PORTLAND HARBOR RI/FS

ROUND 3B UPLAND STORMWATER SAMPLING FIELD SAMPLING REPORT

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Recommended for Inclusion in Administrative Record

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[1] The naming and ordering of Appendices A to W has been kept consistent with the Round 3A FSR so that sampling sites can easily be referenced. Consequently, there are gaps in the appendix lettering that represent locations that were not sampled in Round 3B. Thus, Appendices A, C, D, M, P, Q, R, S, U, and W are not included in this document since no sampling occurred at these stations during Round 3B Sampling.

[2] This site was originally intended to be a Hwy 30 sample but it was sampled in the wrong location during Round 3A sampling and so has been renamed from Hwy 30 to Yeon Mixed Use to better reflect its mixed land use. See Section 8 for more information.

LIST OF ACRONYMS

CAS	Columbia Analytical Service
DEQ	Oregon Department of Environmental Quality
DO	dissolved oxygen
DOC	dissolved organic carbon
EMC	Event Mean Concentration
EPA	U.S. Environmental Protection Agency
FSP	field sampling plan
FSR	Field Sampling Report
HDPE	high density polyethylene
LWG	Lower Willamette Group
NGVD	National Geodetic Vertical Datum
NOAA	National Oceanic and Atmospheric Administration
ORP	oxidation/redox potential
PAHs	polycyclic aromatic hydrocarbons
PCBs	polychlorinated biphenyls
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RI/FS	remedial investigation/feasibility study
SOP	standard operating procedure
SSR	Stormwater Sampling Rationale
TOC	total organic carbon
TS	total solids
TSS	total suspended solids
USGS	United States Geological Service

1.0 Introduction

This Round 3B Field Sampling Report (FSR) summarizes the second round of upland stormwater field sampling activities (Round 3B sampling) conducted from November 2007 through February 2008 for the Remedial Investigation and Feasibility Study (RI/FS) of the Portland Harbor Superfund Site (Site). The first round of upland stormwater field sampling activities took place from February 2007 through July 2007 (Round 3A sampling). The Round 3A sampling resulted in less than the total number of desired samples, as described in the *Round 3A Stormwater Sampling – Field Sampling Report* (Anchor and Integral 2007d), being collected at some sites. The Stormwater Technical Team[3] reviewed the completeness information and determined that there were several substantial data needs required to ensure that the stormwater data set was sufficient to meet the original Round 3A FSP objectives. This Round 3B FSR describes the methods for collection of those additional data needs in late 2007 and early 2008.

The planned sampling activities for the Round 3B stormwater sampling are described in detail in the *Round 3A Stormwater Sampling – Field Sampling Plan Addendum* (FSP Addendum; Anchor and Integral 2007c), the *Round 3A Stormwater Sampling – Field Sampling Plan* (FSP; Anchor and Integral 2007a) and the *Round 2 Quality Assurance Project Plan Addendum 8* (QAPP; Integral 2007)[4]. This Round 3B FSR and the FSP, FSP Addendum, and QAPP are companion documents to the *Round 3A Stormwater Sampling Rationale* (SSR) (Anchor and Integral 2007b), which describes the reasoning behind the overall sampling approach. This Round 3B FSR cites sections of the FSP and Round 3A FSR, rather than repeating sampling method details here.

This Round 3B FSR includes information on the field methods and sampling procedures as implemented for the project, but does not include the analytical results of any of the samples collected. It also does not include field-collected analytical data, such as pH and temperature. All analytical data will be presented and discussed in the *Comprehensive Data Summary Report* to be published at a later date.

The contents of the FSP and SSR were written by the Stormwater Technical Team for the project, comprised of Oregon Department of Environmental Quality (DEQ), U.S. Environmental Protection Agency (EPA), and Lower Willamette Group (LWG) member representatives. Although the SSR was never submitted formally to EPA for official review, comment, and approval, it was the intent of the Stormwater Technical Team (which includes EPA) that the SSR serve as a record of the rationale for the sampling methods described in the FSP. During the course of the Round 3A sampling activities, the Stormwater Technical Team, with EPA approval, provided additional instructions on sampling and analysis procedures that were documented in meeting

[3] The Stormwater Technical Team included representatives from EPA, DEQ and LWG and was convened in order to develop the framework for a sampling plan.

