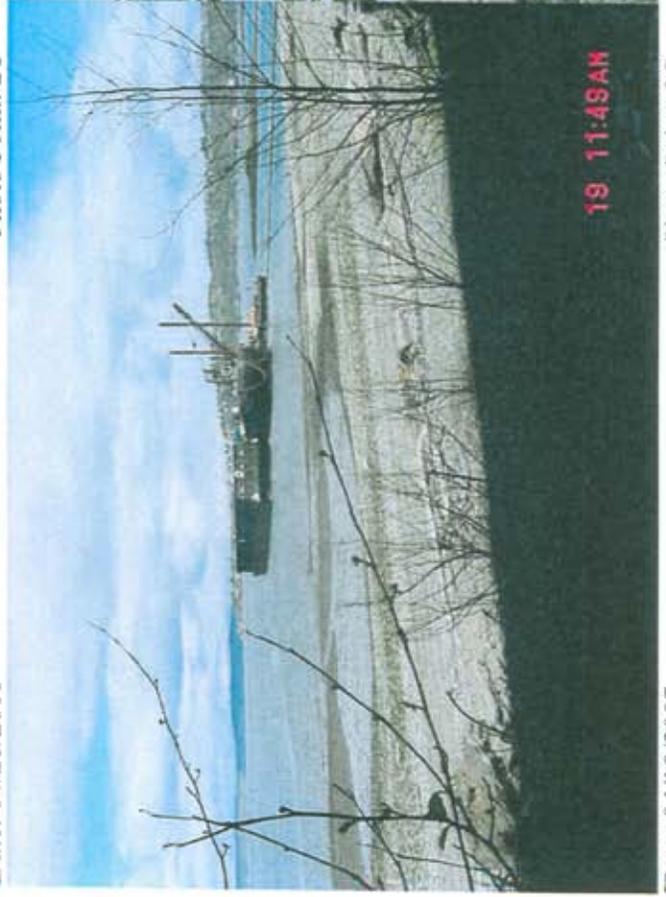
Photo Point: 2C

28 2:05PM



Date: 08/18/2006

Photo Point: 2C



Date: 04/19/2007

Photo Point: 2C

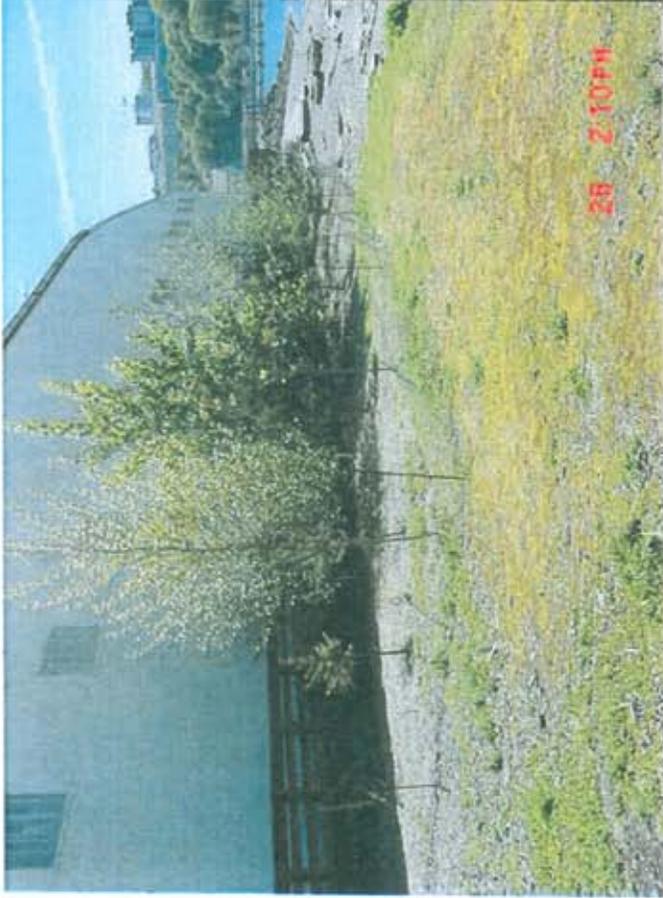
19 11:45AM



Date: 09/17/2007

Photo Point: 2C

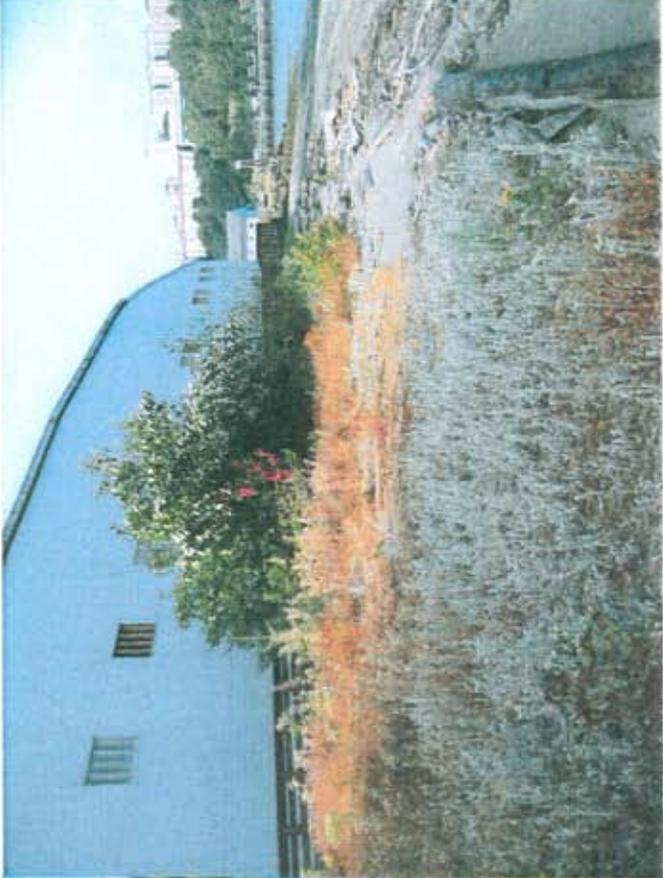
2007 Olympic View Monitoring Photos



Date: 04/28/2006

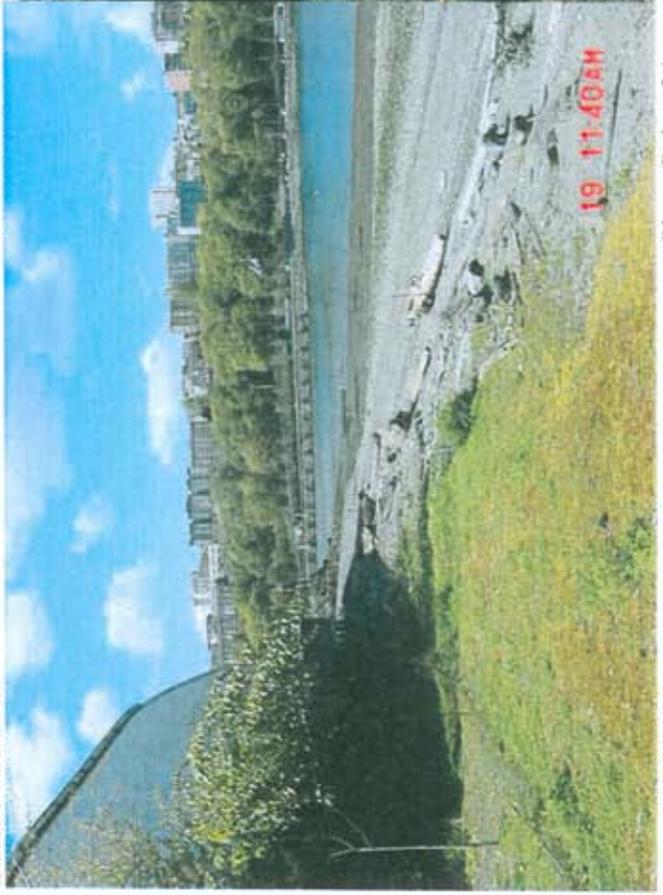
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28 2:10PM



Date: 08/18/2006

Photo Point: 3A



Date: 04/19/2007

Photo Point: 3A

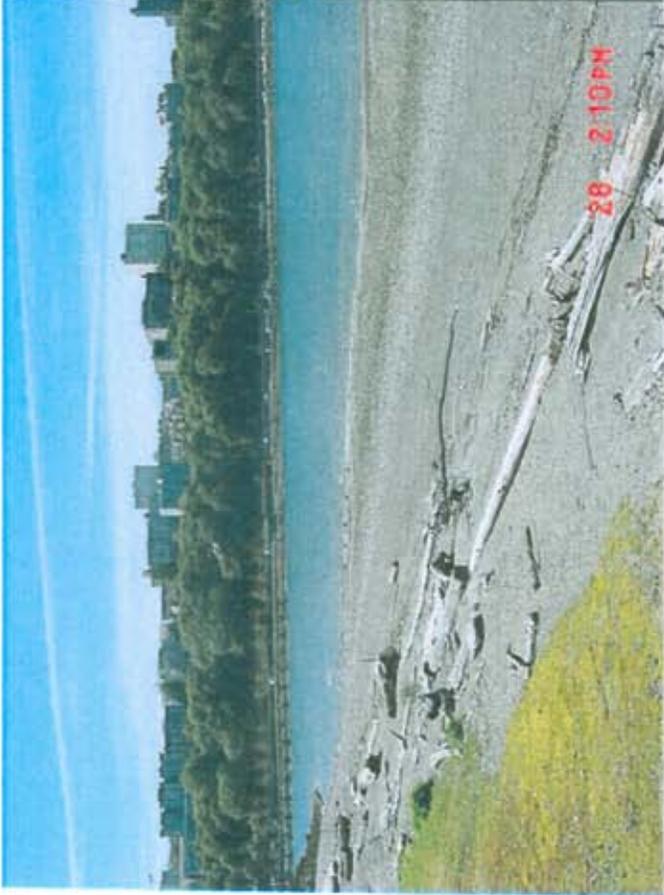
19 11:40AM



Date: 09/17/2007

Photo Point: 3A

2007 Olympic View Monitoring Photos



Date: 04/28/2006

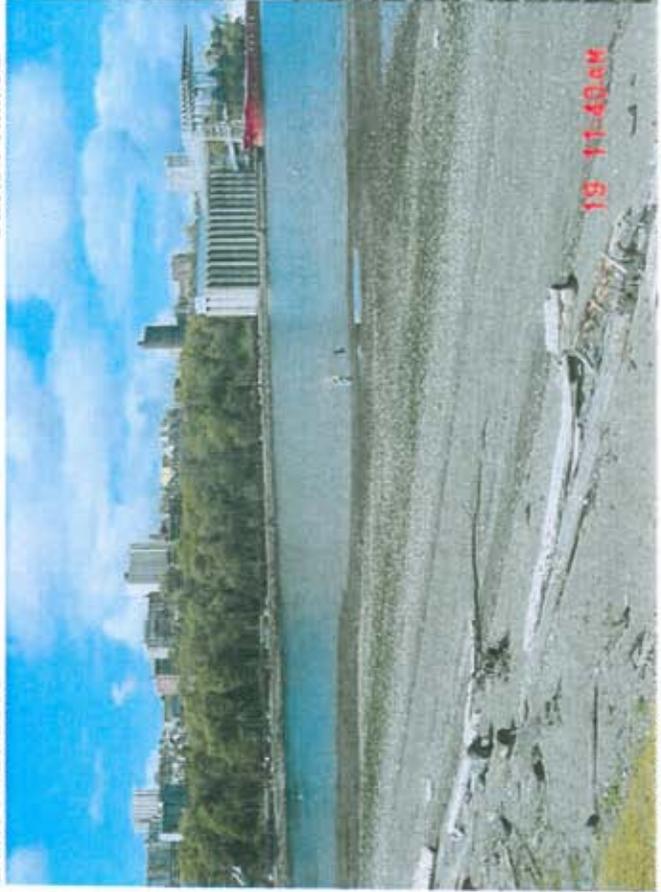
Photo Point: 3B

28 2:10PM



Date: 08/18/2006

Photo Point: 3B



Date: 04/19/2007

Photo Point: 3B

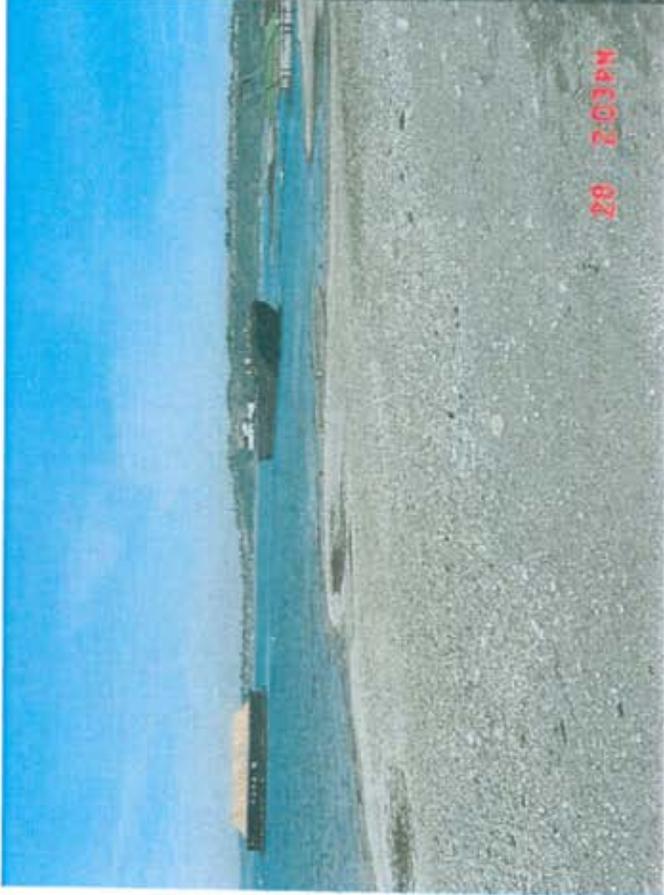
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Date: 09/17/2007

Photo Point: 3B

2007 Olympic View Monitoring Photos



Date: 04/28/2006

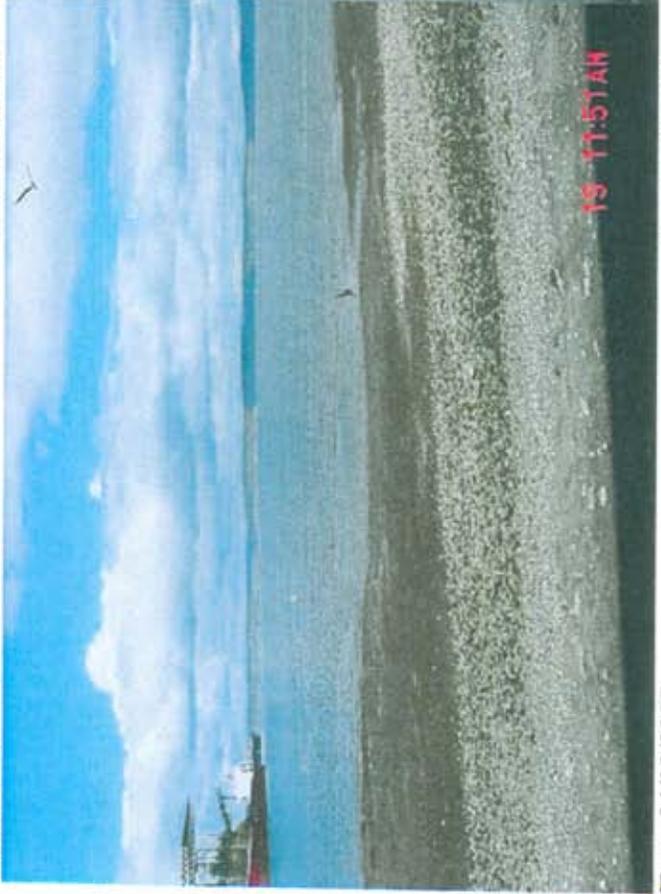
Photo Point: 4A

29 2:03PM



Date: 08/18/2006

Photo Point: 4A



Date: 04/19/2007

Photo Point: 4A

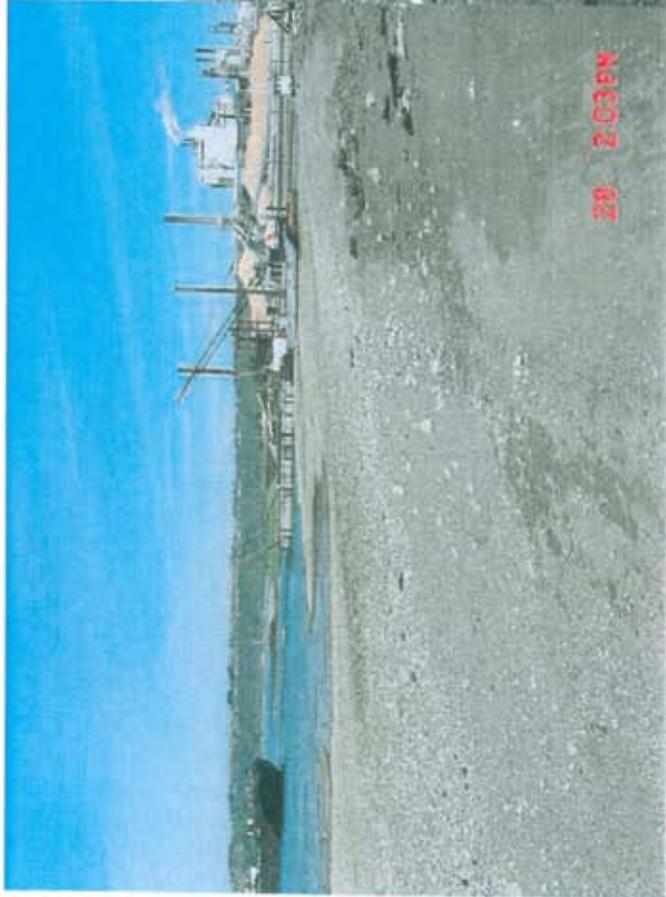
19 11:51AM



Date: 09/17/2007

Photo Point: 4A

2007 Olympic View Monitoring Photos



Date: 04/28/2006

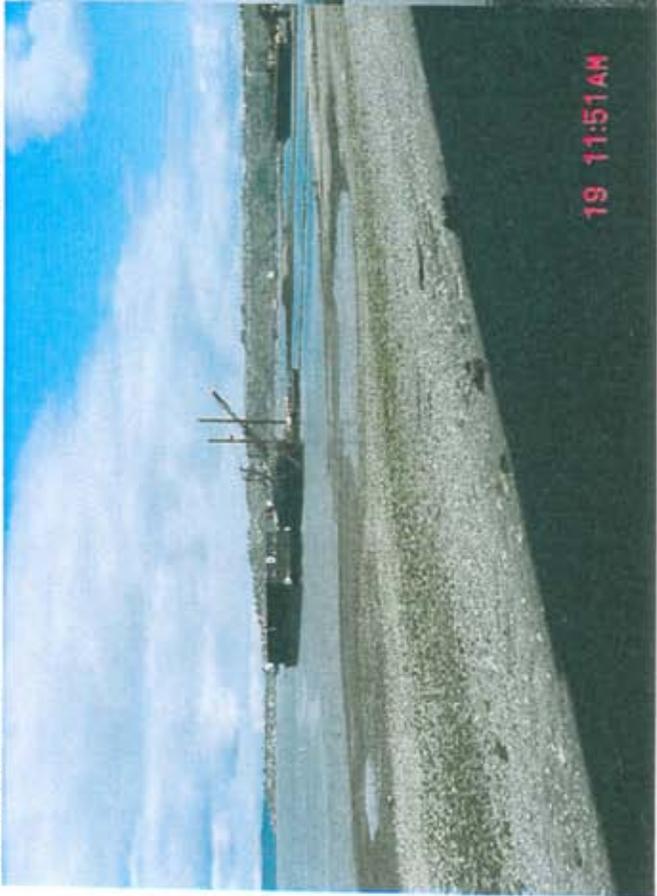
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28 2:03 PM



Date: 08/18/2006

Photo Point: 4B



Date: 04/19/2007

Photo Point: 4B

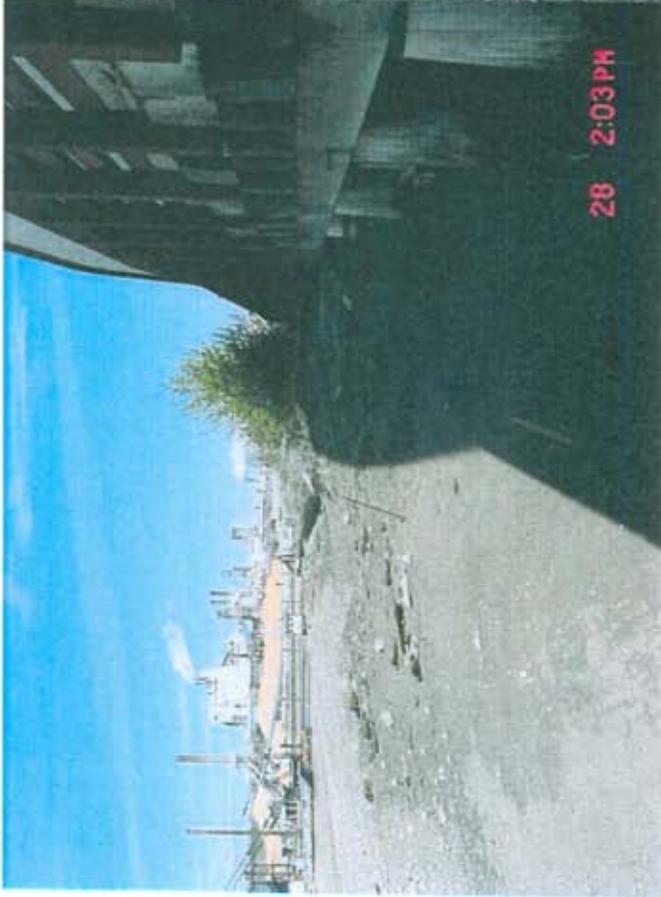
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2007 Olympic View Monitoring Photos