[4] It was recognized after the FSP Addendum was published that the next round of stormwater sampling should be identified as Round 3B, which is used in the remainder of this report to describe the late 2007 and early 2008 stormwater sampling.

highlight emails, which are contained in the Round 3A FSR. Any changes in the sampling and analysis procedures documented in the Round 3A FSR were also included in the FSP Addendum.

Sampling at one station near Terminal 4 (WR-169) is also described in the FSP Addendum. As agreed to by the Stormwater Technical Team field sampling procedures for this location are not reported here because this sampling was conducted by the Port of Portland. The field and analytical data for this station will be provided in the future for data analysis and stormwater loading estimates and will be discussed in the *Comprehensive Data Summary Report*. Sampling at this station is briefly summarized in Section 2.0.

1.1 OBJECTIVES OF ROUND 3A/3B UPLAND STORMWATER SAMPLING

The objectives of the Round 3A/3B upland stormwater sampling program are to provide data for evaluating the potential risk related to in-river fish tissue chemical burdens and sediment recontamination from stormwater discharges to the river. These data will be used for understanding the relative magnitude of stormwater impacts to the harbor, developing the draft Site RI, identifying remaining stormwater data gaps, and eventually evaluating remedial alternatives in the Site FS (see SSR for details).

1.2 DOCUMENT ORGANIZATION

The remaining sections of this document describe the sampling field and analytical procedures that were used to collect stormwater and sediment samples:

- Section 2 provides an overview of the field sampling approach.
- Section 3 provides a chronology of the field sampling operations.
- Section 4 provides a summary of the stormwater composite sample field sampling procedures.
- Section 5 provides a summary of the stormwater grab sample field sampling procedures.
- Section 6 provides a summary of the sediment field sampling procedures.
- Section 7 provides a summary of the laboratory analyses.
- Section 8 provides a summary of Round 3A and 3B sampling conducted by LWG.
- Section 9 provides references.

Appendices A through Y present Site-Specific Sampling Reports, each dedicated to a single sampling location. The naming and ordering of Appendices A to W is kept consistent with the Round 3A FSR so that sampling sites can easily be referenced. Consequently, there are gaps in the appendix lettering that represent locations that were not sampled in Round 3B. Appendices X and Y provide sampling information for two sites that were not sampled during Round 3A sampling. Each appendix contains sampling and equipment specifics for that location. Appendix Z contains the field chain-of-custody forms and compositing instructions. Appendix AA contains communications with EPA describing Stormwater Technical Team decisions subsequent to submittal of the FSP Addendum regarding sampling and analysis procedures. Appendix BB contains data output from the Flowlink database from the ISCO samplers.

2.0 Overview of Field Sampling Approach

Sampling objectives are briefly described in Section 1.1 and detailed in the SSR. The FSP Addendum details 15 locations, including one new location, where Round 3B stormwater and sediment trap sampling took place during late 2007 and early 2008. Figure 2-1a-c shows all locations where stormwater samples were collected during Round 3B sampling.

The FSP Addendum addresses only locations identified as having additional data needs after the first round (Round 3A) of sampling. As discussed in Section 1.0, Figure 2-1 shows one additional station (WR-169/Basin D) discussed in the FSP Addendum but not included in this FSR. This station was sampled by the Port of Portland and is not discussed further in this document. Consequently, 14 stations are described in this document.

The planned sampling approach described by FSP Addendum included:

1. Flow-weighted composite stormwater samples – Composite stormwater samples at nine locations (plus one Terminal 4 location).

2. Sediment trap deployment – Sediment traps at 13 sites (plus one Terminal 4 location)

In some cases, not all of these data were actually collected due to logistical, weather, and other issues. These cases are described in Section 3.3.

3.0 Chronology of Field Operations

This section summarizes the chronology of the field sampling operations including initial installation of the equipment, sampling activities, and final removal of the equipment. In general, all procedures described followed those detailed in the FSP Addendum unless otherwise noted. Deviations from the FSP Addendum are discussed, if applicable, in Sections 4 and 6 for stormwater composite and sediment samples, respectively.