Date: 04/28/2006

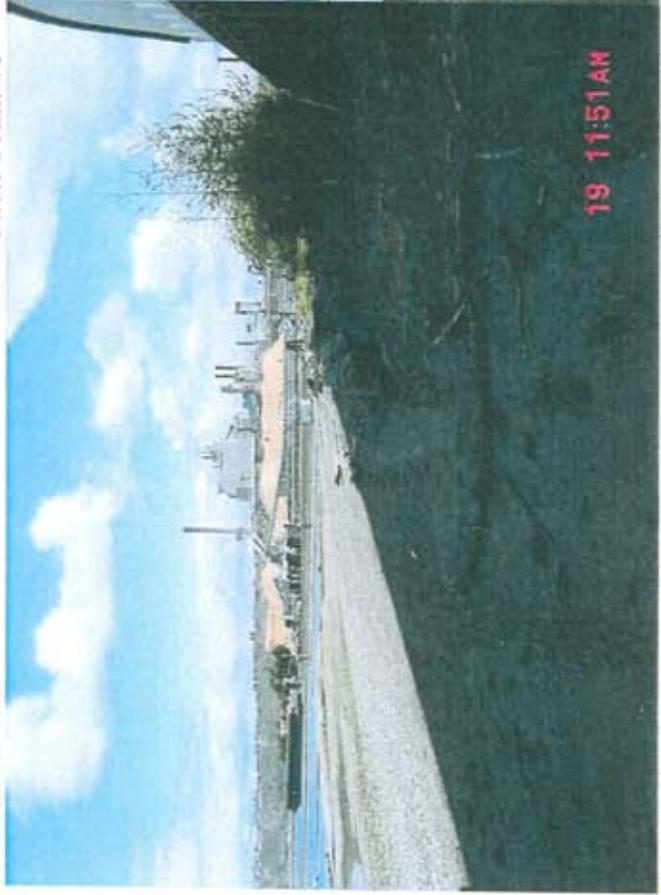
Photo Point: 4C

28 2:03PM



Date: 08/18/2006

Photo Point: 4C



Date: 04/19/2007

Photo Point: 4C

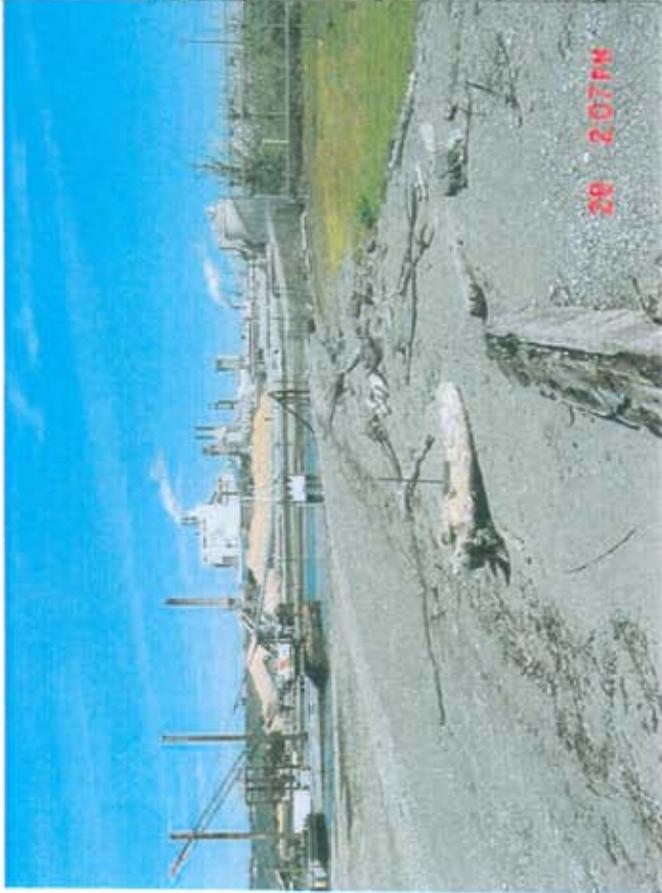
19 11:51AM



Date: 09/17/2007

Photo Point: 4C

2007 Olympic View Monitoring Photos



Date: 04/28/2006

Photo Point: 5A

28 2:07 PM



Date: 08/18/2006

Photo Point: 5A



Date: 04/19/2007

Photo Point: 5A

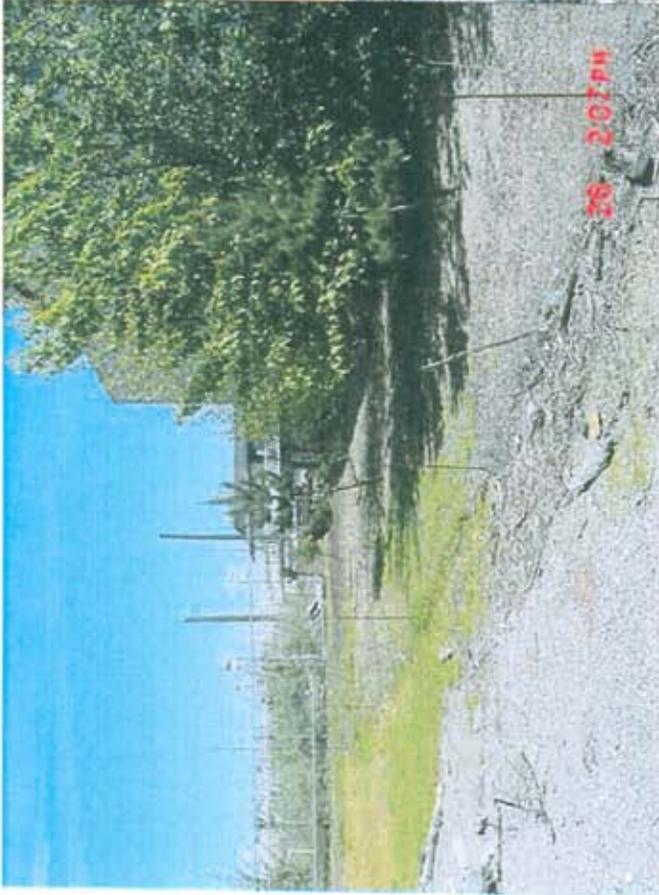
19 11:55 AM



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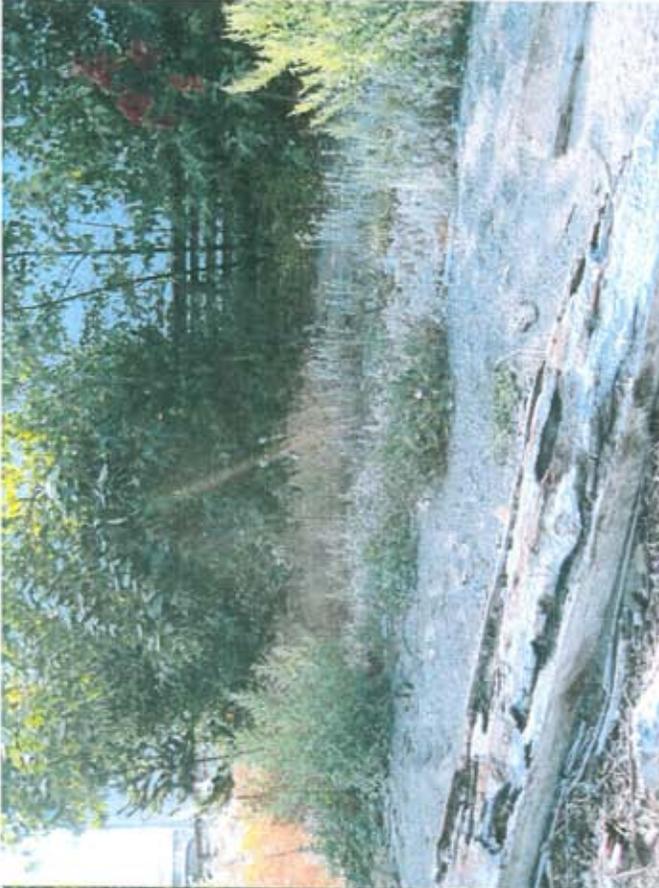
Photo Point: 5A

2007 Olympic View Monitoring Photos



Date: 04/28/2006

Photo Point: 5B



Date: 08/18/2006

Photo Point: 5B



Date: 04/19/2007

Photo Point: 5B



Date: 09/17/2007

Photo Point: 5B

2007 Olympic View Monitoring Photos



Date: 04/28/2006

Photo Point: 5C



Date: 08/18/2006

Photo Point: 5C



Date: 04/19/2007

Photo Point: 5C



Date: 09/17/2007

Photo Point: 5C

2007 Olympic View Monitoring Photos



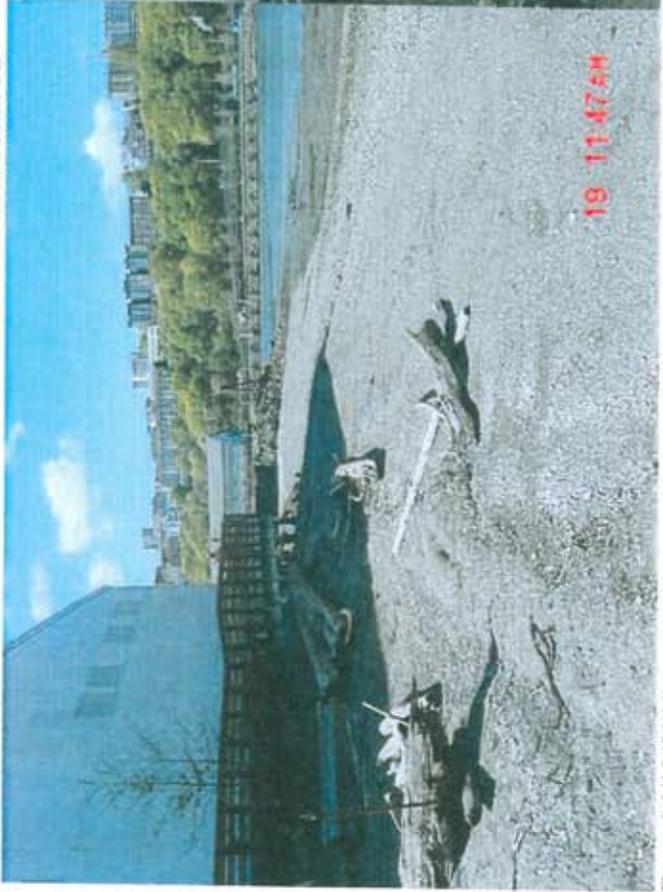
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Photo Point: 5D



Date: 08/18/2006

Photo Point: 5D



Date: 04/19/2007

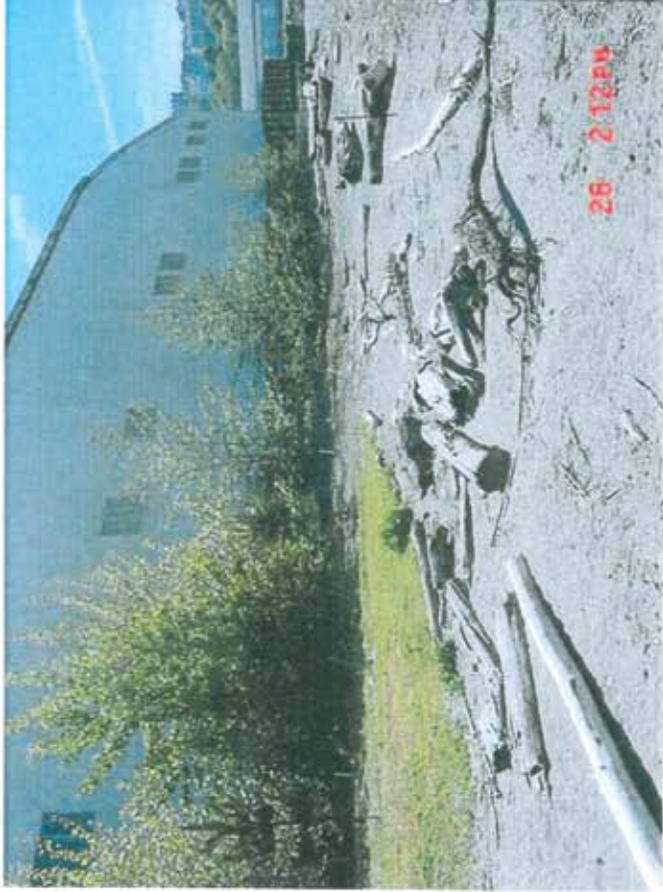
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Date: 09/17/2007

Photo Point: 5D

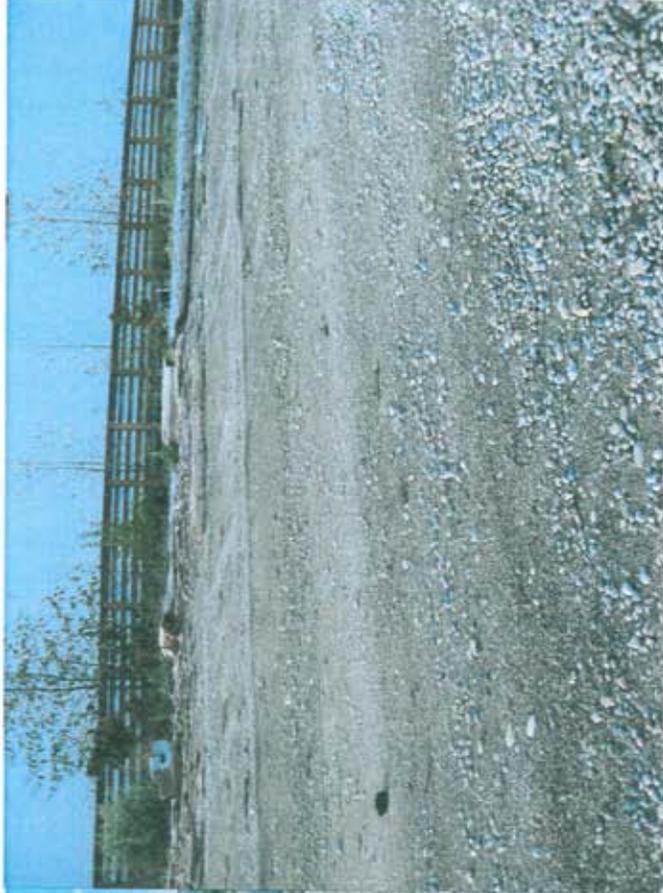
2007 Olympic View Monitoring Photos



Date: 04/28/2006

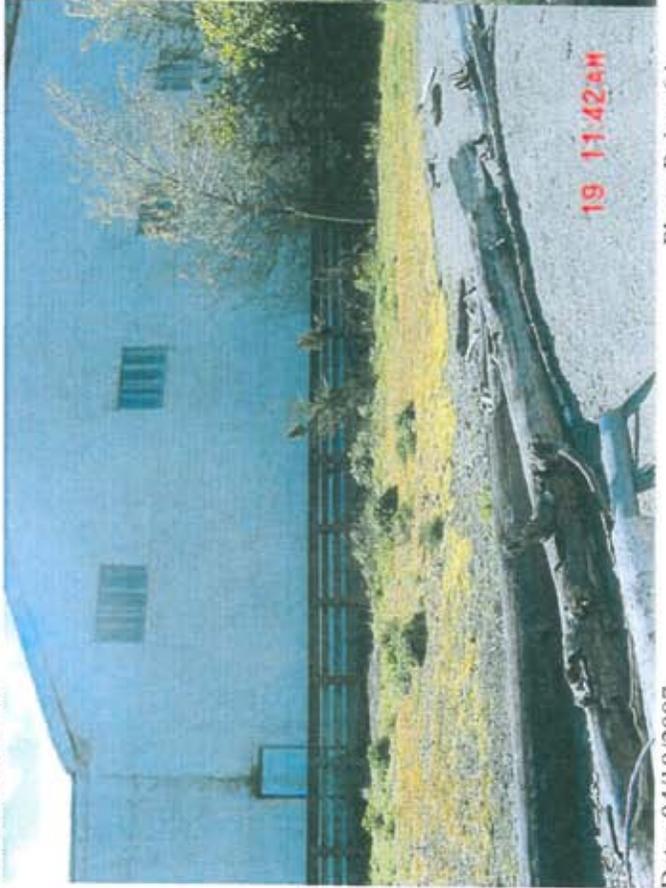
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28 2:12PM



Date: 08/18/2006

Photo Point: 6A



Date: 04/19/2007

Photo Point: 6A

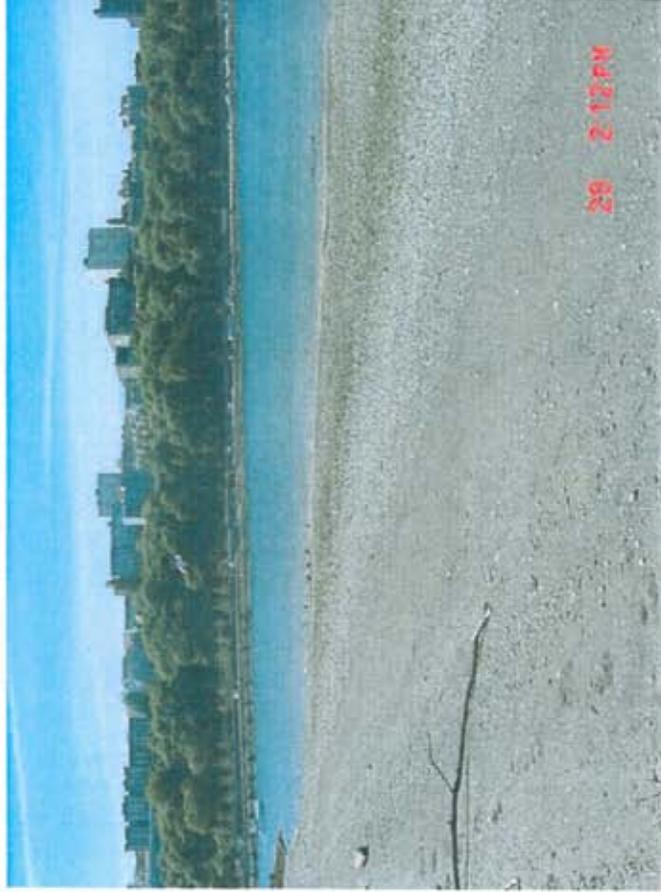
19 11:42AM



Date: 09/17/2007

Photo Point: 6A

2007 Olympic View Monitoring Photos



29 2:12 PM

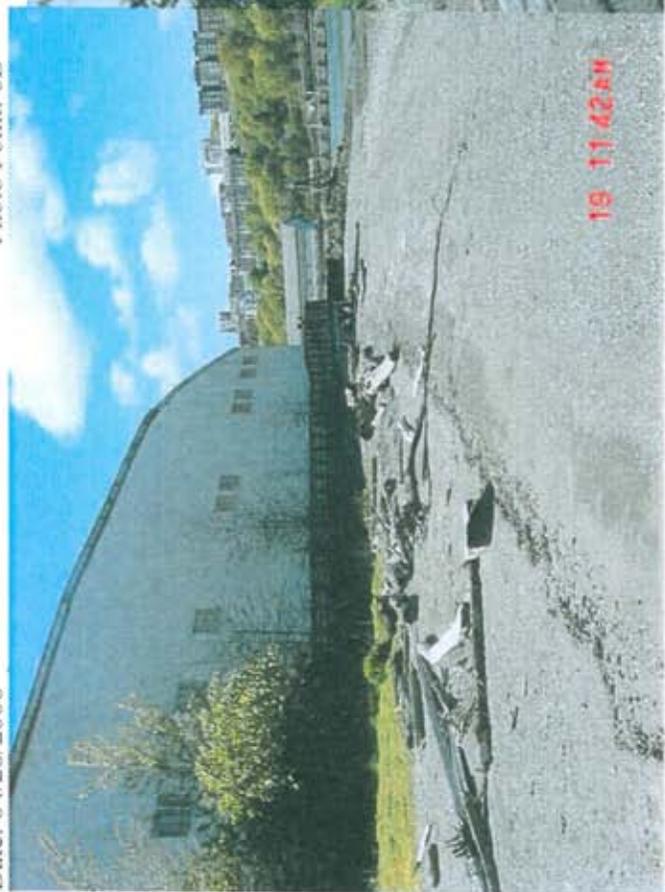
Date: 04/28/2006

Photo Point: 6B



Date: 08/18/2006

Photo Point: 6B



19 11:42 AM

Date: 04/19/2007

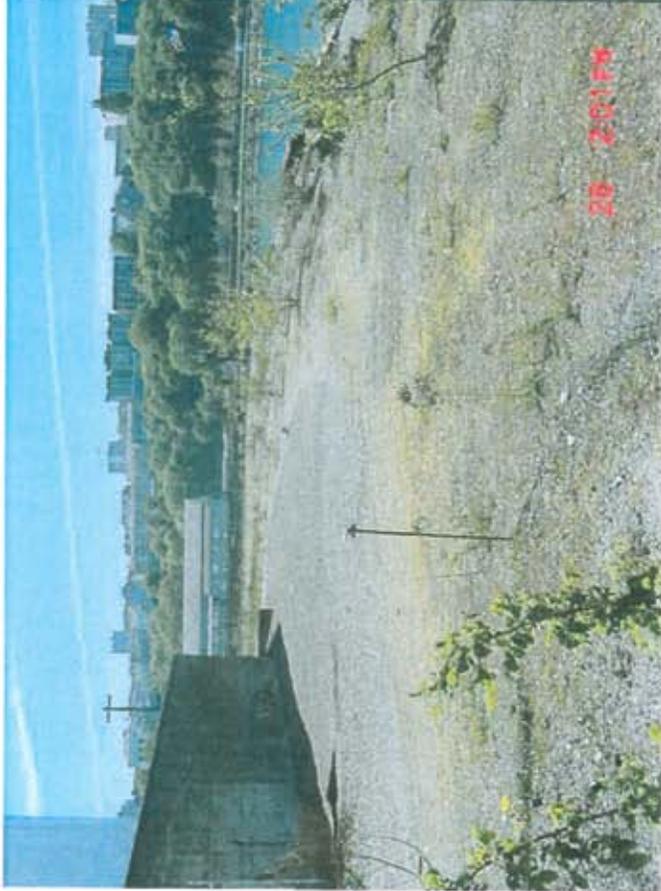
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Date: 09/17/2007