3.1 MOBILIZATION AND INITIAL PROGRAMMING

Mobilization for the field sampling program began in November 2007. Also beginning in November, reconnaissance teams began contacting LWG members and non-members regarding access to their sites and any special requirements that needed to be met to facilitate sampling. In most cases the sites were the same as the Round 3A sampling so this mainly consisted of renewing access agreements.

Preliminary site reconnaissance visits and review of stormwater system information was conducted while relevant site-specific training and access agreements were obtained and site-specific sampling procedures were developed. These preliminary visits were made to characterize the drainage basins and outfall locations to allow fabrication or ordering of equipment that would be needed to mount the automated water samplers and sediment traps at each site. The specific mounting hardware for each site is shown on a figure and in photographs in their respective Site-Specific Sampling Reports (Figures 2 and 3 of Appendices A-Y). Drainage basin characteristics such as size and percent impervious area were collected for use in estimating flow volumes for sampler programming and are included in the Site-Specific Sampling Reports.

The ISCO samplers had been stored at the LWG Field Laboratory since the first round of sampling was completed in July 2007. Prior to the initiation of Round 3b, the ISCO samplers were decontaminated, the ISCO sample jars were sent to the analytical laboratory for decontamination, and initial programming was completed.

The initial programming consisted of entering site identification, alarm dial out numbers, data collection frequency, and a series of programs to cover the range of potential runoff volumes at each site in response to a precipitation event. The specific programming strategies are described in Section 4 of the Round 3A FSR. As the samplers were installed, additional entries were made to the programs. These entries included the measured pipe diameter, the offset of the flow meter (if not installed in the bottom of the pipe), and the length of the sample pickup tube. Additionally, the water depth measured by the sampler was verified and adjusted if needed. The entries critical to sample collection details for each site are included in the Site-Specific Sampling Reports (Appendices A to Y).

3.2 INSTALLATION OF SEDIMENT TRAPS AND ISCO SAMPLERS

Due to a range of logistical issues, such as obtaining access agreements and fabricating installation equipment, the dates of ISCO sampler and sediment trap samplers ranged from November 12, 2007 to December 19, 2007. The installation dates for ISCO samplers and sediment traps are summarized in Table 3-1.

Note that no sediment traps were installed at the WR-4 location. The FSP Addendum stated that, "Sediment traps will be installed at WR-4 if field reconnaissance shows that it is feasible." Field reconnaissance determined that the outfall was submerged and the only access to the outfall pipe was through a catch basin with a 3.5-inch pipe in the bottom that connected into the main outfall pipe. Due to this limited access space, the installation of the sediment traps was not feasible. This was discussed at the November 27, 2007 Stormwater Technical Team meeting, with EPA (see Appendix AA). This is further discussed in Section 6.8.

During installation, the preliminary programming was completed for each sampler as noted above. The installation details for each site are included in their respective Site-Specific Sampling Report (Appendices A to Y). These Site-Specific Sampling Reports include diagrams of the installation, photographs of the installation, and programming information.

3.3 STORM EVENT SUMMARY

This section contains a summary of the response to each storm event sampled. Note that the "sample date" is the date the whole water samples were retrieved from the field and the sample was prepared from the aliquots collected by the ISCO automated samplers. These are the dates that this report references when discussing particular samples and the dates referenced by the lab for each sample. Dates of rainfall and automated sample collection are summarized by storm sample date in Tables 3-3a to h Generally, the sampling activities, such as activating the ISCO automated samplers, began several days before the samples were prepared.

The storm conditions targeted for sampling, as described in the FSP, were to meet both of the following criteria:

- Storms predicted to produce more than 0.2 inches of rainfall over a minimum of a 3-hour period, not to exceed approximately 2.25 inches in a 24-hour period (equivalent to the 2-year event)
- Storms preceded by at least a 24-hour dry period (less than 0.1 inches rainfall).

As discussed below, the storms sampled during Round 3B sampling, as discussed more below, had average rainfall amounts ranging between 0.29 and 0.89 inches, average

durations between 0.13 days to 1.13 days, and antecedent dry periods of a minimum of 24 hours and a maximum of more than 11 days. As discussed in Section 4.4 of the Round 3A FSR, the precipitation was found to be variable in the Portland metropolitan area, with the project site frequently in the rain shadow of the Tualatin Mountains, so the closest rain gage to each location's basin was used.