Photo Point: 6B

2007 Olympic View Monitoring Photos



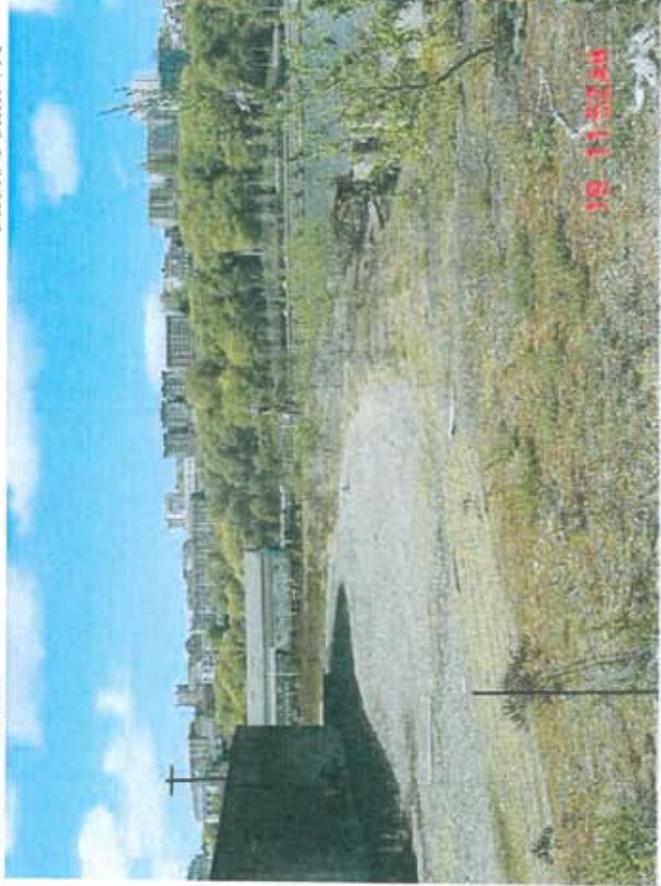
Date: 04/28/2006

Photo Point: 7A



Date: 08/18/2006

Photo Point: 7A



Date: 04/19/2007

Photo Point: 7A



Date: 09/17/2007

Photo Point: 7A

2007 Olympic View Monitoring Photos



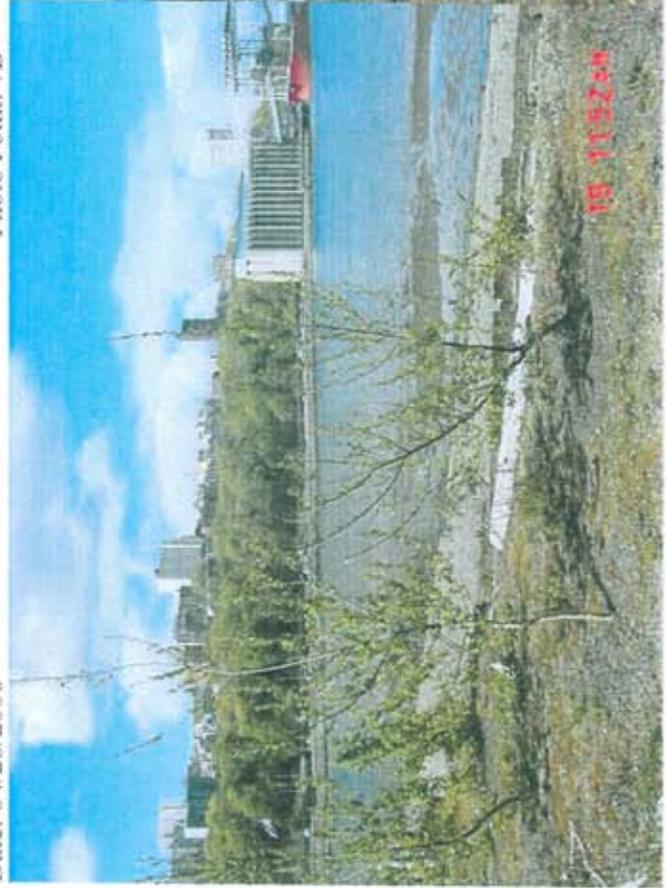
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Photo Point: 7B



Date: 08/18/2006

Photo Point: 7B



Date: 04/19/2007

Photo Point: 7B



Date: 09/17/2007

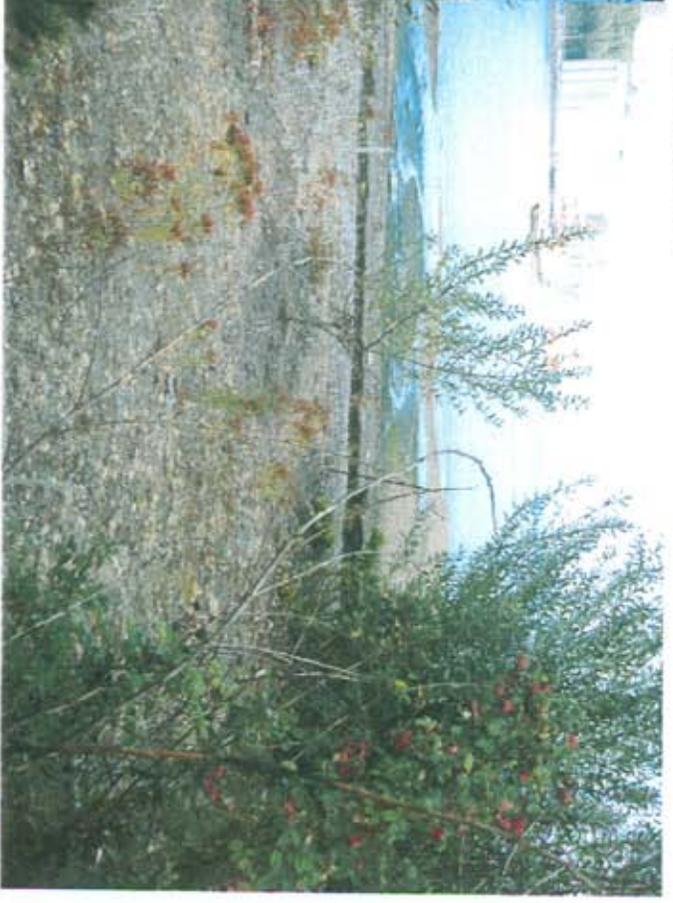
Photo Point: 7B

2007 Olympic View Monitoring Photos



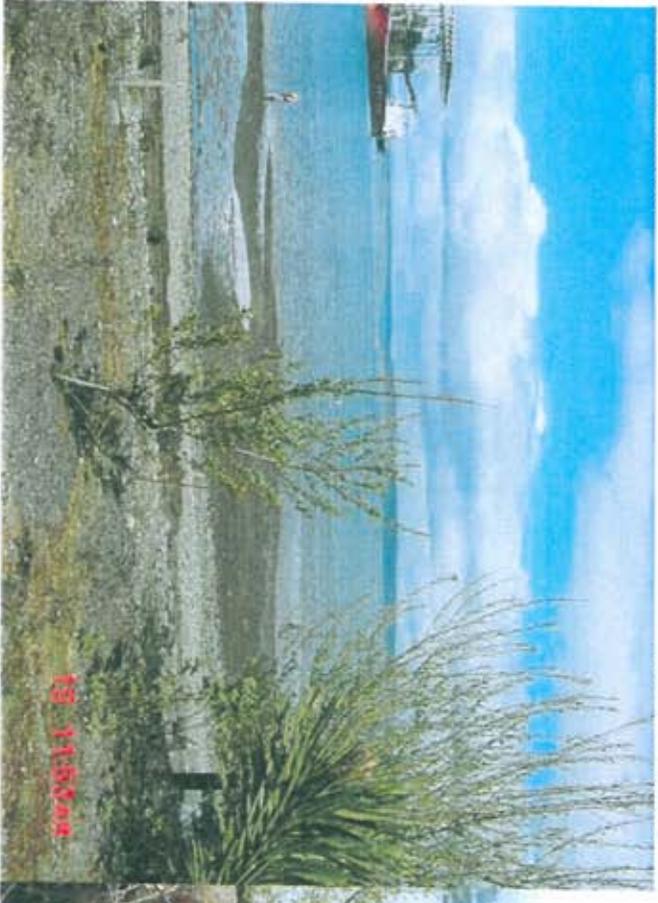
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Photo Point: 7C



Date: 08/18/2006

Photo Point: 7C



Date: 04/19/2007

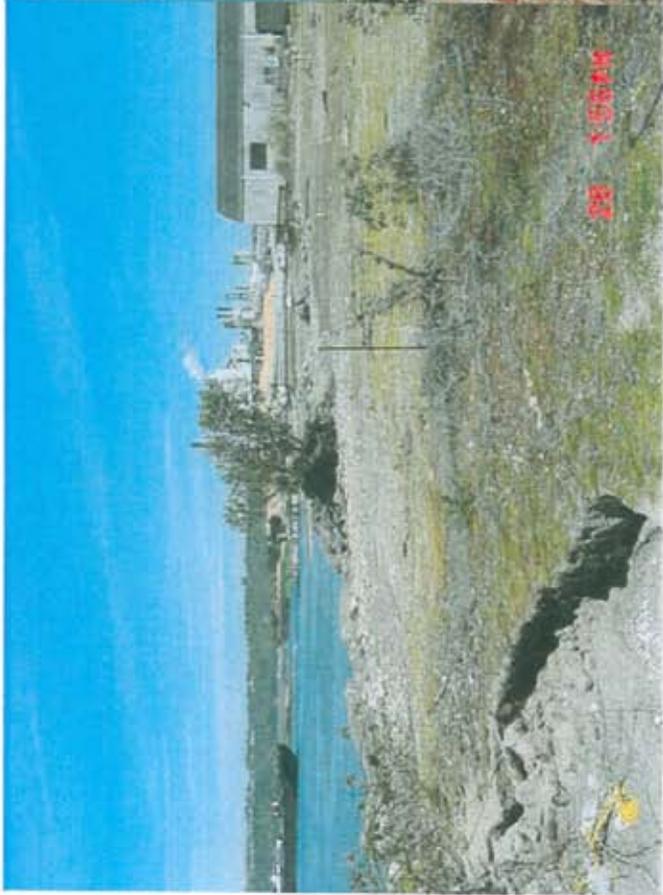
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Date: 09/17/2007

Photo Point: 7C

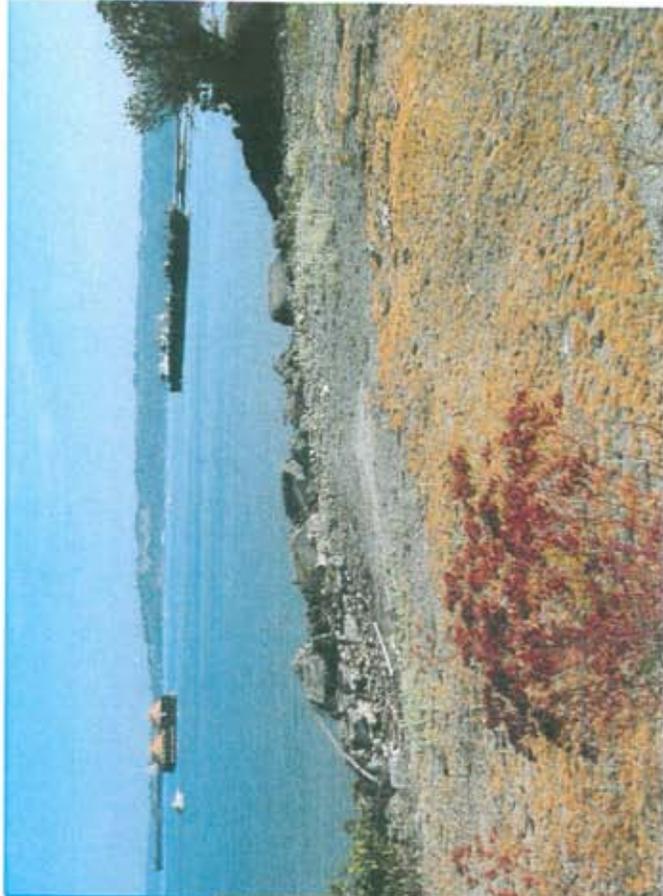
2007 Olympic View Monitoring Photos



Date: 04/28/2006

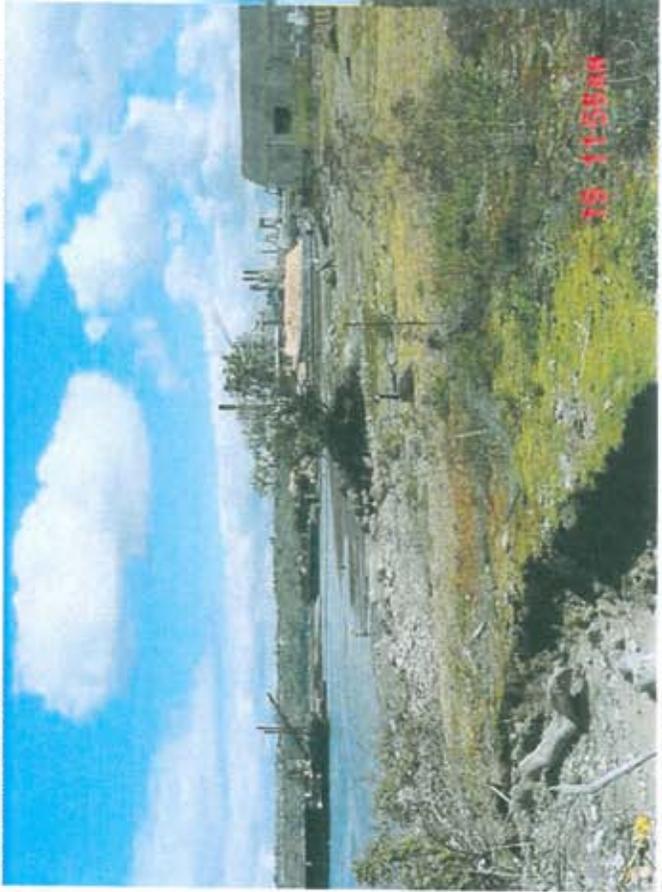
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28 11:55AM



Date: 08/18/2006

Photo Point: 8A



Date: 04/19/2007

Photo Point: 8A

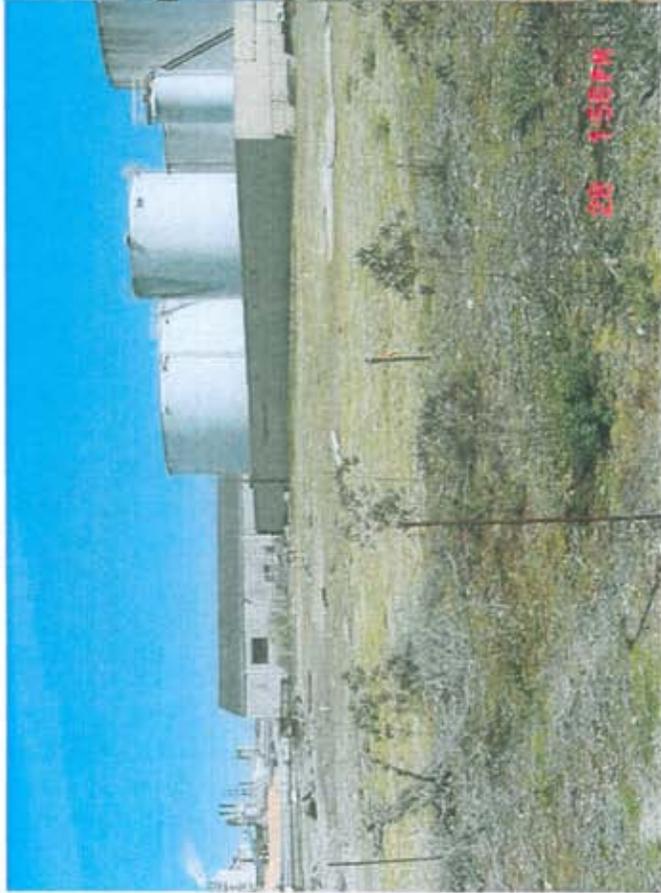
19 11:55AM



Date: 09/17/2007

Photo Point: 8A

2007 Olympic View Monitoring Photos



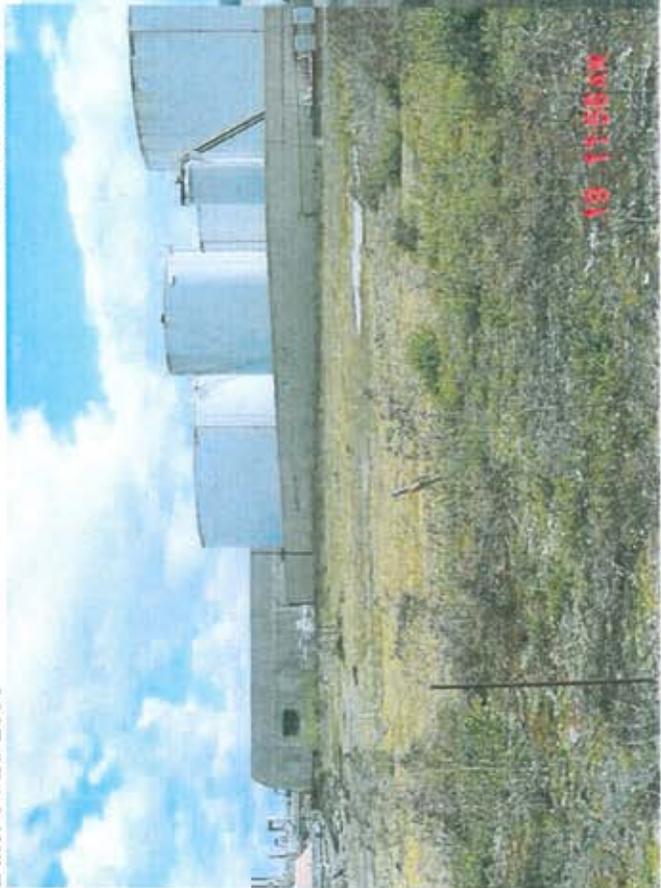
Date: 04/28/2006

Photo Point: 8B



Date: 08/18/2006

Photo Point: 8B



Date: 04/19/2007

Photo Point: 8B



Date: 09/17/2007

Photo Point: 8B

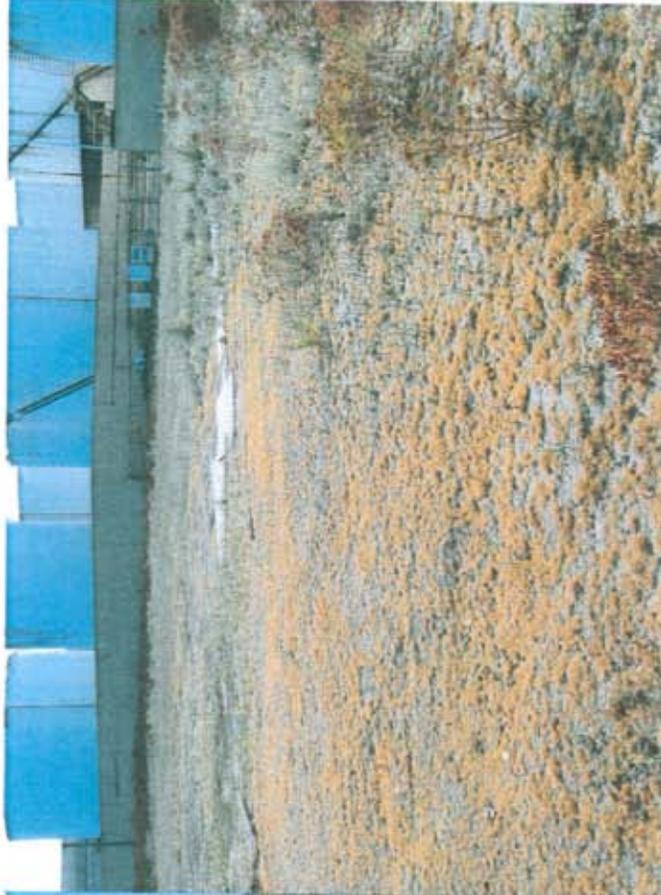
2007 Olympic View Monitoring Photos



Date: 04/28/2006

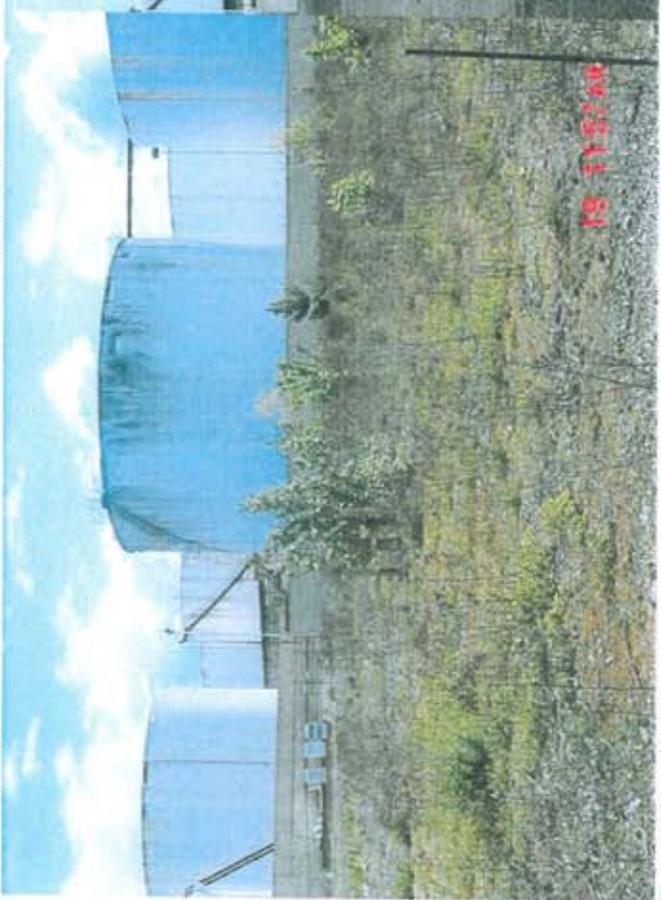
Photo Point: 8C

26-153-604



Date: 08/18/2006

Photo Point: 8C



Date: 04/19/2007

Photo Point: 8C

19-17-53-600



Date: 09/17/2007

Photo Point: 8C

2007 Olympic View Monitoring Photos



Close up of Erosion Protection Material A



Close up of Erosion Protection Material B

APPENDIX D

LABORATORY REPORT & QA/QC INFORMATION



City of Tacoma
Environmental Services
Science and Engineering Division

Memorandum

TO: Desiree Pooley, Environmental Specialist, Sr.