Table 3-2 provides a summary of samplers successfully collecting samples for each storm event. The table identifies a successful event by detailing the type of sampling program activated. The table also shows which samplers were installed for a particular event, and if no samples were collected because adequate samples had already been collected from the site. The general approach was to attempt to collect samples at as many installed stations as possible. As samples were successfully collected, some prioritization of collection occurred to attempt to obtain samples at those stations where samples were not obtained in previous storms.

A discussion of flow-based sampling versus time-based sampling is provided in Section 3.2 of the FSP Addendum. In summary, time-based sampling was used at all sites sampled during Round 3B sampling except OF-22B. Flow-based sampling was used for the second sampling event for OF-22B because adequate flow data was available and reliable.

The following subsections summarize sampling for each storm event. The preparation of the laboratory samples for specific water quality analyses by site and storm is further described in Section 4.5 of this document.

3.3.1 Response to Storm 1: Sample Date – November 16, 2007

On the evening of November 14, 2007, all of the seven ISCO automated samplers installed by that time were activated via cell phone modem in anticipation of a storm that was forecasted to deliver between 0.75 and 1.50 inches of rain beginning early November 15. These seven samplers are referred to as the activated samplers in this section. (Samplers at WR-218 and WR-4 were not installed at this time due to site access issues.) Detailed programming information is shown in the Site-Specific Sampling Reports (Appendices A to Y). Figure 3-1 shows a plot of the measured precipitation at rain gages operated in the project area for Storm 1.

The first measurable rainfall was recorded on November 15 at 5:00 p.m. Depending on the rain gage, the total rainfall for the storm ranged between 0.78 and 0.80 inches and lasted about one day. The antecedent dry period was approximately 3 days, with between 0 and 0.04 inches of rain in the 24 hours preceding the storm. Complete storm statistics by sampling location including dates of rainfall and automated sample collection are summarized for this storm in Table 3-3a.

Four of the seven activated samplers provided adequate sample volume collected during the targeted period of the hydrograph meeting FSP storm flow sampling requirements

(Table 3-2). The three samplers that failed to collect samples were examined to determine why they did not function properly and to make adjustments to improve performance. This evaluation revealed the following:

- At OF-22C, the sampler had a low battery. The battery was replaced.
- At Hwy 30B the hose disconnected from the sampler, so no samples could be collected. The hose was resecured.
- At WR-96, flow was collected over the wrong storm interval. It was reprogrammed.

3.3.2 Response to Storm 2: Sample Date November 27, 2007

By Storm 2, eight ISCO automated samplers had been installed. On the morning of November 26, 2007, seven ISCO automated samplers were activated via cell phone modem in anticipation of a storm that was forecasted to provide between 0.20 and 0.35 inches of precipitation starting later that night. The sampler was not installed at WR-4 due to site access issues. The sampler at OF-49 was not activated because an adequate number (per the FSP Addendum) of samples had already been collected from this station. Detailed programming information is shown in the Site-Specific Sampling Reports (Appendices A to Y). Figure 3-2 shows a plot of the measured precipitation at rain gages operated in the project area for Storm 2.

The first measurable rainfall was recorded at 4:00 p.m. on November 26. Depending on the rain gage, the total rainfall for the storm ranged between 0.29 and 0.35 inches and lasted 3 hours. The antecedent dry period was approximately 6½ days, with no rain in the 24 hours preceding the storm. Complete storm statistics by sampling location, including dates of rainfall and automated sample collection are summarized for this storm in Table 3-3b. This storm was in accordance with the storm criteria set forth in the FSP, summarized in Section 4.1 of the Round 3A FSR.

As shown in Table 3-2, six of the activated samplers provided adequate sample volume collected during the targeted period of the hydrograph meeting FSP storm flow sampling requirements (Table 3-2).

The sampler at the OF-22C station that failed to collect samples was examined to determine, if possible, why it did not function properly and to make adjustments to improve performance. This evaluation revealed that the flow meter failed. The flow meter was replaced and remounted.