FROM: Christopher L. Getchell, Sr. Environmental Specialist

SUBJECT: Olympic View WBS Element ENV-00012-05-02

DATE: August 29, 2007

Attached are the analytical results for the OVRA samples collected June 1, 2007. The samples were analyzed for Total Metals, Polychlorinated Biphenyls (PCBs), and PCDD/PCDF compounds.

The Environmental Services Laboratory analyzed the samples for Total Mercury and Total Metals. Severn Trent Laboratories (STL-Seattle & STL-Sacramento) analyzed the samples for PCBs and PCDD/PCDF compounds. A detailed Data Quality Review report was prepared. The original data is immediately available for review upon request.

The PCDD/PCDF data was validated by EcoChem, Incorporated. The validation report is attached following the Metals and PCBs Data Review Report.

If you have any questions concerning this data, call me at (253) 502-2130. Please note that the remaining portion of the samples associated with this report will be discarded six months from the date of this report, unless notified otherwise.

A handwritten signature in black ink, appearing to read "Christopher L. Getchell", written over a horizontal line.

Christopher L. Getchell
Sr. Environmental Specialist

CLG:LAZ

L:\LABGROUP\QCGROUP\Sharedwd\2007\20070601003.doc

Fs005\lab_reports\SurfaceWater\Miscellaneous\OVRA2007.pdf

Data Review Report

TO: Christopher L. Getchell, Sr. Environmental Specialist
FROM: Lori A. Zboralski, Senior Laboratory Analyst *LZ*
DATE: August 29, 2007

SAMPLES

This report concerns the following samples associated with **OVRA WBS Element ENV-00012-05-02**:

<u>Sample Description</u>	<u>Lab ID#</u>	<u>Date Sampled</u>
OVRA Rinse Blank	20070601003	06/01/2007
A1-07	20070601004	06/01/2007
A2-07	20070601005	06/01/2007
A2-07 DUP	20070601006	06/01/2007
B1-07	20070601007	06/01/2007
B2-07	20070601008	06/01/2007
B2-07 DUP	20070601009	06/01/2007
C9-07	20070601011	06/01/2007
C10-07	20070601012	06/01/2007

The following samples' PCDD/PCDF data are reviewed in the attached document from EcoChem:

<u>Sample Description</u>	<u>Lab ID#</u>	<u>Date Sampled</u>
OVRA Rinse Blank	20070601003	06/01/2007
B1-07	20070601007	06/01/2007
B2-07	20070601008	06/01/2007
B2-07 DUP	20070601009	06/01/2007
C5-07	20070601010	06/01/2007
D1-07	20070601013	06/01/2007
E3-07	20070601014	06/01/2007

HOLDING TIMES

The samples were extracted within 14 days for Polychlorinated Biphenyls (PCBs) and analyzed within 7 days for Total Solids, 28 days for Mercury, 40 days for PCBs, and 180 days for Total Metals.

CHAIN OF CUSTODY

There were no deviations from Chain of Custody procedures.

METHODS

The samples were analyzed according to EPA SW-846 Methods 7471 for Mercury, 8082 for PCBs, and 6010B for Total Metals.

CALIBRATION AND VERIFICATION

The Initial Calibration for the PCBs met QAPP recommendations of %RSD for the standard response factors of less than 25% for all compounds analyzed. The Continuing Calibration for the PCBs met QAPP recommendations with Recoveries between 80 and 120%, except for Aroclor-1260 on Column one measured at 10:03 PM on June 6, 2007. All other continuing calibrations met the QAPP recommendations so no data is qualified.

The ICP and Mercury calibrations met method requirements for linearity and accuracy. Independent mid-range standards were analyzed to monitor calibration accuracy (ICV and CCV). All recoveries for ICP and Mercury were within the 90 - 110% limits.

METHOD AND CALIBRATION BLANKS

Method Preparation and Calibration Blanks were analyzed at the required frequency. The concentrations of these blanks were less than 1/5 the amount found in the sample or less than the detection limit at all times, except for Copper in the Method Blank digested with the Rinse Blank sample. The Method Blank had a concentration of Copper at 6.5 ug/L. The Copper value in the Rinse Blank was non-detect (U) so no further qualification of the data is required.

FIELD BLANKS

Sample OVRA Rinse Blank (20070601003) is a field blank. There were no target analytes detected in the Rinse Blank.

SURROGATE COMPOUNDS

Two Surrogate compounds are added to each sample in PCB method 8082. Recoveries of surrogate compounds are compared with the QAPP limits of 30 – 150%. The Surrogate recoveries for this sample ranged from 40 – 113%. All recoveries were within the QAPP limits.

LABORATORY CONTROL SAMPLES

Laboratory Control Samples (LCS) monitor the performance of each step of the analysis, including sample preparation. The LCS recoveries for all parameters were within the limits stated in the QAPP. No data was qualified.

DUPLICATE SAMPLE ANALYSIS

The duplicate samples had relative percent differences (RPD) within laboratory established limits of less than 35% for analytes with concentrations greater than five times the CRQL.

MATRIX SPIKE SAMPLE ANALYSIS

A1-07 was analyzed with Matrix Spike for Total Metals and A2-07 DUP was analyzed with a Matrix Spike for Mercury. Recoveries for Total Metals ranged from 85 – 95%. The recoveries of these spikes were within the acceptance limits of 75 – 125% for Total Metals. The Mercury spike was outside the limits at 39%. Matrix Spike analysis was repeated for Mercury with a recovery of 75%. No data is qualified because the second spike sample was within the project limits of 75 – 125%.

MATRIX SPIKE AND MATRIX SPIKE DUPLICATE ANALYSIS

B2-07 was analyzed with a Matrix Spike (MS) and Matrix Spike Duplicate (MSD) for PCBs using a mixture of Aroclor-1016 and Aroclor-1260 analysis. The recoveries ranged from 84 – 94%. All recoveries were within the laboratory's established control limits. No data is qualified.

ICP SERIAL DILUTIONS

The A1-07 sample was analyzed at a five-fold dilution for Total Metals. The percent differences of the diluted samples when compared to the undiluted samples were less than 10% for the analytes with concentrations greater than 50 times the method detection limit.

FIELD DUPLICATE ANALYSIS

Samples A2-07 and A2-07 DUP and B2-07 and B2-07 DUP are field duplicate samples. The results for detected analytes are summarized in the following tables.

Analyte	A2-07	A2-07 DUP	RPD
Arsenic (mg/Kg)	7.75	8.42	
Copper (mg/Kg)	24.9	28.8	
Lead (mg/Kg)	8.54	7.95	
Zinc (mg/Kg)	46.6	41.4	

There were no PCBs detected in the B2-07 and B2-07 DUP samples.

The field duplicate met the project criteria of RPD less than 50%.



City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421

Phone: 253.591.5588 Fax: 253.502.2170

Project: Olympic View Resources Area
ENV-00012-05-02
Date: August 29, 2007

Lab#: 20070601003
Sample ID: OVRA Rinse Blank
Sample Type: Water
Sample Date: 6/1/2007

	Test	Result	Units
CV	Mercury	0.050 U	ug/L
GC/ECD	Aroclor-1016	0.077 U	ug/L
	Aroclor-1221	0.077 U	ug/L
	Aroclor-1232	0.077 U	ug/L
	Aroclor-1242	0.077 U	ug/L
	Aroclor-1248	0.077 U	ug/L
	Aroclor-1254	0.048 U	ug/L
	Aroclor-1260	0.048 U	ug/L
ICP	Arsenic	4.2 U	ug/L
	Copper	3.0 U	ug/L
	Lead	2.6 U	ug/L
	Zinc	4.6 U	ug/L
SUBCONTRACT	Dioxin	See Attached	ug/Kg

Flags: U: The analyte was not detected at or above the reported value.
UJ: The analyte was not detected at or above the reported estimated result.
J: The associated value is an estimate.
E: The analyte was positively identified. The associated value is an estimate.
B: The analyte was detected above the MDL but is less than the reporting limit.
*: The value includes 1/2 MDL for non-detected compounds.
X: The value is based on a dilution.

Lab#: 20070601003
Sample ID: OVRA Rinse Blank
Sample Type: Water
Sample Date: 6/1/2007

Test	Result	Units
<i>Lori A. Zboralski</i>	August 29, 2007	
Reviewed By:	Date	

- Flags:
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Science and Engineering Division

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Phone: 253.591.5588 Fax: 253.502.2170

Project: Olympic View Resources Area
ENV-00012-05-02
Date August 29, 2007

Lab#: 20070601004
Sample ID: A1-07
Sample Type: Sediment
Sample Date: 6/1/2007

	Test	Result	Units
CV	Mercury	0.026	mg/Kg
ICP	Arsenic	1.87	mg/Kg
	Copper	13.1	mg/Kg
	Lead	2.75	mg/Kg
	Zinc	18.9	mg/Kg

Lou A. Zporalski

August 29, 2007

Reviewed By:

Date

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City of Tacoma

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Phone: 253.591.5588 Fax: 253.502.2170

Project: Olympic View Resources Area
ENV-00012-05-02
Date August 29, 2007

Lab#: 20070601005
Sample ID: A2-07
Sample Type: Sediment
Sample Date: 6/1/2007

	Test	Result	Units
CV	Mercury	0.0081 U	mg/Kg
ICP	Arsenic	7.75	mg/Kg
	Copper	24.9	mg/Kg
	Lead	8.54	mg/Kg
	Zinc	46.6	mg/Kg

Len A. Zboralski

August 29, 2007

Reviewed By:

Date

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Science and Engineering Division

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Phone: 253.591.5588 Fax: 253.502.2170

Project: **Olympic View Resources Area**

ENV-00012-05-02

Date: August 29, 2007

Lab#: 20070601006

Sample ID: A2-07 DUP

Sample Type: Sediment

Sample Date: 6/1/2007

	Test	Result	Units
CV	Mercury	0.0062 U	mg/Kg
ICP	Arsenic	8.42	mg/Kg
	Copper	28.8	mg/Kg
	Lead	7.95	mg/Kg
	Zinc	41.4	mg/Kg

Lerida Zboralski

August 29, 2007

Reviewed By:

Date

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Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421

Phone: 253.591.5588 Fax: 253.502.2170

Project: Olympic View Resources Area
ENV-00012-05-02
Date: August 29, 2007

Lab#: 20070601007
Sample ID: B1-07
Sample Type: Sediment
Sample Date: 6/1/2007

Test	Result	Units
GC/ECD		
Aroclor-1016	6.1 U	ug/Kg
Aroclor-1221	6.1 U	ug/Kg
Aroclor-1232	6.1 U	ug/Kg
Aroclor-1242	6.1 U	ug/Kg
Aroclor-1248	6.1 U	ug/Kg
Aroclor-1254	1.6 U	ug/Kg
Aroclor-1260	1.6 U	ug/Kg
SUBCONTRACT		
Dioxin	See Attached	ug/Kg

Lori A. Zboralski

August 29, 2007

Reviewed By:

Date

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Phone: 253.591.5588 Fax: 253.502.2170

Project: Olympic View Resources Area
ENV-00012-05-02
Date: August 29, 2007

Lab#: 20070601008
Sample ID: B2-07
Sample Type: Sediment
Sample Date: 6/1/2007

Test	Result	Units
GC/ECD		
Aroclor-1016	5.9 U	ug/Kg
Aroclor-1221	5.9 U	ug/Kg
Aroclor-1232	5.9 U	ug/Kg
Aroclor-1242	5.9 U	ug/Kg
Aroclor-1248	5.9 U	ug/Kg
Aroclor-1254	1.5 U	ug/Kg
Aroclor-1260	1.5 U	ug/Kg
SUBCONTRACT		
Dioxin	See Attached	ug/Kg

Lori A. Zporalski
Reviewed By:

August 29, 2007

Date

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2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Olympic View Resources Area
ENV-00012-05-02
Date August 29, 2007

Lab#: 20070601009
Sample ID: B2-07 DUP
Sample Type: Sediment
Sample Date: 6/1/2007

Test	Result	Units
GC/ECD		
Aroclor-1016	6.0 U	ug/Kg
Aroclor-1221	6.0 U	ug/Kg
Aroclor-1232	6.0 U	ug/Kg
Aroclor-1242	6.0 U	ug/Kg
Aroclor-1248	6.0 U	ug/Kg
Aroclor-1254	1.5 U	ug/Kg
Aroclor-1260	1.5 U	ug/Kg
SUBCONTRACT		
Dioxin	See Attached	ug/Kg

Loria Zboralski

August 29, 2007

Reviewed By:

Date

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2201 Portland Avenue Tacoma WA 98421

Phone: 253.591.5588 Fax: 253.502.2170

Project: Olympic View Resources Area
 ENV-00012-05-02
Date August 29, 2007

Lab#: 20070601011
Sample ID: C9-07
Sample Type: Sediment
Sample Date: 6/1/2007

	Test	Result	Units
CV	Mercury	0.0740	mg/Kg
ICP	Arsenic	4.71	mg/Kg
	Copper	27.0	mg/Kg
	Lead	8.83	mg/Kg
	Zinc	22.8	mg/Kg

Lou A. Zboralski

August 29, 2007

Reviewed By:

Date

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City of Tacoma

Science and Engineering Division

2201 Portland Avenue Tacoma WA 98421
Phone: 253.591.5588 Fax: 253.502.2170

Project: Olympic View Resources Area
ENV-00012-05-02
Date August 29, 2007

Lab#: 20070601012
Sample ID: C10-07
Sample Type: Sediment
Sample Date: 6/1/2007

	Test	Result	Units
CV	Mercury	0.0647	mg/Kg
ICP	Arsenic	3.23	mg/Kg
	Copper	20.1	mg/Kg
	Lead	7.54	mg/Kg
	Zinc	20.4	mg/Kg

Lori A. Zboralski

August 29, 2007

Reviewed By:

Date

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EcoChem, Inc.

Environmental Science and Chemistry

TRANSMITTAL

DATE: August 23, 2007

PROJECT NO.: 5405-1

TO: Lori Zboralski
Environmental Services
City of Tacoma Public Works
2201 Portland Avenue
Tacoma, Washington 98421
(253) 502-2133

FROM: Chris Ransom
EcoChem, Inc.
710 2nd Ave. Suite 660
Seattle, Washington 98104

VIA: Fed Ex

WE ARE SENDING THE FOLLOWING MATERIALS:

Data Validation Report for the OVRA Site Project and the corresponding hard copy data.

REMARKS:

Please feel free to call if you have any questions.

Sincerely,

Chris Ransom
Project Manager
EcoChem, Inc.

Copies: Chron
Project



EcoChem, INC.
Environmental Data Quality

DATA VALIDATION REPORT

CITY OF TACOMA
OVRA Site

Prepared for:

City of Tacoma
Public Works Department
2201 Portland Avenue
Tacoma, Washington 98421

Prepared by:

EcoChem, Inc.
710 Second Avenue, Suite 660
Seattle, Washington 98104

EcoChem Project: C5405-1

August 21, 2007

Approved for Release:

Christine Ransom
Project Manager
EcoChem, Inc.

PROJECT NARRATIVE

Basis for the Data Validation

This report summarizes the results for validation performed on soil and rinsate sample data submitted for the OVRA Site project. Full validation (Level IV) was performed on all samples.

Samples were analyzed for dioxins/furans by Severn Trent Laboratories, Inc., West Sacramento, California. The analytical methods and EcoChem project chemists are listed in the table below.

ANALYSIS METHODS AND ECOCHEM CHEMISTS

Analysis	Method	Primary Review	Secondary Review
Dioxins and Furans	EPA 1613B	Mark T. Brindle	Craig Hutchings

Data validation was based on the quality control (QC) criteria documented in the method listed above, in *National Functional Guidelines for Chlorinated Dioxin/Furan Data Review* (USEPA 2005).

Data qualifier definitions, reason codes, and validation criteria are included as **APPENDIX A**. **APPENDIX B** contains all Form 1s. Data validation worksheets are in **APPENDIX C**.

DATA VALIDATION REPORT
Dioxin/Furan Analysis by Method EPA 1613B
SDG: G7F050209

Analytical data for six soil samples and one rinsate blank were reviewed using quality control (QC) criteria documented in the analytical method, *National Functional Guidelines for Organic Data Review* (USEPA, 1999), and *National Functional Guidelines for Chlorinated Dioxin/Furan Data Review* (USEPA 2002). The samples were collected on June 1, 2007. Severn Trent Laboratories, Inc. of West Sacramento, California performed the analyses. Full validation (Level IV) was performed on all data. Refer to the table below for a complete listing of samples.

Client Sample ID	Lab Sample ID	Matrix
OVRA Rinse Blank	G7F050209-001	Equipment Rinsate
B1 07	G7F050209-002	Soil
B2 07	G7F050209-003	Soil
B2 07 DUP	G7F050209-004	Soil
D1 07	G7F050209-005	Soil
C5 07	G7F050209-006	Soil
E3 07	G7F050209-007	Soil

I. DATA PACKAGE COMPLETENESS

The laboratory submitted all required deliverables. The laboratory followed adequate corrective action processes and all anomalies were discussed in the case narrative.

II. TECHNICAL DATA VALIDATION

The quality control (QC) requirements that were reviewed are listed in the following table.

Sample Receipt, Preservation, and Holding Times	1	Matrix Spikes/Matrix Spike Duplicates (MS/MSD)
GC/MS Instrument Performance Check		Ongoing Precision and Recovery (OPR)
Initial Calibration (ICAL)	2	Field Duplicates
Calibration Verification (CVER)		Target Analyte List
Isomer Specificity		Reporting Limits (MDL and MRL)
Laboratory Blanks	2	Compound Identification (Full validation only)
1 Field (Equipment Rinsate) Blanks	1	Calculation Verification (Full validation only)
Labeled Compound Recovery		

¹ Quality control results are discussed below, but no data were qualified.

² Quality control outliers that impact the reported data were noted. Data qualifiers were issued as discussed below.

Field Blank (Equipment Rinsate)

The laboratory method blank is used to evaluate the associated field blank. Any remaining positive results in the equipment blank are then used to evaluate the associated samples.

One equipment rinsate blank (OVRA Rinse Blank) was submitted with the samples. No positive results were reported in this rinsate blank.

Matrix Spike/Matrix Spike Duplicate

No matrix spike/matrix spike duplicate (MS/MSD) analyses were performed with this data set. Accuracy was assessed using labeled compound recoveries and the ongoing precision and recovery samples.

Field Duplicates

Relative percent difference (RPD) is used to evaluate precision for all results; the criterion for soil is that the RPD must be less than 50%. If the RPD criterion is not met, and the results are less than 5x the reporting limit, the absolute difference (D) is then evaluated. The criterion is that the difference must be less than 2x the RL.

Samples B2 07 and B2 07 DUP were submitted as field duplicates.

Field precision criteria were exceeded for total hexachlorofuran, total heptachlorofuran, total heptachlorodioxin, 1,2,3,4,6,7,8-HpCDD, OCDD, 1,2,3,4,6,7,8-HpCDF, and OCDF. Results for these analytes were estimated (J-9) in both samples.

Compound Identification

The criterion for the ion abundance ratio was not met for 1,2,3,6,7,8-HxCDD in Sample E3 07. The reporting limit was elevated to the reported concentration (U-21).

Calculation Verification

Calculation verifications were performed on this SDG. No calculation or transcription errors were found.

III. OVERALL ASSESSMENT

As was determined by this evaluation, the laboratory followed the specified analytical method.

Laboratory accuracy was acceptable, as demonstrated by the % recovery values for labeled compounds and recoveries reported for the OPR sample. Laboratory precision was not evaluated; field precision for several analytes was not acceptable and several analytes in the field duplicate samples were estimated.

The reporting limit for one analyte in one sample was elevated to the reported concentration.

All data, as qualified, are acceptable for use.



EcoChem, INC.
Environmental Data Quality

APPENDIX A
DATA QUALIFIER DEFINITIONS
REASON CODES
AND CRITERIA TABLES

DATA VALIDATION QUALIFIER CODES

National Functional Guidelines

The following definitions provide brief explanations of the qualifiers assigned to results in the data review process.

U	The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
J	The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
N	The analysis indicates the presence of an analyte for which there is presumptive evidence to make a "tentative identification".
NJ	The analysis indicates the presence of an analyte that has been "tentatively identified" and the associated numerical value represents its approximate concentration.
UJ	The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
R	The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

The following is an EcoChem qualifier that may also be assigned in the data review process:

DNR	Do-not-report. Duplicate results exist due to reanalyses. This result should not be reported.
-----	---

DATA QUALIFIER REASON CODES

1	Holding Time/Sample Preservation
2	Chromatographic pattern in sample does not match pattern of calibration standard.
3	Compound Confirmation
4	Tentatively Identified Compound (TIC) (associated with NJ only)
5A	Calibration (initial)
5B	Calibration (continuing)
6	Field Blank Contamination
7	Lab Blank Contamination (e.g., method blank, instrument, etc.)
8	Matrix Spike(MS & MSD) Recoveries
9	Precision (all replicates)
10	Laboratory Control Sample Recoveries
11	A more appropriate result is reported (associated with "R" and "DNR" only)
12	Reference Material
13	Surrogate Spike Recoveries (a.k.a., labeled compounds & recovery standards)
14	Other (define in validation report)
15	GFAA Post Digestion Spike Recoveries
16	ICP Serial Dilution % Difference
17	ICP Interference Check Standard Recovery
18	Trip Blank Contamination
19	Internal Standard Performance (e.g., area, retention time, recovery)
20	Linear Range Exceeded
21	Potential False Positives

EcoChem Validation Guidelines for Dioxin/Furan Analysis by HRMS
 (Based on EPA Reg. 10 SOP, Rev. 2, 1996 & EPA SW-846, Methods 1613b and 8290)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Cooler/Storage Temperature	Waters/Solids < 4°C Tissues <-10°C	EcoChem PJ, see TM-05	1
Holding Time	Extraction - Water: 30 days from collection <i>Note:</i> Under CWA, SDWA, and RCRA the HT for H2O is 7 days* Extraction - Soil: 30 days from collection Analysis: 40 days from extraction	J(+)/UJ(-) if ext > 30 days J(+)/UJ(-) if analysis > 40 Days EcoChem PJ, see TM-05	1
Mass Resolution	>=10,000 resolving power at m/z 304.9824 Exact mass of m/z 380.9760 w/in 5 ppm of theoretical value (380.97410 to 380.97790) Analyzed prior to ICAL and at the start and end of each 12 hr. shift	R(+/-) if not met	14
Window Defining Mix and Column Performance Mix	Window defining mixture/isomer specificity std run before ICAL and CCAL Valley < 25% (valley = (x/y)*100%) x = ht. of TCDD y = baseline to bottom of valley For all isomers eluting near 2378-TCDD/TCDF isomers (TCDD only for 8290)	J(+) if valley > 25%	5A (ICAL) 5B (CCAL)
Initial Calibration	Minimum of five standards %RSD < 20% for native compounds %RSD <30% for labeled compounds (%RSD <35% for labeled compounds under 1613b)	J(+) natives if %RSD > 20%	5A
	Abs. RT of ¹³ C ₁₂ -1234-TCDD >25 min on DB5 >15 min on DB-225	EcoChem PJ, see TM-05	
	Ion Abundance ratios within QC limits (Table 8 of method 8290) (Table 9 of method 1613B)	EcoChem PJ, see TM-05	
	S/N ratio > 10 for all native and labeled compounds in CS1 std.	If <10, elevate Det. Limit or R(-)	

EcoChem Validation Guidelines for Dioxin/Furan Analysis by HRMS
 (Based on EPA Reg. 10 SOP, Rev. 2, 1996 & EPA SW-846, Methods 1613b and 8290)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Continuing Calibration	Analyzed at the start and end of each 12 hour shift. %D +/-20% for native compounds %D +/-30% for labeled compounds (Must meet limits in Table 6, Method 1613B) (if %Ds in the closing CCAL are w/in 25%/35% the avg RF from the two CCAL may be used to calculate samples per Method 8290, Section 8.3.2.4)	Do not qualify labeled compounds. Narrate in report for labeled compound %D outliers. For native compound %D outliers: 8290: J(+)/UJ(-) if %D = 20% - 75% J(+)/R(-) if %D > 75% 1613: J(+)/UJ(-) if %D is outside Table 6 limits J(+)/R(-) if %D is +/- 75% of Table 6 limit	5B
	Abs. RT of ¹³ C ₁₂ -1234-TCDD and ¹³ C ₁₂ -123789-HxCDD +/- 15 sec of ICAL.	EcoChem PJ, see ICAL section of TM-05	
	RRT of all other compounds must meet Table 2 of 1613B.	EcoChem PJ, see TM-05	
	Ion Abundance ratios within QC limits (Table 8 of method 8290) (Table 9 of method 1613B)	EcoChem PJ, see TM-05	
	S/N ratio > 10	If <10, elevate Det. Limit or R(-)	
Method Blank	One per matrix per batch No positive results	If sample result <5X action level, qualify U at reported value.	7
Field Blanks (Not Required)	No positive results	If sample result <5X action level, qualify U at reported value.	6
LCS / OPR	Concentrations must meet limits in Table 6, Method 1613B or lab limits.	J(+) if %R > UCL J(+)/UJ(-) if %R < LCL J(+)/R(-) using PJ if %R <<LCL (< 10%)	10
MS/MSD (recovery)	May not analyze MS/MSD %R should meet lab limits.	Qualify parent only unless other QC indicates systematic problems: J(+) if both %R > UCL J(+)/UJ(-) if both %R < LCL J(+)/R(-) if both %R < 10% PJ if only one %R outlier	8
MS/MSD (RPD)	May not analyze MS/MSD RPD < 20%	J(+) in parent sample if RPD > CL	9

EcoChem Validation Guidelines for Dioxin/Furan Analysis by HRMS
 (Based on EPA Reg. 10 SOP, Rev. 2, 1996 & EPA SW-846, Methods 1613b and 8290)

VALIDATION QC ELEMENT	ACCEPTANCE CRITERIA	ACTION	REASON CODE
Lab Duplicate	RPD <25% if present.	J(+)/JJ(-) if outside limits	9
Labeled Compounds / Internal Standards	<i>Method 8290</i> : %R = 40% - 135% in all samples	J(+)/JJ(-) if %R = 10% to LCL J(+) if %R > UCL J(+)/R(-) if %R < 10%	13
	<i>Method 1613B</i> : %R must meet limits specified in Table 7, Method 1613		
Quantitation/ Identification	Ions for analyte, IS, and rec. std. must max w/in 2 sec. S/N >2.5 IA ratios meet limits in Table 9 of 1613B or Table 8 of 8290 RRTs w/in limits in Table 2 of 1613B	If RT criteria not met, use PJ (see TM-05) If S/N criteria not met, J(+). if unlabelled ion abundance not met, change to EMPC If labelled ion abundance not met, J(+).	21
EMPC (estimated maximum possible concentration)	If quantitation identification criteria are not met, laboratory should report an EMPC value.	If laboratory correctly reported an EMPC value, qualify with U to indicate that the value is a detection limit.	14
Interferences	PCDF interferences from PCDFE	If both detected, change PCDF result to EMPC	14
Second Column Confirmation	All 2378-TCDF hits must be confirmed on a DB-225 (or equiv) column. All QC specs in this table must be met for the confirmation analysis.	Report lower of the two values. If not performed use PJ (see TM-05).	3
Field Duplicates	Use QAPP limits. If no QAPP: Solids: RPD <50% OR absolute diff. < 2X RL (for results < 5X RL) Aqueous: RPD <35% OR absolute diff. < 1X RL (for results < 5X RL)	Narrate and qualify if required by project (EcoChem PJ)	9
Two analyses for one sample	Report only one result per analyte	"DNR" results that should not be used	11



EcoChem, INC.
Environmental Data Quality

APPENDIX B

FORM 1s

STL SEATTLE

Client Sample ID: OVRA RINSE BLANK (580-6075-1)

Trace Level Organic Compounds

Lot-Sample #...: G7F050209-001 Work Order #...: JOAFH1AA Matrix.....: W
 Date Sampled...: 06/01/07 Date Received...: 06/05/07
 Prep Date.....: 06/08/07 Analysis Date...: 06/15/07
 Prep Batch #...: 7163525
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
Total HpCDF	ND	7.7	pg/L	EPA-5 1613B
Total TCDD	ND	3.2	pg/L	EPA-5 1613B
Total PeCDD	ND	14	pg/L	EPA-5 1613B
Total HxCDD	ND	4.4	pg/L	EPA-5 1613B
Total HpCDD	ND	7.7	pg/L	EPA-5 1613B
Total TCDF	ND	4.7	pg/L	EPA-5 1613B
Total PeCDF	ND	7.3	pg/L	EPA-5 1613B
Total HxCDF	ND	10	pg/L	EPA-5 1613B
2,3,7,8-TCDD	ND	3.2	pg/L	EPA-5 1613B
1,2,3,7,8-PeCDD	ND	5.5	pg/L	EPA-5 1613B
1,2,3,4,7,8-HxCDD	ND	4.2	pg/L	EPA-5 1613B
1,2,3,6,7,8-HxCDD	ND	4.4	pg/L	EPA-5 1613B
1,2,3,7,8,9-HxCDD	ND	4.0	pg/L	EPA-5 1613B
1,2,3,4,6,7,8-HpCDD	ND	7.7	pg/L	EPA-5 1613B
OCDD	ND	21	pg/L	EPA-5 1613B
2,3,7,8-TCDF	ND CON	4.7	pg/L	EPA-5 1613B
1,2,3,7,8-PeCDF	ND	6.4	pg/L	EPA-5 1613B
2,3,4,7,8-PeCDF	ND	4.0	pg/L	EPA-5 1613B
1,2,3,4,7,8-HxCDF	ND	10	pg/L	EPA-5 1613B
1,2,3,6,7,8-HxCDF	ND	4.5	pg/L	EPA-5 1613B
2,3,4,6,7,8-HxCDF	ND	2.9	pg/L	EPA-5 1613B
1,2,3,7,8,9-HxCDF	ND	4.0	pg/L	EPA-5 1613B
1,2,3,4,6,7,8-HpCDF	ND	7.7	pg/L	EPA-5 1613B
1,2,3,4,7,8,9-HpCDF	ND	5.4	pg/L	EPA-5 1613B
OCDF	ND	9.7	pg/L	EPA-5 1613B

(Continued on next page)

MTB 7/25/07

STL SEATTLE

Client Sample ID: OVRA RINSE BLANK (580-6075-1)

Trace Level Organic Compounds

Lot-Sample #...: G7F050209-001 Work Order #...: JOAFH1AA Matrix.....: W

<u>INTERNAL STANDARDS</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
13C-2,3,7,8-TCDD	66	(25 - 164)
13C-1,2,3,7,8-PeCDD	65	(25 - 181)
13C-1,2,3,4,7,8-HxCDD	61	(32 - 141)
13C-1,2,3,6,7,8-HxCDD	77	(28 - 130)
13C-1,2,3,4,6,7,8-HpCDD	59	(23 - 140)
13C-OCDD	39	(17 - 157)
13C-2,3,7,8-TCDF	74	(24 - 169)
13C-1,2,3,7,8-PeCDF	75	(24 - 185)
13C-2,3,4,7,8-PeCDF	83	(21 - 178)
13C-1,2,3,6,7,8-HxCDF	84	(26 - 123)
13C-2,3,4,6,7,8-HxCDF	78	(28 - 136)
13C-1,2,3,7,8,9-HxCDF	69	(29 - 147)
13C-1,2,3,4,6,7,8-HpCDF	65	(28 - 143)
13C-1,2,3,4,7,8,9-HpCDF	65	(26 - 138)
13C-1,2,3,4,7,8-HxCDF	74	(26 - 152)

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
37Cl4-2,3,7,8-TCDD	97	(35 - 197)

NOTE (S) :

CON Confirmation analysis.

WATB 7/25/07

STL SEATTLE

Client Sample ID: B1 07 (580-6075-2)

Trace Level Organic Compounds

Lot-Sample #...: G7F050209-002 Work Order #...: JOAPN1AC Matrix.....: SO
 Date Sampled...: 06/01/07 Date Received...: 06/05/07
 Prep Date.....: 06/07/07 Analysis Date...: 06/15/07
 Prep Batch #...: 7158582
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
Total TCDF	ND	0.28	pg/g	EPA-5 1613B
Total PeCDF	ND	0.56	pg/g	EPA-5 1613B
Total HxCDF	ND	1.6	pg/g	EPA-5 1613B
Total HpCDF	7.7		pg/g	EPA-5 1613B
Total TCDD	ND	0.48	pg/g	EPA-5 1613B
Total PeCDD	ND	0.84	pg/g	EPA-5 1613B
Total HxCDD	ND	0.69	pg/g	EPA-5 1613B
Total HpCDD	18		pg/g	EPA-5 1613B
2,3,7,8-TCDD	ND	0.48	pg/g	EPA-5 1613B
1,2,3,7,8-PeCDD	ND	0.83	pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDD	ND	0.49	pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDD	ND	0.52	pg/g	EPA-5 1613B
1,2,3,7,8,9-HxCDD	ND	0.48	pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDD	9.1		pg/g	EPA-5 1613B
OCDD	96		pg/g	EPA-5 1613B
2,3,7,8-TCDF	ND	0.28	pg/g	EPA-5 1613B
1,2,3,7,8-PeCDF	ND	0.51	pg/g	EPA-5 1613B
2,3,4,7,8-PeCDF	ND	0.49	pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDF	ND	0.41	pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDF	ND	0.42	pg/g	EPA-5 1613B
2,3,4,6,7,8-HxCDF	ND	0.41	pg/g	EPA-5 1613B
1,2,3,7,8,9-HxCDF	ND	0.54	pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDF	3.3 J		pg/g	EPA-5 1613B
1,2,3,4,7,8,9-HpCDF	ND	0.58	pg/g	EPA-5 1613B
OCDF	ND	4.7	pg/g	EPA-5 1613B

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MTB 7/25/07

STL SEATTLE

Client Sample ID: B1 07 (580-6075-2)

Trace Level Organic Compounds

Lot-Sample #...: G7F050209-002 Work Order #...: J0APN1AC Matrix.....: SO

<u>INTERNAL STANDARDS</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
13C-2,3,7,8-TCDD	91	(25 - 164)
13C-1,2,3,7,8-PeCDD	84	(25 - 181)
13C-1,2,3,4,7,8-HxCDD	104	(32 - 141)
13C-1,2,3,6,7,8-HxCDD	108	(28 - 130)
13C-1,2,3,4,6,7,8-HpCDD	116	(23 - 140)
13C-OCDD	108	(17 - 157)
13C-2,3,7,8-TCDF	99	(24 - 169)
13C-1,2,3,7,8-PeCDF	97	(24 - 185)
13C-2,3,4,7,8-PeCDF	111	(21 - 178)
13C-1,2,3,6,7,8-HxCDF	116	(26 - 123)
13C-2,3,4,6,7,8-HxCDF	111	(28 - 136)
13C-1,2,3,7,8,9-HxCDF	104	(29 - 147)
13C-1,2,3,4,6,7,8-HpCDF	119	(28 - 143)
13C-1,2,3,4,7,8,9-HpCDF	134	(26 - 138)
13C-1,2,3,4,7,8-HxCDF	112	(26 - 152)

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
37C14-2,3,7,8-TCDD	97	(35 - 197)

NOTE (S) :

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than the reporting limit.

MTB 7/26/07

STL SEATTLE

Client Sample ID: B2 07 (580-6075-3)

Trace Level Organic Compounds

Lot-Sample #....: G7F050209-003 Work Order #....: JOAPQ1AA Matrix.....: SO
 Date Sampled....: 06/01/07 Date Received...: 06/05/07
 Prep Date.....: 06/08/07 Analysis Date...: 06/12/07
 Prep Batch #....: 7159499
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
Total TCDF	ND	0.39	pg/g	EPA-5 1613B
Total PeCDF	ND	0.43	pg/g	EPA-5 1613B
Total HxCDF	7.8		pg/g	EPA-5 1613B J-9
Total HpCDF	46		pg/g	EPA-5 1613B J-9
Total TCDD	ND	0.32	pg/g	EPA-5 1613B
Total PeCDD	ND	0.64	pg/g	EPA-5 1613B
Total HxCDD	ND	2.2	pg/g	EPA-5 1613B
Total HpCDD	45		pg/g	EPA-5 1613B J-9
2,3,7,8-TCDD	ND	0.28	pg/g	EPA-5 1613B
1,2,3,7,8-PeCDD	ND	0.63	pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDD	ND	1.3	pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDD	ND	1.1	pg/g	EPA-5 1613B
1,2,3,7,8,9-HxCDD	ND	0.60	pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDD	21		pg/g	EPA-5 1613B J-9
OCDD	210		pg/g	EPA-5 1613B J-9
2,3,7,8-TCDF	ND	0.39	pg/g	EPA-5 1613B
1,2,3,7,8-PeCDF	ND	0.33	pg/g	EPA-5 1613B
2,3,4,7,8-PeCDF	ND	0.43	pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDF	ND	1.1	pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDF	ND	0.32	pg/g	EPA-5 1613B
2,3,4,6,7,8-HxCDF	ND	0.26	pg/g	EPA-5 1613B
1,2,3,7,8,9-HxCDF	ND	0.26	pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDF	16		pg/g	EPA-5 1613B J-9
1,2,3,4,7,8,9-HpCDF	ND	0.62	pg/g	EPA-5 1613B
OCDF	21		pg/g	EPA-5 1613B J-9

(Continued on next page)

MTB
 7/25/07

STL SEATTLE

Client Sample ID: B2 07 (580-6075-3)

Trace Level Organic Compounds

Lot-Sample #...: G7F050209-003 Work Order #...: J0APQ1AA Matrix.....: SO

INTERNAL STANDARDS	PERCENT RECOVERY	RECOVERY LIMITS
13C-2,3,7,8-TCDD	45	(25 - 164)
13C-1,2,3,7,8-PeCDD	56	(25 - 181)
13C-1,2,3,4,7,8-HxCDD	42	(32 - 141)
13C-1,2,3,6,7,8-HxCDD	49	(28 - 130)
13C-1,2,3,4,6,7,8-HpCDD	47	(23 - 140)
13C-OCDD	54	(17 - 157)
13C-2,3,7,8-TCDF	39	(24 - 169)
13C-1,2,3,7,8-PeCDF	50	(24 - 185)
13C-2,3,4,7,8-PeCDF	42	(21 - 178)
13C-1,2,3,6,7,8-HxCDF	40	(26 - 123)
13C-2,3,4,6,7,8-HxCDF	42	(28 - 136)
13C-1,2,3,7,8,9-HxCDF	45	(29 - 147)
13C-1,2,3,4,6,7,8-HpCDF	42	(28 - 143)
13C-1,2,3,4,7,8,9-HpCDF	36	(26 - 138)
13C-1,2,3,4,7,8-HxCDF	31	(26 - 152)
SURROGATE	PERCENT RECOVERY	RECOVERY LIMITS
37Cl4-2,3,7,8-TCDD	80	(35 - 197)

NOTE (S) :

Results and reporting limits have been adjusted for dry weight.

11.15 7/25/07

STL SEATTLE

Client Sample ID: B2 07 DUP (530-6075-4)

Trace Level Organic Compounds

Lot-Sample #...: G7F050209-004 Work Order #...: J0APT1AA Matrix.....: SO
 Date Sampled...: 06/01/07 Date Received...: 06/05/07
 Prep Date.....: 06/08/07 Analysis Date...: 06/12/07
 Prep Batch #...: 7159499
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
Total TCDF	ND	0.24	pg/g	EPA-5 1613B
Total PeCDF	ND	0.41	pg/g	EPA-5 1613B
Total HxCDF	3.0		pg/g	EPA-5 1613B J-9
Total HpCDF	19		pg/g	EPA-5 1613B J-9
Total TCDD	ND	0.34	pg/g	EPA-5 1613B
Total PeCDD	ND	0.36	pg/g	EPA-5 1613B
Total HxCDD	ND	1.3	pg/g	EPA-5 1613B
Total HpCDD	20		pg/g	EPA-5 1613B J-9
2,3,7,8-TCDD	ND	0.17	pg/g	EPA-5 1613B
1,2,3,7,8-PeCDD	ND	0.36	pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDD	ND	0.62	pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDD	ND	0.51	pg/g	EPA-5 1613B
1,2,3,7,8,9-HxCDD	ND	0.45	pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDD	9.4		pg/g	EPA-5 1613B J-9
OCDD	83		pg/g	EPA-5 1613B J-9
2,3,7,8-TCDF	ND	0.24	pg/g	EPA-5 1613B
1,2,3,7,8-PeCDF	ND	0.21	pg/g	EPA-5 1613B
2,3,4,7,8-PeCDF	ND	0.26	pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDF	ND	1.3	pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDF	ND	0.30	pg/g	EPA-5 1613B
2,3,4,6,7,8-HxCDF	ND	0.57	pg/g	EPA-5 1613B
1,2,3,7,8,9-HxCDF	ND	0.15	pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDF	8.2		pg/g	EPA-5 1613B J-9
1,2,3,4,7,8,9-HpCDF	ND	0.34	pg/g	EPA-5 1613B
OCDF	8.1 J		pg/g	EPA-5 1613B J-9

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STL SEATTLE

Client Sample ID: B2 07 DUP (580-6075-4)

Trace Level Organic Compounds

Lot-Sample #...: G7F050209-004 Work Order #...: JOAPT1AA Matrix.....: SO

<u>INTERNAL STANDARDS</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
13C-2,3,7,8-TCDD	79	(25 - 164)
13C-1,2,3,7,8-PeCDD	98	(25 - 181)
13C-1,2,3,4,7,8-HxCDD	72	(32 - 141)
13C-1,2,3,6,7,8-HxCDD	84	(28 - 130)
13C-1,2,3,4,6,7,8-HpCDD	81	(23 - 140)
13C-OCDD	94	(17 - 157)
13C-2,3,7,8-TCDF	66	(24 - 169)
13C-1,2,3,7,8-PeCDF	86	(24 - 185)
13C-2,3,4,7,8-PeCDF	77	(21 - 178)
13C-1,2,3,6,7,8-HxCDF	65	(26 - 123)
13C-2,3,4,6,7,8-HxCDF	71	(28 - 136)
13C-1,2,3,7,8,9-HxCDF	75	(29 - 147)
13C-1,2,3,4,6,7,8-HpCDF	71	(28 - 143)
13C-1,2,3,4,7,8,9-HpCDF	65	(26 - 138)
13C-1,2,3,4,7,8-HxCDF	55	(26 - 152)

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
37Cl4-2,3,7,8-TCDD	82	(35 - 197)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

J Estimated result. Result is less than the reporting limit.

MTS
7/25/07

STL SEATTLE

Client Sample ID: D1 07 (580-6075-5)

Trace Level Organic Compounds

Lot-Sample #...: G7F050209-005 Work Order #...: J0APW1AA Matrix.....: SO
 Date Sampled...: 06/01/07 Date Received...: 06/05/07
 Prep Date.....: 06/08/07 Analysis Date...: 06/12/07
 Prep Batch #...: 7159499
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION		METHOD
		LIMIT	UNITS	
Total TCDF	ND	0.53	pg/g	EPA-5 1613B
Total PeCDF	ND	0.54	pg/g	EPA-5 1613B
Total HxCDF	5.5		pg/g	EPA-5 1613B
Total HpCDF	31		pg/g	EPA-5 1613B
Total TCDD	0.78		pg/g	EPA-5 1613B
Total PeCDD	ND	0.70	pg/g	EPA-5 1613B
Total HxCDD	8.9		pg/g	EPA-5 1613B
Total HpCDD	83		pg/g	EPA-5 1613B
2,3,7,8-TCDD	ND	0.53	pg/g	EPA-5 1613B
1,2,3,7,8-PeCDD	ND	0.35	pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDD	ND	0.33	pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDD	ND	1.2	pg/g	EPA-5 1613B
1,2,3,7,8,9-HxCDD	ND	0.87	pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDD	30		pg/g	EPA-5 1613B
OCDD	230		pg/g	EPA-5 1613B
2,3,7,8-TCDF	ND	0.53	pg/g	EPA-5 1613B
1,2,3,7,8-PeCDF	ND	0.25	pg/g	EPA-5 1613B
2,3,4,7,8-PeCDF	ND	0.31	pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDF	ND	0.81	pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDF	ND	0.31	pg/g	EPA-5 1613B
2,3,4,6,7,8-HxCDF	ND	0.21	pg/g	EPA-5 1613B
1,2,3,7,8,9-HxCDF	ND	0.13	pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDF	13		pg/g	EPA-5 1613B
1,2,3,4,7,8,9-HpCDF	ND	0.46	pg/g	EPA-5 1613B
OCDF	13		pg/g	EPA-5 1613B

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MTB 7/25/07

STL SEATTLE

Client Sample ID: D1 07 (580-6075-5)

Trace Level Organic Compounds

Lot-Sample #...: G7F050209-005 Work Order #...: JOAPW1AA Matrix.....: SO

<u>INTERNAL STANDARDS</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
13C-2,3,7,8-TCDD	79	(25 - 164)
13C-1,2,3,7,8-PeCDD	100	(25 - 181)
13C-1,2,3,4,7,8-HxCDD	72	(32 - 141)
13C-1,2,3,6,7,8-HxCDD	88	(28 - 130)
13C-1,2,3,4,6,7,8-HpCDD	80	(23 - 140)
13C-OCDD	92	(17 - 157)
13C-2,3,7,8-TCDF	66	(24 - 169)
13C-1,2,3,7,8-PeCDF	82	(24 - 185)
13C-2,3,4,7,8-PeCDF	74	(21 - 178)
13C-1,2,3,6,7,8-HxCDF	67	(26 - 123)
13C-2,3,4,6,7,8-HxCDF	73	(28 - 136)
13C-1,2,3,7,8,9-HxCDF	78	(29 - 147)
13C-1,2,3,4,6,7,8-HpCDF	73	(28 - 143)
13C-1,2,3,4,7,8,9-HpCDF	62	(26 - 138)
13C-1,2,3,4,7,8-HxCDF	58	(26 - 152)

<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
37Cl4-2,3,7,8-TCDD	91	(35 - 197)

NOTE(S):

Results and reporting limits have been adjusted for dry weight.

STL SEATTLE

Client Sample ID: C5 07 (580-6075-6)

Trace Level Organic Compounds

Lot-Sample #....: G7F050209-006 Work Order #....: J0AP01AA Matrix.....: SO
 Date Sampled....: 06/01/07 Date Received...: 06/05/07
 Prep Date.....: 06/08/07 Analysis Date...: 06/12/07
 Prep Batch #....: 7159499
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION LIMIT	UNITS	METHOD
Total TCDF	ND	0.63	pg/g	EPA-5 1613B
Total PeCDF	ND	0.96	pg/g	EPA-5 1613B
Total HxCDF	7.5		pg/g	EPA-5 1613B
Total HpCDF	44		pg/g	EPA-5 1613B
Total TCDD	ND	0.45	pg/g	EPA-5 1613B
Total PeCDD	ND	0.45	pg/g	EPA-5 1613B
Total HxCDD	20		pg/g	EPA-5 1613B
Total HpCDD	150		pg/g	EPA-5 1613B
2,3,7,8-TCDD	ND	0.26	pg/g	EPA-5 1613B
1,2,3,7,8-PeCDD	ND	0.45	pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDD	ND	0.30	pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDD	ND	1.6	pg/g	EPA-5 1613B
1,2,3,7,8,9-HxCDD	ND	1.4	pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDD	40		pg/g	EPA-5 1613B
OCDD	300		pg/g	EPA-5 1613B
2,3,7,8-TCDF	ND CON	0.63	pg/g	EPA-5 1613B
1,2,3,7,8-PeCDF	ND	0.32	pg/g	EPA-5 1613B
2,3,4,7,8-PeCDF	ND	0.44	pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDF	ND	1.3	pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDF	ND	0.51	pg/g	EPA-5 1613B
2,3,4,6,7,8-HxCDF	ND	0.44	pg/g	EPA-5 1613B
1,2,3,7,8,9-HxCDF	ND	0.23	pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDF	20		pg/g	EPA-5 1613B
1,2,3,4,7,8,9-HpCDF	ND	0.66	pg/g	EPA-5 1613B
OCDF	17		pg/g	EPA-5 1613B

(Continued on next page)

MTB 7/25/07

STL SEATTLE

Client Sample ID: C5 07 (580-6075-6)

Trace Level Organic Compounds

Lot-Sample #...: G7F050209-006 Work Order #...: JOAP01AA Matrix.....: SO

<u>INTERNAL STANDARDS</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
13C-2,3,7,8-TCDD	87	(25 - 164)
13C-1,2,3,7,8-PeCDD	107	(25 - 181)
13C-1,2,3,4,7,8-HxCDD	78	(32 - 141)
13C-1,2,3,6,7,8-HxCDD	96	(28 - 130)
13C-1,2,3,4,6,7,8-HpCDD	87	(23 - 140)
13C-OCDD	96	(17 - 157)
13C-2,3,7,8-TCDF	70	(24 - 169)
13C-1,2,3,7,8-PeCDF	92	(24 - 185)
13C-2,3,4,7,8-PeCDF	80	(21 - 178)
13C-1,2,3,6,7,8-HxCDF	72	(26 - 123)
13C-2,3,4,6,7,8-HxCDF	82	(28 - 136)
13C-1,2,3,7,8,9-HxCDF	85	(29 - 147)
13C-1,2,3,4,6,7,8-HpCDF	78	(28 - 143)
13C-1,2,3,4,7,8,9-HpCDF	69	(26 - 138)
13C-1,2,3,4,7,8-HxCDF	63	(26 - 152)
<u>SURROGATE</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
37C14-2,3,7,8-TCDD	94	(35 - 197)

NOTE(S) :

Results and reporting limits have been adjusted for dry weight.
 CON Confirmation analysis.

MTB 7/25/07

STL SEATTLE

Client Sample ID: E3 07 (580-6075-7)

Trace Level Organic Compounds

Lot-Sample #....: G7F050209-007 Work Order #....: J0AP21AA Matrix.....: SO
 Date Sampled....: 06/01/07 Date Received...: 06/05/07
 Prep Date.....: 06/08/07 Analysis Date...: 06/12/07
 Prep Batch #....: 7159499
 Dilution Factor: 1

PARAMETER	RESULT	DETECTION		UNITS	METHOD
		LJMIT			
Total TCDF	3.5			pg/g	EPA-5 1613B
Total PeCDF	ND	1.8		pg/g	EPA-5 1613B
Total HxCDF	16			pg/g	EPA-5 1613B
Total HpCDF	92			pg/g	EPA-5 1613B
Total TCDD	5.2			pg/g	EPA-5 1613B
Total PeCDD	ND	3.1		pg/g	EPA-5 1613B
Total HxCDD	67			pg/g	EPA-5 1613B
Total HpCDD	370			pg/g	EPA-5 1613B
2,3,7,8-TCDD	ND	0.30		pg/g	EPA-5 1613B
1,2,3,7,8-PeCDD	ND	0.46		pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDD	ND	0.59		pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDD	3.6 J, JA			pg/g	EPA-5 1613B U-21
1,2,3,7,8,9-HxCDD	ND	2.6		pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDD	85			pg/g	EPA-5 1613B
OCDD	590			pg/g	EPA-5 1613B
2,3,7,8-TCDF	0.84 CON, J			pg/g	EPA-5 1613B
1,2,3,7,8-PeCDF	ND	0.50		pg/g	EPA-5 1613B
2,3,4,7,8-PeCDF	ND	0.43		pg/g	EPA-5 1613B
1,2,3,4,7,8-HxCDF	ND	2.1		pg/g	EPA-5 1613B
1,2,3,6,7,8-HxCDF	ND	0.76		pg/g	EPA-5 1613B
2,3,4,6,7,8-HxCDF	ND	0.69		pg/g	EPA-5 1613B
1,2,3,7,8,9-HxCDF	ND	0.36		pg/g	EPA-5 1613B
1,2,3,4,6,7,8-HpCDF	40			pg/g	EPA-5 1613B
1,2,3,4,7,8,9-HpCDF	ND	0.95		pg/g	EPA-5 1613B
OCDF	38			pg/g	EPA-5 1613B

(Continued on next page)

MTB
7/25/07

STL SEATTLE

Client Sample ID: E3 07 (580-6075-7)

Trace Level Organic Compounds

Lot-Sample #...: G7F050209-007 Work Order #...: JOAP21AA Matrix.....: SO

<u>INTERNAL STANDARDS</u>	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
13C-2,3,7,8-TCDD	63	(25 - 164)
13C-1,2,3,7,8-PeCDD	74	(25 - 181)
13C-1,2,3,4,7,8-HxCDD	53	(32 - 141)
13C-1,2,3,6,7,8-HxCDD	58	(28 - 130)
13C-1,2,3,4,6,7,8-HpCDD	58	(23 - 140)
13C-OCDD	66	(17 - 157)
13C-2,3,7,8-TCDF	52	(24 - 169)
13C-1,2,3,7,8-PeCDF	64	(24 - 185)
13C-2,3,4,7,8-PeCDF	56	(21 - 178)
13C-1,2,3,6,7,8-HxCDF	47	(26 - 123)
13C-2,3,4,6,7,8-HxCDF	54	(28 - 136)
13C-1,2,3,7,8,9-HxCDF	59	(29 - 147)
13C-1,2,3,4,6,7,8-HpCDF	50	(28 - 143)
13C-1,2,3,4,7,8,9-HpCDF	46	(26 - 138)
13C-1,2,3,4,7,8-HxCDF	42	(26 - 152)
	<u>PERCENT RECOVERY</u>	<u>RECOVERY LIMITS</u>
<u>SURROGATE</u>		
37Cl4-2,3,7,8-TCDD	102	(35 - 197)

NOTE(S) :

- Results and reporting limits have been adjusted for dry weight.
- J Estimated result. Result is less than the reporting limit.
- JA The analyte was positively identified, but the quantitation is an estimate.
- CON Confirmation analysis.

MTB 7/25/07



EcoChem, INC.
Environmental Data Quality

APPENDIX C DATA VALIDATION WORKSHEETS

Project No.: 5405-1
 Project Name: City of Tacoma OYRA
 SDG/Package: G7F050209

Screener: MTB Date: 7/23/07
 Reviewer: CH Date: 8/16/07

MODULE A: COMPLETENESS AND HOLDING TIME CHECKLIST

1.0 Chain-of-Custody

	Y	N	N/A
1.1 Are all Chain-of-Custody (COC) forms included in data package?	✓		
1.2 Were COC forms properly signed and dated?	✓		
1.3 Was sample container temperature recorded on COC form (or other appropriate form) by laboratory?	✓		
1.4 Is the recorded temperature within control limits (4°C ±2°C) Temperature(s): <u>2.0°C</u>	✓		

Comments:

2.0 Completeness Check

2.1 Is a case narrative present and does it describe analytical problems, discrepancies and corrective actions?	✓		
2.2 Are all required summary forms present (see attached list)?	✓		
2.3 Are data present for all samples listed on COC form?	✓		
2.4 Are all required raw data sections present (see attached list)? (PRELIMINARY CHECK ONLY; detailed review of raw data will be documented on Module B Checklist).	✓		

Comments:

3.0 Holding Times/Preservation (Technical Criteria: CFR40; QAPP; Other _____)

3.1 Were all samples properly preserved?	✓		
3.2 Complete the Holding Time Tables. (Documented in Comments or in worksheets attached to Module B; qualifiers assigned during Module B review)	✓		

Comments:

Completeness and Holding Time Check Complete?

Table	Parameters (✓)	Completed	Location (attached or filename)
Sample Index		Y	
Holding Time Tables (list):			
Volatiles		Y / NA	
Semivolatiles		Y / NA	
Pest/PCBs		Y / NA	
Metals		Y / NA	
Dioxins/Furans	✓	Y / NA	see attached
Conventionals		Y / NA	
		Y / NA	
		Y / NA	
Other: (list)		Y / NA	
		Y / NA	
		Y / NA	

HOLDING TIME CHECKLIST

Dioxins/Furans by 1613B

Project Name: OVRA
 Project Number: 5405-1
 Client: City of Tacoma

Date: 7/23/2007
 Reviewer: MTB
 SDG: G7F050209

Client Sample ID	Client Sample ID	Laboratory Sample ID	Matrix	Date Received	Date Extracted	Date Analyzed	Holding Time (days)		Qualifier	
							Extracted	Analyzed	Positive	ND
OVRA Rinse Blank	(580-6075-1)	G7F050209-1	Rinsate Blank	6/1/07	6/8/07	6/15/07	7	7		
B1 07	(580-6075-2)	G7F050209-2	Soil	6/1/07	6/7/07	6/16/07	6	9		
B2 07	(580-6075-3)	G7F050209-3	Soil	6/1/07	6/8/07	6/12/07	7	4		
B2 07 DUP	(580-6075-4)	G7F050209-4	Soil	6/1/07	6/8/07	6/12/07	7	4		
D1 07	(580-6075-5)	G7F050209-5	Soil	6/1/07	6/8/07	6/12/07	7	4		
C5 07	(580-6075-6)	G7F050209-6	Soil	6/1/07	6/8/07	6/12/07	7	4		
E3 07	(580-6075-7)	G7F050209-7	Soil	6/1/07	6/8/07	6/12/07	7	4		

Holding Time Criteria

Matrix	Extraction	Analysis
Tissue	30 days	40 days
Tissue, frozen -20C	one year	40 days
Water	30 days	40 days



EcoChem, Inc.

Environmental Science and Chemistry

DATA PACKAGE COMPLETENESS HIGH RESOLUTION MASS SPECTROMETER DIOXIN/FURAN OR PCB CONGENER

PROJECT NO.: 5405-1 SDG: G7F 050209
 SCREENED BY: — DATE: —
 REVIEWED BY: MTB DATE: 7/23/07

1 = COMPLIANCE SCREENING (ECOHEM DOCUMENTATION MODULES A + B-1) Summarized sample and QC results only; no instrument calibration or performance checks
 2 = SUMMARY VALIDATION (EcoChem Documentation Modules A + B1 & B-2) Summarized sample, QC, calibration & instrument performance results; no raw data

3 = FULL VALIDATION (EcoChem Documentation Modules A + B1 & B-2 + C) Summarized sample, QC, calibration & instrument performance results; includes raw data transcription checks & result recalculation checks

Deliverable Requirement	Required	Present	Comments
Copies of Shipping Documents (Fed-Ex Airbills)	1, 2, 3	NO	
Case Narrative	1, 2, 3	yes	
Table of Contents	3	yes	
Cross reference of Field Sample No., Lab Sample No., and Analytical Batch	1, 2, 3	yes	
Chain-of-Custody Form (including Sample Receipt Checklist)	1, 2, 3	yes	
Sample Calculation (usually just a page copied from SOW)	3	NO	
Results Summary for Each Sample and Blank (includes ion abundance ratios)	1, 2, 3	yes	
TEF/TEQ Summary (if requested by client)	1,2,3	NO	
Blank Spike Results (OPR)	1, 2, 3	yes	
Labeled Compound Recovery Summary	1, 2, 3	yes	
Matrix Spiker/Duplicate Matrix Spike Recovery Summaries	1, 2, 3	N/A	
Instrument Performance Check (Resolution)	2, 3	yes	
Initial Calibration Data	2, 3		
Continuing Calibration Data	2, 3		
Windows Defining Mixture/Column Resolution Check	3		
Selected Ion Chromatograms for Each Sample, Blank, and Standard	3		
Quantitation List	3		
Copies of Sample Preparation Work Sheets	3		
Copies of Run Logs	3		

Project No.: <u>5405-1</u>	Reviewer: <u>MTB</u>	Date: <u>7/23/07</u>
Project Name: <u>City of Tacoma OVRA</u>	Secondary: <u>CLT</u>	Date: <u>8/1/07</u>
SDG/Package: <u>G7F050209</u>	Laboratory: <u>STL - W. Sacramento</u>	

HRMS-DXN

Parameter/Method: <u>Dioxins/Furans</u> <u>1613B</u>	Data Validation Criteria Table: <u>Rev. No. 2</u> <u>Last Rev. Date 12/7/04</u>
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MODULE B: TECHNICAL EVALUATION CHECKLIST- ORGANICS

- MODULE B-1 (Summaries of sample results; accuracy; precision; blanks)
- MODULE B-2 (Summaries of calibration, instrument performance & compound ID)
 - B-2 Org
 - B-2 HRMS
 - B-2 Other _____ (name)

Yes Qualifiers Issued. See Sample Summary forms or other: Forms 1

1.0 Technical Holding Times and Sample Handling (B-1)

	Y	N	N/A
1.1 Is Module A Checklist (COC, package completeness, Holding Time Table) complete?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2 Are all holding times within the technical criteria from CFR40; <u>QAPP</u> Other _____)? <input checked="" type="checkbox"/> no outliers _____ see attached Holding Time worksheet or data package page _____ see below	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3 Are all cooler temperatures within the control limits? (temperature outliers listed on HT table) <input checked="" type="checkbox"/> no outliers _____ see attached Holding Time worksheet or data package page _____ see below	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Comments: _____ Data judged as not significantly affected by outliers; no qualifiers assigned

2.0 Surrogates/Labeled Compounds (B-1)

2.1 Are all recovery values within the control limits? <input checked="" type="checkbox"/> no outliers _____ see attached Surrogate Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--	-------------------------------------	--------------------------	--------------------------

Comments: _____ No positive results; no qualifiers as all outliers were > UCL (high bias)
 _____ No qualifiers assigned; one outlier per fraction/column acceptable (if > 10%)

3.0 Method/Field Blank (B-1)

Y N N/A

3.1 Are Method Blanks free from contamination? <input checked="" type="checkbox"/> no outliers _____ see attached Blank Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		
3.2 Are there any trip/equipment/field blanks included in the data package (list below)?	<input checked="" type="checkbox"/>		
3.3 Are trip/equipment/field blanks free from contamination? <input checked="" type="checkbox"/> no outliers _____ see attached Blank Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		

Comments: _____ No positive results in associated samples; no action required for method / trip / equip. / other
 _____ 10X action level established for common lab cont.; 5X action level for others

2 MB - both clean

OVRA rinse blank - clean

4.0 Laboratory Control Sample (Blank Spike/OPR Sample) (B-1)

4.1 Are all %R-values within the control limits? <input checked="" type="checkbox"/> no outliers _____ see attached Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		
4.2 Are all RPD values within control limits (if duplicate analyzed)? _____ no outliers _____ see attached Summary Form or data package page _____ see below			<input checked="" type="checkbox"/>

Comments for LCS: _____ No positive results in associated samples; no qualifiers as all outliers were > UCL (high bias)

2 OPR

5.0 Performance Evaluation (PE)/Standard Reference Material (SRM) (B-1)

PE/SRM Sample ID(s):

5.1 Was PE/SRM sample(s) analyzed?		<input checked="" type="checkbox"/>	
5.2 Are all values within control limits? _____ no outliers _____ see below			<input checked="" type="checkbox"/>

Comments: _____ No qualifiers assigned based on PE/SRM outliers

MODULE: B-2-HRMS (calibration, instrument performance & compound identification)

9.0 HRMS/GC Compound Identification (B-2)

Y N N/A

9.1 Were all retention time criteria met? <input checked="" type="checkbox"/> no outliers <input type="checkbox"/> see below	<input checked="" type="checkbox"/>		
9.2 Were the retention times of all the native compound ions within ± 2 seconds of the labeled compound ions? <input checked="" type="checkbox"/> no outliers <input type="checkbox"/> see below	<input checked="" type="checkbox"/>		
9.3 Were the ion abundance ratios within the method QC limits? <input type="checkbox"/> no outliers <input checked="" type="checkbox"/> see below		<input checked="" type="checkbox"/>	
9.4 Were all S/N ratio criteria met? <input checked="" type="checkbox"/> no outliers <input type="checkbox"/> see below	<input checked="" type="checkbox"/>		
9.5 Was a DB-225 (or equivalent column) confirmation performed for 2378-TCDF hits? (Dioxins only)?	<input checked="" type="checkbox"/>		
9.6 Were there any false positives or negatives?		<input checked="" type="checkbox"/>	

Comments: E3 07 1, 2, 3, 6, 7, 8-HxCDD ion abund. ratio out
U-21

10.0 HRMS Instrument Performance (B-2)

10.1 Are PFK static resolving power checks performed at the required frequency?	<input checked="" type="checkbox"/>		
10.2 Was PFK resolving power at least 10,000 (10% valley definition) for an appropriate mass ?	<input checked="" type="checkbox"/>		
10.3 Was the resolving power zeroed correctly (i.e. were the bases of peak displays within the lower grid intersections)?	<input checked="" type="checkbox"/>		
10.4 Was the exact mass within 5 ppm of the theoretical mass? (see method for specific mass and criteria) <input checked="" type="checkbox"/> no outliers <input type="checkbox"/> see below	<input checked="" type="checkbox"/>		
10.5 Was the GC windows-defining mixture analyzed at the required frequency?	<input checked="" type="checkbox"/>		
10.6 Are any/all chromatographic separation (valley/peak) criteria met? <input checked="" type="checkbox"/> no outliers <input type="checkbox"/> see below	<input checked="" type="checkbox"/>		
10.7 Are retention time windows established for all homologue groups?	<input checked="" type="checkbox"/>		

Comments:

11.0 Initial Calibration (B-2)

	Y	N	N/A
11.1 Are ICALs analyzed on all instruments on which samples are analyzed?	<input checked="" type="checkbox"/>		
11.2 Are the correct number and concentration of standards used?	<input checked="" type="checkbox"/>		
11.3 Are all ion abundance ratios for unlabeled and labeled compounds within method QC limits? <input checked="" type="checkbox"/> no outliers _____ see attached ICAL Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		
11.4 Is the method-specified signal to noise (S/N) criteria met? <input checked="" type="checkbox"/> no outliers _____ see attached ICAL Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		
11.5 Are the %RSD values for the native compounds within QC limits? (\leq _____ %RSD) <input checked="" type="checkbox"/> no outliers _____ see attached ICAL Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		
11.6 Are the %RSD values for the labeled compounds within QC limits? (\leq _____ %RSD) <input checked="" type="checkbox"/> no outliers _____ see attached ICAL Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		
11.7 Are any/all absolute retention time criteria met? <input checked="" type="checkbox"/> no outliers _____ see attached ICAL Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		

Comments: _____ No positive results assoc. w/ outliers; RL judged as not affected – no qualifiers assigned

12.0 Continuing Calibration / Calibration Verification (B-2)

12.1 Are continuing calibration/calibration verification standards analyzed at the proper frequency?	<input checked="" type="checkbox"/>		
12.2 Are all ion abundance ratios for unlabeled and labeled compounds within method QC limits? <input checked="" type="checkbox"/> no outliers _____ see attached CCAL Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		
12.3 Is the method-specified signal to noise (S/N) criteria met? <input checked="" type="checkbox"/> no outliers _____ see attached CCAL Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		
12.4 Are any/all absolute retention time criteria met? <input checked="" type="checkbox"/> no outliers _____ see attached CCAL Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		
12.5 Are CCALs acceptable (_____ %D _____ Concentration Values _____ other)? <input checked="" type="checkbox"/> no outliers _____ see attached CCAL Summary Form or data package page _____ see below	<input checked="" type="checkbox"/>		

Comments: _____ No positive results assoc. w/ outliers; RL judged as not affected – no qualifiers assigned

Field Duplicate Precision

Dioxin/Furans by HR/MS

Control Limit =
50%

Compound	Sample Result pg/g	Duplicate Result pg/g	Calculated RPD	Calculated Difference	Suggested Qualifier
	B2 07	B2 07 DUP			
Total HxCDF	7.8	3.0	88.89%	4.80	J-9
Total HpCDF	46.0	19.0	83.08%	27.00	J-9
Total HpCDD	45.0	20.0	76.92%	25.00	J-9
1,2,3,4,6,7,8-HpCDD	21.0	9.4	76.32%	11.60	J-9
OCDD	210.0	83.0	86.69%	127.00	J-9
1,2,3,4,6,7,8-HpCDF	16.0	82.0	134.69%	-66.00	J-9
OCDF	21.0	8.1	88.66%	12.90	J-9

J = Estimated concentration less than the reporting limit.

U = Not detected at the stated concentration.

Project No.: <u>5405-1</u>	Reviewer: <u>MTB</u> Date: <u>7/24/07</u>
SDG/Package: <u>G7F050209</u>	Secondary: <u>CLX</u> Date: <u>8/1/07</u>
Parameter/Method: <u>Dioxins/Furans 1613B</u>	Equation List: <u> </u> Attached
Laboratory: <u>STL - W. Sacramento</u>	<u> </u> See Calculation Worksheets

MODULE C: CALCULATION AND TRANSCRIPTION CHECKLIST

(As per project specific requirements and/or *Summary of Recalculation Requirements*)

	Chromatograms Checked (✓/NA/*) * see comments	Calculations Attached (✓/NA)	Transcriptions		
			OK (✓)	See Below (✓)	NA (✓)
Tunes	✓	✓	✓		
Initial calibration	✓	✓	✓		
Continuing Calibration	✓	✓	✓		
Blanks (method & instrument)	✓	N/A	✓		
Samples	✓	✓	✓		
Surrogates	✓	✓	✓		
LCS or OPR	✓	✓	✓		
MS/MSD or Matrix Spike	N/A	N/A			✓
Laboratory Duplicate	N/A	N/A			✓
Internal Standards	✓	N/A	✓		
Serial Dilutions					
Other:					

Comments: (attach additional page if needed)

Dioxins/Furans

Method 1613B

Initial Calibration for native compounds

Project Name: OVRA
 Project Number: 5405-1
 SDG: G7F050209
 Reviewer: MTB
 Date: 07/24/07

$$RR = \frac{(An1 + An2) (Cl)}{(A1 + A2) (Cn)}$$

where:

An1 + An2 = Areas of 1 + 2 ions for non-labeled compounds
 A1 + A2 = Areas of 1 + 2 ions for labeled compounds
 Cl = concentration of labeled compound (ng/mL)
 Cn = concentration of unlabeled compound in standard (ng/mL)

For 1,2,3,7,8-PeCDF vs 13C-1,2,3,7,8-PeCDF

CS 1 Std		Date = 9/14/06								
Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	A1 + A2	Cn / Cl conc.	calc'd RR	reported RR
339.8597	3.33E+06	1.49	20	52	20.87		5.57E+06	2.5	0.918	0.92
341.8567	2.24E+06		x	x		1.002				
351.9000	1.48E+08	1.56	20	50	20.83		2.43E+08	100		
353.8970	9.46E+07		x	x						
CS 2 Std		Date = 9/14/06								
Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	A1 + A2	Cn / Cl conc.	calc'd RR	reported RR
339.8597	1.59E+07	1.54	20	50	20.83		2.62E+07	10	0.936	0.94
341.8567	1.03E+07		x	x		1.001				
351.9000	1.72E+08	1.59	20	49	20.82		2.80E+08	100		
353.8970	1.08E+08		x	x						
CS 3 Std		Date = 9/14/06								
Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	A1 + A2	Cn / Cl conc.	calc'd RR	reported RR
339.8597	5.78E+07	1.56	20	56	20.93		9.48E+07	50	0.903	0.90
341.8567	3.70E+07		x	x		1.002				
351.9000	1.29E+08	1.59	20	54	20.90		2.10E+08	100		
353.8970	8.10E+07		x	x						
CS 4 Std		Date = 9/14/06								
Ion	Area	ion ratio	RT min	sec	calc's RT	RRT	A1 + A2	Cn / Cl conc.	calc'd RR	reported RR
339.8597	2.93E+08	1.53	20	50	20.83		4.84E+08	200	0.946	0.95
341.8567	1.91E+08		x	x		1.002				
351.9000	1.56E+08	1.56	20	48	20.80		2.56E+08	100		
353.8970	9.97E+07		x	x						
CS 5 Std		Date = 9/14/06								
Ion	Area	ion ratio	RT min	sec	calc's RT	RRT	A1 + A2	Cn / Cl conc.	calc'd RR	reported RR
339.8597	1.82E+09	1.54	20	48	20.80		3.00E+09	1000	0.923	0.92
341.8567	1.18E+09		x	x		1.000				
351.9000	1.99E+08	1.58	20	48	20.80		3.25E+08	100		
353.8970	1.26E+08		x	x						

Mean RR calculated =	0.925
% RSD calculated =	1.801%

Mean RR reported =	0.925
% RSD reported =	1.91%

Dioxins/Furans

Method 1613B

Initial Calibration for native compounds

Project Name: OVRA
 Project Number: 5405-1
 SDG: G7F050209
 Reviewer: MTB
 Date: 07/24/07

$$RR = \frac{(An1 + An2) (Ci)}{(Al1 + Al2) (Cn)}$$

where:

An1 + An2 = Areas of 1 + 2 ions for non-labeled compounds
 Al1 + Al2 = Areas of 1 + 2 ions for labeled compounds
 Ci = concentration of labeled compound (ng/mL)
 Cn = concentration of unlabeled compound in standard (ng/mL)

For OCDD vs 13C-OCDD

CS 1 Std		Date = 9/14/06		Instrum 1D5						
Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	A1 + A2	Cn / Ci conc.	calc'd RR	reported RR
457.7377	2.17E+06	0.89	36	46	36.77		4.62E+06	5.0	2.105	2.11
459.7348	2.45E+06		x	x		1.000				
469.7779	4.08E+07	0.87	36	45	36.75		8.78E+07	200		
417.7750	4.70E+07		x	x						
CS 2 Std		Date = 9/14/06								
Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	A1 + A2	Cn / Ci conc.	calc'd RR	reported RR
457.7377	1.17E+07	0.89	36	46	36.77		2.49E+07	20	2.145	2.14
459.7348	1.32E+07		x	x		1.000				
469.7779	5.49E+07	0.90	36	45	36.75		1.16E+08	200		
417.7750	6.12E+07		x	x						
CS 3 Std		Date = 9/14/06								
Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	A1 + A2	Cn / Ci conc.	calc'd RR	reported RR
457.7377	3.39E+07	0.87	36	47	36.78		7.30E+07	100	2.065	2.06
459.7348	3.91E+07		x	x		1.000				
469.7779	3.34E+07	0.90	36	46	36.77		7.07E+07	200		
417.7750	3.73E+07		x	x						
CS 4 Std		Date = 9/14/06								
Ion	Area	ion ratio	RT min	sec	calc's RT	RRT	A1 + A2	Cn / Ci conc.	calc'd RR	reported RR
457.7377	2.07E+08	0.88	36	44	36.73		4.41E+08	400	2.057	2.06
459.7348	2.34E+08		x	x		1.000				
469.7779	5.08E+07	0.90	36	43	36.72		1.07E+08	200		
417.7750	5.64E+07		x	x						
CS 5 Std		Date = 9/14/06								
Ion	Area	ion ratio	RT min	sec	calc's RT	RRT	A1 + A2	Cn / Ci conc.	calc'd RR	reported RR
457.7377	1.36E+09	0.89	36	43	36.72		2.89E+09	2000	1.862	1.86
459.7348	1.53E+09		x	x		1.000				
469.7779	7.45E+07	0.92	36	42	36.70		1.55E+08	200		
417.7750	8.07E+07		x	x						

Mean RR calculated =	2.047
% RSD calculated =	5.324%

Mean RR reported =	2.046
% RSD reported =	5.40%

Dioxins/Furans

Method 1613B

Initial Calibration for native compounds

Project Name: OVRA
 Project Number: 5405-1
 SDG: G7F050209
 Reviewer: MTB
 Date: 07/24/07

$$RR = \frac{(An1 + An2) (Cl)}{(Al1 + Al2) (Cn)}$$

where:

An1 + An2 = Areas of 1 + 2 ions for non-labeled compounds
 Al1 + Al2 = Areas of 1 + 2 ions for labeled compounds
 Cl = concentration of labeled compound (ng/mL)
 Cn = concentration of unlabeled compound in standard (ng/mL)

For 2,3,7,8-TCDF vs 13C - 2,3,7,8-TCDF

CS 1 Std		Date = 9/1/06								
Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	A1 + A2	Cn / Cl conc.	calc'd RR	reported RR
303.9016	2.69E+05	0.86	13	8	13.13		5.81E+05	0.5	0.912	0.91
305.8987	3.12E+05		x	x		1.001				
315.9419	5.65E+07	0.80	13	7	13.12		1.27E+08	100		
317.9389	7.09E+07		x	x						
CS 2 Std		Date = 9/1/06								
Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	A1 + A2	Cn / Cl conc.	calc'd RR	reported RR
303.9016	9.51E+05	0.72	13	9	13.15		2.27E+06	2	0.941	0.94
305.8987	1.32E+06		x	x		1.003				
315.9419	5.43E+07	0.82	13	7	13.12		1.21E+08	100		
317.9389	6.64E+07		x	x						
CS 3 Std		Date = 9/1/06								
Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	A1 + A2	Cn / Cl conc.	calc'd RR	reported RR
303.9016	4.97E+06	0.81	13	8	13.13		1.11E+07	10	0.996	1.00
305.8987	6.17E+06		x	x		1.001				
315.9419	5.02E+07	0.81	13	7	13.12		1.12E+08	100		
317.9389	6.17E+07		x	x						
CS 4 Std		Date = 9/1/06								
Ion	Area	ion ratio	RT min	sec	calc's RT	RRT	A1 + A2	Cn / Cl conc.	calc'd RR	reported RR
303.9016	2.40E+07	0.79	13	8	13.13		5.44E+07	40	1.070	1.07
305.8987	3.04E+07		x	x		1.001				
315.9419	5.57E+07	0.78	13	7	13.12		1.27E+08	100		
317.9389	7.14E+07		x	x						
CS 5 Std		Date = 9/1/06								
Ion	Area	ion ratio	RT min	sec	calc's RT	RRT	A1 + A2	Cn / Cl conc.	calc'd RR	reported RR
303.9016	1.28E+08	0.78	13	7	13.12		2.92E+08	200	1.057	1.06
305.8987	1.64E+08		x	x		1.000				
315.9419	6.05E+07	0.78	13	7	13.12		1.38E+08	100		
317.9389	7.76E+07		x	x						

Mean RR calculated =	0.995
% RSD calculated =	6.983%

Mean RR reported =	0.996
% RSD reported =	6.94%

Concentration and recovery of labeled compounds Dioxins/Furans by 1613B

$$\% R = \frac{(\text{Area is}) (\text{Amt rs})(100\%)}{(\text{Area rs})(\text{RF})(\text{Amt is})}$$

where:

- Area is = Areas of quant ion of internal standard
- Area rs = Area of quant ion of recovery standard
- Amt rs = amount of recovery standard (ng/mL)
- RF = Response Factor
- Amt is = Amount of internal standard (ng/mL)

*Amt(is) = amount of internal standard (ng)--corr. for diln
Cis = conc. of int. std. (ng/g), corr. for sa size & %sol.*

Sample:																			
D1 07																			
G7F050209-005																			
13C-2,3,7,8-TCDD																			
13C-1,2,3,4-TCDD																			
Ion	Area	ion ratio	Quant Ion Area	ICAL AVE RF	Amt.	diln	cal'd conc.	cal'd %Rec	Reported % Rec.	Ion	Area	ion ratio	Quant Ion Area	ICAL AVE RF	Amt.	diln	cal'd conc.	cal'd %Rec	Reported % Rec.
331.9368	1.04E+08	0.83				1.000	155.689	77.84%	78.9%	383.8639	5.08E+07	0.54				1.000	57.639	57.64%	57.7%
333.9339	1.26E+08		2.30E+08	0.903	200					385.8610	9.41E+07		1.45E+08	1.113	100				
331.9368	7.43E+07	0.83								401.8559	1.26E+08	1.26							
333.9339	8.93E+07		1.64E+08		100					403.8529	9.99E+07		2.26E+08		100				
13C-1,2,3,4,7,8-HxCDF																			
13C-1,2,3,7,8,9-HxCDD																			

Compound Concentration Verification Dioxins/Furans by 1613B

$$\text{Conc.} = \frac{(\text{An1} + \text{An2}) (\text{Amt}(\text{is})) (\text{Dilution Factor})}{(\text{AI1} + \text{AI2}) (\text{RRF}) (\text{Amount Extracted}) / (\text{Pct. Solids})}$$

where:

An1+An2 = Area of 1 + 2 ion unlabeled compounds

AI1 + AI2 = Area of 1 + 2 ions labeled compound

Amt(is) = amount of labeled compound

RRF = Mean relative response factor from ICAL

Sample: D1 07 Amount Extracted (g): 10.1 Dilution Factor: 1
 G7F050209-005 Pct. Solids: 84.8%

OCDF
13C12 -OCDF

Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	Quant Ion Area	ICAL RRF	pg/g calc'd conc.	pg/g reported conc.
441.7428	3.97E+06		38	8	38.13			2.401	13.02	13
443.7398	4.58E+06	0.87	x	x		1.004	8.55E+06			
453.7831	6.05E+07		38	0	38.00					
455.7801	6.72E+07	0.90	x	x			1.28E+08			

Amt(is) = 4000

1,2,3,4,6,7,8-HpCDD
13C-1,2,3,4,6,7,8-HpCDD

Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	Quant Ion Area	ICAL RRF	pg/g calc'd conc.	pg/g reported conc.
423.7766	9.25E+06		35	19	35.32			0.907	29.54	30
425.7737	8.51E+06	1.09	x	x		1.000	1.78E+07			
435.8169	7.96E+07		35	19	35.32					
437.8140	7.52E+07	1.06	x	x			1.55E+08			

Amt(is) = 2000

OCDD
13C-OCDD

Ion	Area	ion ratio	RT min	sec	calc'd RT	RRT	Quant Ion Area	ICAL RRF	pg/g calc'd conc.	pg/g reported conc.
457.7377	5.96E+07		38	1	38.02			2.046	228.44	230
459.7348	6.82E+07	0.87	x	x		1.000	1.28E+08			
469.7790	6.05E+07		38	0	38.00					
741.7750	6.72E+07	0.90	x	x			1.28E+08			

Amt(is) = 4000

Ongoing Precision Recovery (OPR)

Dioxins and Furans by EPA Method 1613B

OPR_check.xls

Project Name: OVRA
Project No: 5405-1
Client: City of Tacoma

SDG: G7F050209
Reviewer/Date: MTB 7/24/07

G7F070000-582

Compound	Reported Amount (pg/g)	Spike Added (pg/g)	Reported Percent Recovery	Calculated Percent Recovery
2,3,7,8-TCDD	22.30	20	111%	111.50%
1,2,3,7,8-PeCDD	111.00	100	111%	111.00%
1,2,3,4,7,8-HxCDD	109.00	100	109%	109.00%
1,2,3,6,7,8-HxCDD	106.00	100	106%	106.00%
1,2,3,7,8,9-HxCDD	128.00	100	128%	128.00%
1,2,3,4,6,7,8-HpCDD	113.00	100	113%	113.00%
OCDD	239.00	200	120%	119.50%
2,3,7,8-TCDF	20.50	20	103%	102.50%
1,2,3,7,8-PeCDF	109.00	100	109%	109.00%
2,3,4,7,8-PeCDF	97.10	100	97%	97.10%
1,2,3,4,7,8-HxCDF	94.30	100	94%	94.30%
1,2,3,6,7,8-HxCDF	99.70	100	100%	99.70%
2,3,4,6,7,8-HxCDF	108.00	100	108%	108.00%
1,2,3,7,8,9-HxCDF	107.00	100	107%	107.00%
1,2,3,4,6,7,8-HpCDF	110.00	100	110%	110.00%
1,2,3,4,7,8,9-HpCDF	97.00	100	97%	97.00%
OCDF	247.00	200	124%	123.50%



Chain of Custody Record

Page of

SAP Accounting		Project Name		Analysis / # of Containers		Samples Sent to:							
#	EPA ID	Date	Time	Matrix	Grb	Composite	Sample ID	Total Containers	Date/Time	Received for Laboratory By (Signature):	Date/Time	Received for Laboratory By (Signature):	
1		2/17	1000	Sed		X	E3-07	1		<i>Bill Estimator</i>		<i>Bill Estimator</i>	
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
Relinquished By (Signature):		Date/Time		Relinquished By (Signature):		Date/Time		Received for Laboratory By (Signature):		Date/Time		Received for Laboratory By (Signature):	
<i>Bill Estimator</i>		2/17						<i>Bill Estimator</i>				<i>Bill Estimator</i>	
Relinquished By (Signature):		Date/Time		Received for Analysis By (Signature):		Date/Time		Remarks					



Chain of Custody Record

Page 1 of 1

#	EPA ID	Date	Time	Matrix	Grab	Composite	Sample ID	Total Containers	Analysis/# of Containers			Samples Sent to:	Remarks
									PCBs	Metals	Other		
1		4/17/07	10:00 AM	Water		X	1000-01	4	1	1	2	PCBs and Metals	
2		4/17/07	10:00 AM	Water		X	B1-07	2	1	1			
3		4/17/07	10:00 AM	Water		X	B2-07	2	1	1			
4		4/17/07	10:00 AM	Water		X	B3-07	2	1	1			
5		4/17/07	10:00 AM	Water		X	A1-07	1	1				
6		4/17/07	10:00 AM	Water		X	A2-07	1	1				
7		4/17/07	10:00 AM	Water		X	A3-07	1	1				
8		4/17/07	10:00 AM	Water		X	D1-07	1	1				
9		4/17/07	10:00 AM	Water		X	C5-07	1	1				
10		4/17/07	10:00 AM	Water		X	C1-07	1	1				
11		6/1	10:00 AM	Water		X	C6-07	1	1				
12		6/1	10:00 AM	Water		X	E3-07	1	1				
13													
14													
15													
16													

APPENDIX B

QUALITATIVE SAMPLE CHARACTERISTICS FORMS

Qualitative Sample Characteristics

Page 2 of 11

Sample ID Label Here	Place
----------------------	-------

Date (mm/dd/yy)	Location	Station
01/10/17	101V121A1	1A121-1017

Coordinates				Water Depth			Elevation	Time	Weather
North	East	Depth	Unit	+/-	Elev.				
								10/10/17	

Rep	Sample Type	Sample Type	Penetration		Recovery		Photograph		Grain Vol	Initials	Su fid e	V O A
			Depth	Unit	Length	Unit	Roll#	Exp.				
	15E1D		110	cm						DKIP		

Surficial sediment characteristics: (circle most descriptive)

Texture Smooth Fine Coarse Clay Silt Sand Gravel Cobble

Color Light Dark / Gray Brown Black Other _____

Odor Normal Sewage Petroleum Chemical H2S None Other _____

Presence of:

	Yes/No	Percent	Describe Type
Biological structures	N		
Debris	N		
Oily sheen	N		

Vertical profile characteristics: Describe

Changes in sediment characteristics: see comments

Presence and depth of redox potential discontinuity layer (rpd): n/a

Sample quality comment Describe

Leakage	/
Winnowing	
Disturbance	

Comments sandy on the upper grab.
large gravels on the surface.
Sample pts. #10, 11, 12

Qualitative Sample Characteristics

Page 1 of 1

Sample ID Label Here	Place
----------------------	-------

Date (mm/dd/yy)	Location	Station
06/01/07	101V1F1A111-107	

Coordinates				Water Depth			Elevation		Time	Weather
North	*	East	*	Depth	Unit	+/-	Elev.			
									17:50 A	

Rep	Sample Type	Sample Type	Penetration		Recovery		Photograph		Grain Vol	Initials	Su lfi de	V O A
			Depth	Unit	Length	Unit	Roll#	Exp.				
	ICIFDI											

Surficial sediment characteristics: (circle most descriptive)

Texture Smooth Fine Coarse / Clay Silt Sand Gravel Cobble

Color Light Dark / Gray Brown Black Other _____

Odor Normal Sewage Petroleum Chemical H₂S None Other _____

Presence of:

	Yes/No	Percent	Describe Type
Biological structures	Y	5%	shells
Debris	N		
Oily sheen	N		

Vertical profile characteristics:

Describe

Changes in sediment characteristics	see comments.
Presence and depth of redox potential discontinuity layer (rpd)	Y/A

Sample quality comment

Describe

Leakage
Winnowing
Disturbance

Comments

large cobbles over 2 lower grabs
upper grab sandy
Sample pts #7,8,9

Qualitative Sample Characteristics

Sample ID Label Here	Place
----------------------	-------

Date (mm/dd/yy)	Location	Station
06/10/17	101V121A1	1A21017

Coordinates				Water Depth		Elevation		Time	Weather
North	East	Depth	Unit	+/-	Elev.				
								11/01/10A	

Rep	Sample Type	Sample Type	Penetration		Recovery		Photograph		Grain Vol	Initials	Su lfid e	V O A
			Depth	Unit	Length	Unit	Roll#	Exp.				

Surficial sediment characteristics: (circle most descriptive)

Texture Smooth Fine Coarse / Clay Silt Sand Gravel Cobble

Color Light Dark / Gray Brown Black Other _____

Odor Normal Sewage Petroleum Chemical H2S None Other _____

Presence of:

	Yes/No	Percent	Describe Type
Biological structures	n		
Debris	n		
Oily sheen	n		

Vertical profile characteristics: Describe

Changes in sediment characteristics	see comments
Presence and depth of redox potential discontinuity layer (rpd)	n/a

Sample quality comment Describe

Leakage	/
Winnowing	
Disturbance	

Comments sandy on the upper grab
large gravels on the surface
Sample pts. # 10, 11, 12

Qualitative Sample Characteristics

Page 4 of 11

Sample ID Label Here	Place
----------------------	-------

Date (mm/dd/yy)	Location	Station
01/10/17	10V R1A1	1B11-107

Coordinates				Water Depth			Elevation	Time	Weather
North	East	Depth	Unit	+/-	Elev.				
								1912101A1	

Rep	Sample Type	Sample Type	Penetration		Recovery		Photograph		Grain Vol	Initials	Su V fid e A
			Depth	Unit	Length	Unit	Roll#	Exp.			

Surficial sediment characteristics: (circle most descriptive)

Texture Smooth Fine Coarse Clay Silt Sand Gravel Cobble

Color Light Dark / Gray Brown Black Other _____

Odor Normal Sewage Petroleum Chemical H₂S None Other _____

Presence of:

	Yes/No	Percent	Describe Type
Biological structures	Y	20%	shells, algae
Debris	n	—	
Oily sheen	n	—	

Vertical profile characteristics:

	Describe
Changes in sediment characteristics	n/a
Presence and depth of redox potential discontinuity layer (rpd)	n/c

Sample quality comment

	Describe
Leakage	/
Winnowing	
Disturbance	

Comments Sample pts #1, 2, 3

Qualitative Sample Characteristics

Page 2 of 11

Sample ID Label Here	Place
----------------------	-------

Date (mm/dd/yy)	Location	Station
01/10/11	101V121F1	13121-107

Coordinates				Water Depth			Elevation	Time	Wealth
North		East		Depth	Unit	+/-	Elev.		
				+ + +					191401A

Rep	Sample Type	Sample Type	Penetration		Recovery		Photograph		Grain Vol	Initials	Su lfid e	V O A
			Depth	Unit	Length	Unit	Roll#	Exp.				
1	151E1D1											

Surficial sediment characteristics: (circle most descriptive)

Texture Smooth Fine Coarse Clay Silt Sand Gravel Cobble

Color Light Dark / Gray Brown Black Other _____

Odor Normal Sewage Petroleum Chemical H2S None Other _____

Presence of:

	Yes/No	Percent	Describe Type
Biological structures	Y	10%	shells
Debris	n	—	—
Oily sheen	n	—	—

Vertical profile characteristics:

Describe

Changes in sediment characteristics	n/a
Presence and depth of redox potential discontinuity layer (rpd)	n/a

Sample quality comment

Describe

Leakage

Winnowing

Disturbance

Comments

Sample pts #4, 5, 6

Qualitative Sample Characteristics

Page 1 of 11

Sample ID Label Here	Place
----------------------	-------

Date (mm/dd/yy)	Location	Station
01/10/11 1071	1211R1A1	1B121D107

Coordinates				Water Depth		Elevation	Time	Weather
North	East	Depth	Unit	+/-	Elev.			
							1940A1	

Rep	Sample Type	Sample Type	Penetration		Recovery		Photograph		Grain Vol	Initials	Su lfid e	V O A
			Depth	Unit	Length	Unit	Roll#	Exp.				
	SIEID											

Surficial sediment characteristics: (circle most descriptive)

Texture Smooth Fine Coarse Clay Silt Sand Gravel Cobble

Color Light Dark / Gray Brown Black Other _____

Odor Normal Sewage Petroleum Chemical H₂S None Other _____

Presence of:

	Yes/No	Percent	Describe Type
Biological structures	Y	10%	Shells
Debris	N		
Oily sheen	N		

Vertical profile characteristics:

Describe

Changes in sediment characteristics	n/a
Presence and depth of redox potential discontinuity layer (rpd)	n/a

Sample quality comment

Describe

Leakage	
Winnowing	
Disturbance	

Comments

Sample pts. #4, 5, 6

Qualitative Sample Characteristics

Sample ID Label Here	Place
----------------------	-------

Date (mm/dd/yy)	Location	Station
01/01/10	1014 R P 1 D 11-1017	

Coordinates				Water Depth			Elevation	Time	Weath
North	•	East	•	Depth	Unit	+/-	Elev.		
								10:30	A

Rep	Sample Type	Sample Type	Penetration		Recovery		Photograph		Grain Vol	Initials	Su lfid e	V O A
			Depth	Unit	Length	Unit	Roll#	Exp.				

Surficial sediment characteristics: (circle most descriptive)

Texture Smooth Fine Coarse / Clay Silt Sand Gravel Cobble

Color Light Dark / Gray Brown Black Other redox

Odor Normal Sewage Petroleum Chemical H2S None Other _____

Presence of:

	Yes/No	Percent	Describe Type
Biological structures	Y	1%	Crabs, algae
Debris	N		
Oily sheen	N		

Vertical profile characteristics:

Describe

Changes in sediment characteristics #1.5 lt. brown w/ redox.

Presence and depth of redox potential discontinuity layer (rpd) #15, at least 3"; #1.3

Sample quality comment

Describe

Leakage
Winnowing
Disturbance

Comments

sediment was rocky w/ 2" rock
watery sample on #13, #15
Sample pts # 13, 14, 15

Qualitative Sample Characteristics

Page 9 of 11

Sample ID Label Here	Place
----------------------	-------

Date (mm/dd/yy)	Location	Station
01610110171	101V1R1A1	1C151-1017

Coordinates				Water Depth		Elevation	Time	Weather
North	East	Depth	Unit	+/-	Elev.			
							110551A1	

Rep	Sample Type	Sample Type	Penetration		Recovery		Photograph		Grain Vol	Initials	Su	V
			Depth	Unit	Length	Unit	Roll#	Exp.				

Surficial sediment characteristics: (circle most descriptive)

Texture Smooth Fine Coarse / Clay Silt Sand Gravel Cobble

Color Light Dark / Gray Brown Black Other _____

Odor Normal Sewage Petroleum Chemical H₂S None Other _____

Presence of:

	Yes/No	Percent	Describe Type
Biological structures	n		
Debris	n		
Oily sheen	n		

Vertical profile characteristics:

Describe

Changes in sediment characteristics	See comments
Presence and depth of redox potential discontinuity layer (rpd)	#18. Δ 3"

Sample quality comment

Describe

Leakage	/
Winnowing	
Disturbance	

Comments

#18 in depression under water (black)
 #16 (in water) #16, 17 mostly large gravels.
 very watery sample.
 Sample pts. #16, 17, 18.

Qualitative Sample Characteristics

Sample ID Label Here	Place
----------------------	-------

Date (mm/dd/yy)	Location	Station
01610110171	101V12A1	1C191-107

Coordinates				Water Depth		Elevation	Time	Weather
North	*	East	*	Depth	Unit +/-	Elev.		
				+	+			

Rep	Sample Type	Sample Type	Penetration		Recovery		Photograph		Grain Vol	Initials	Su	V
			Depth	Unit	Length	Unit	Roll#	Exp.				
1	SE	ID1										

Surficial sediment characteristics: (circle most descriptive)

Texture Smooth Fine Coarse Clay Silt Sand Gravel Cobble

Color Light Dark / Gray Brown Black Other _____

Odor Normal Sewage Petroleum Chemical H2S None Other _____

Presence of:

	Yes/No	Percent	Describe Type
Biological structures	N		
Debris	N		
Oily sheen	N		

Vertical profile characteristics: Describe

Changes in sediment characteristics: #19, much fines

Presence and depth of redox potential discontinuity layer (rpd): #19, ≈ 3"

Sample quality comment Describe

Leakage	/
Winnowing	
Disturbance	

Comments Sample pts #19, 20, 21

Qualitative Sample Characteristics

Page 0 of 11

Sample ID Label Here	Place
----------------------	-------

Date (mm/dd/yy)	Location	Station
06/01/07	101V121A	1C110107

Coordinates				Water Depth		Elevation	Time	Weather
North	East	Depth	Unit	+/-	Elev.			

Rep	Sample Type	Sample Type	Penetration		Recovery		Photograph		Grain Vol	Initials	Su fid e	V O A
			Depth	Unit	Length	Unit	Roll#	Exp.				

Surficial sediment characteristics: (circle most descriptive)

Texture Smooth Fine Coarse Clay Silt Sand Gravel Cobble

Color Light Dark / Gray Brown Black Other _____

Odor Normal Sewage Petroleum Chemical H₂S None Other _____

Presence of:

	Yes/No	Percent	Describe Type
Biological structures	✓	1%	worms
Debris	✓		
Oily sheen	✓		

Vertical profile characteristics:

Describe

Changes in sediment characteristics	n/a
Presence and depth of redox potential discontinuity layer (rpd)	n/a

Sample quality comment

Describe

Leakage	/
Winnowing	
Disturbance	

Comments

Sample pts # 22, 23, 24

Qualitative Sample Characteristics

Page 1 of 11

Sample ID Label Here

Place

OVRA E3-07

Bill Essmeier
ES-Lab

Component of OVRA

Date (mm/dd/yy)	Location	Station
0161011017		

Stations 25, 26, 27

Coordinates		Water Depth		Elevation		Time	Weather
North	East	Depth	Unit +/-	Elev.			

Rep	Sample Type	Sample Type	Penetration		Recovery		Photograph		Grain Vol	Initials	Su l f i d e	V O A
			Depth	Unit	Length	Unit	Roll#	Exp.				

Station 25 - 9:30 - 2nd attempt penetrates to 8 cm. Dark Brown, sandy, No odor
 Station 26 - 9:50 - 1st attempt penetrates to 8 cm. Dark Brown, smooth, No odor

Surficial sediment characteristics: (circle most descriptive)

Texture Smooth Fine Coarse / Clay Silt Sand Gravel Cobble

Color Light Dark Gray Brown Black Other _____

Odor Normal Sewage Petroleum Chemical H₂S None Other _____

Station 27 - 10:00 - 1st grab - 10 cm. Pea gravel / fish mix. Dark Brown / Black
 Some H₂S odor.

Presence of:

	Yes/No	Percent	Describe Type
Biological structures	Yes		Small worms
Debris	Very little		
Oily sheen	None		

Vertical profile characteristics:

Describe

Changes in sediment characteristics	
Presence and depth of redox potential discontinuity layer (rpd)	

Sample quality comment

Describe

Leakage	
Winnowing	
Disturbance	

Comments _____

APPENDIX C

VISUAL INSPECTIONS: FIELD NOTES AND PHOTOS

Olympic View Resource Area Restoration
Monitoring Report Form

LMR.P(5)

Date April 19, 2007 Year 0A 0B 1A 1B 2A 2B 3 (4) 5

Staff Present: D Pooley

Weather Conditions: partly cloudy

Overall health and vigor of plants: Excellent ← Fair Poor

Qualitative Observations:

	Riparian Area (A/B)	Salt Marsh Area	Comments
Erosion	X		near sign
Sedimentation			n/a
Wildlife			geese nesting; seagull, see below
Vegetation			
Invasive	X		poison hemlock St. John's wort
Volunteer			minimal non-weeds as per spec
Survival (%)			95% from last yr.
Animal Damage	X		bunnies
Disease			n/a
Trash			clean
Vandalism	✓		possible tree abuse
Large Organic Debris		X	high tide line - lots of cowp

Wildlife Observed:

bunny, crow, seagull, nesting geese

Soil/Sediment Quality -

Odor: n/a looked good
 Sheen: lots of algae - bio nodules in intertidal
 Color: varies by area - see pics.
 Texture: varies by area - see pics.

General Comments:

no sign of plants.
2 shore pine dead in Rip Area A
continue to remove or netting.
recently brush cleared up.
trees pushed (?) down.

arrived on site 11:20 left site - noon.
CITY survey on site

**Olympic View Resource Area Restoration
Monitoring Report Form**

Date Sept 17, 2007

Year 0A 0B 1A 1B 2A 2B 3 (4) 5

Staff Present: D. Poolley

Weather Conditions: overcast, sprinkling

Overall health and vigor of plants: Excellent (+) Fair Poor

Qualitative Observations:

	Riparian Area (A/B)	Salt Marsh Area	Comments
Erosion	no		
Sedimentation	no		
Wildlife	yes		see below
Vegetation			
Invasive	X		lots of weed sp. see comments
Volunteer	Y		pracher
Survival (%)	—		
Animal Damage			
Disease	?		Alder? die off due to higher tides or?
Trash	yes		assoc. w/ high tide line
Vandalism	no		
Large Organic Debris	yes		Good along high tide line.

Wildlife Observed: wren, geese, great blue heron, caspian terns

Soil/Sediment Quality -

Odor: n/a

Sheen: n/a

Color:

Texture:

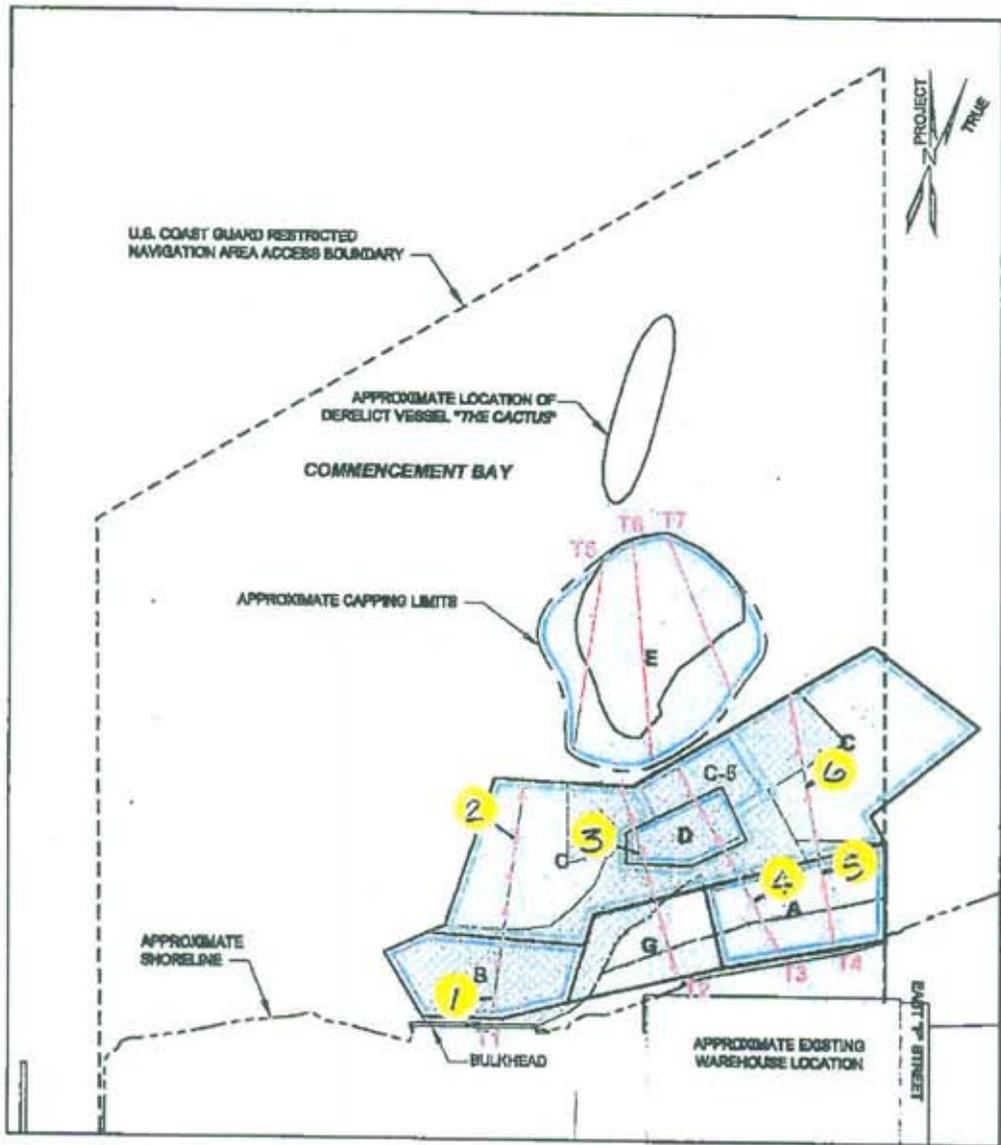
General Comments:

OVRA triangle project completed.

weeds: tansy, dune tansy, hedge mustard, white sweet clover, nightshade, poison hemlock, peppercorn

dune grass not surviving → not enough sun/pred by rabbits

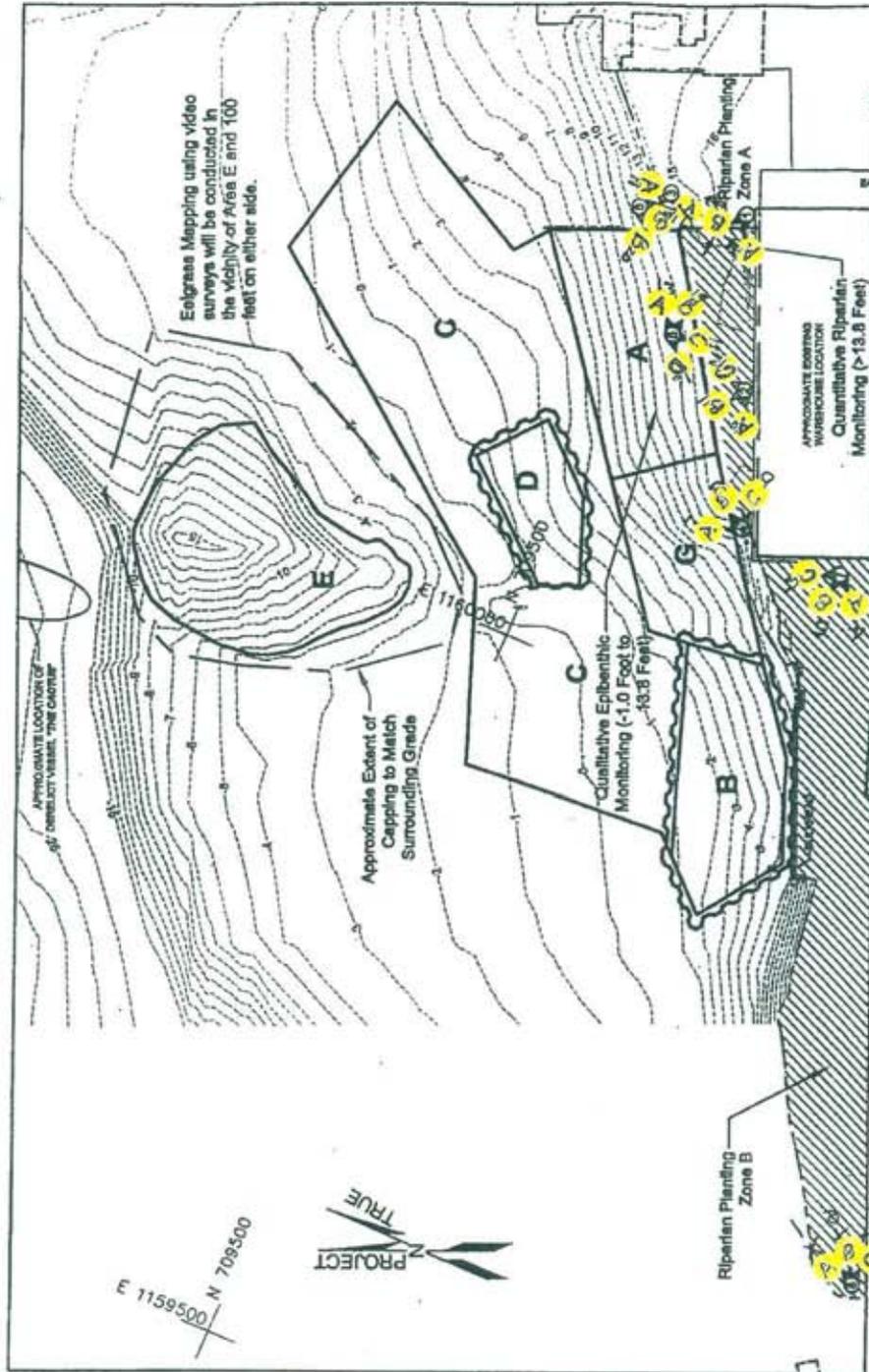
original



Notes on Photo Point Monitoring

Photos were taken from locations noted in attached Figure 1 from the Maintenance, Monitoring and Adaptive Management Plan (MAMP). Title indicates in which direction the photo is looking.

Post-Construction Habitat Restoration Monitoring Location Plan



Legend:

- ① Approximate Photo Point Location and Number
- A Site Area Boundary and Designation
- ▨ Riparian Planting Zones (See Plan Sheet 9)

Note: See Plan Sheet 9 for location of intertidal erosion protection areas.