3.3.3 Response to Storm 3: Sample Date November 29, 2007

On the morning of November 28, 2007, five out of eight ISCO automated samplers installed at the time were activated via cell phone modem in anticipation of a storm that

was forecasted to provide between 0.35 and 0.50 inches of precipitation starting later that afternoon. The sampler was not installed at WR-4 due to site access issues. The samplers at OF-49, OF-22B, and WR-96 were not activated because an adequate number (per the FSP Addendum) of samples had already been collected from these stations. Detailed programming information is shown in Table 3-2 and in the Site-Specific Sampling Reports (Appendices A to Y). Figure 3-3 shows a plot of the measured precipitation at rain gages operated in the project area for Storm 3.

The first measurable rainfall was recorded at 1:00 p.m. on November 28th. Depending on the rain gage, the total rainfall for the storm ranged between 0.42 and 0.43 inches and lasted between 7 and 8 hours. The antecedent dry period was approximately 2 days, with 0.6 inches of rain in the 24 hours preceding the storm. Complete storm statistics by sampling location including dates of rainfall and automated sample collection are summarized for this storm in Table 3-3c. This storm was in accordance with criteria set forth in the FSP, as summarized in Section 4.1 of the Round 3A FSR.

During this storm, two of the five activated samplers provided adequate sample volume collected during the targeted period of the hydrograph meeting FSP storm flow sampling requirements (Table 3-2). Samples were not successfully collected at other stations for the following reasons:

- At two sites (Hwy 30A and OF-22C), the flow meter did not function correctly. It was removed and replaced in both cases.
- The sampler pump ran continuously at Hwy 30B and all of the bottles were overfilled. The sampler was reprogrammed to stop after the bottles were filled with the correct volume.

3.3.4 Response to Storm 4: Sample Date January 9, 2008

On the morning of January 7, five out of nine ISCO automated samplers installed at the time were activated via cell phone modem in anticipation of a storm that was forecasted to provide between 0.75 and 1.25 inches of precipitation starting later that afternoon. The samplers at OF-49, OF-22B, WR-96, and WR-218 were not activated because an adequate number (per the FSP Addendum) of samples had already been collected from these stations. Detailed programming information is shown in Table 3-2 and in the Site-Specific Sampling Reports (Appendices A to Y). Figure 3-4 shows a plot of the measured precipitation at rain gages operated in the project area for Storm 4.

The first measurable rainfall was recorded at 9:00 p.m. on January 7. The total rainfall for the storm was 0.89 inches and lasted approximately 18 hours. The antecedent dry period was 24 hours with 0.05 inches of rain in the 24 hours preceding the storm. Complete storm statistics by sampling location including dates of rainfall and automated sample collection are summarized for this storm in Table 3-3d. This storm was in accordance with criteria set forth in the FSP, as summarized in Section 4.1 of the Round 3A FSR.

During this storm, two of the five activated samplers provided adequate sample volume collected during the targeted period of the hydrograph meeting FSP storm flow sampling requirements (Table 3-2). Samples were not successfully collected at other stations for the following reasons:

- Samples from two stations (Hwy 30A, and Hwy 30B) were discarded because insufficient sampling volume was collected over the storm interval to meet the FSP criteria or less than half of the storm hydrograph was sampled.
- The sample pickup tube was damaged by a forklift at the WR-4 sampling location and no sample was collected.

3.3.5 Response to Storm 5: Sample Date January 11, 2008

On the morning of January 9, 2008, three ISCO automated samplers were activated via cell phone modem in anticipation of a storm that was forecasted to provide between 0.35 and 0.50 inches of precipitation starting later that day. The samplers at OF-49, OF-22B, WR-96, WR-218, WR-142, and OF-22C were not activated because an adequate number (per the FSP Addendum) of samples had already been collected from these stations. Detailed programming information is shown in the Site-Specific Sampling Reports (Appendices A to Y). Figure 3-5 shows a plot of the measured precipitation at rain gages operated in the project area for Storm 5.

The first measurable rainfall was recorded at 4:00 p.m. on January 9. The total rainfall for the storm ranged between 0.39 and 0.45 inches and lasted less than 24 hours. The antecedent dry period was 24 hours with 0.07 inches of rain in the 24 hours preceding the storm. Complete storm statistics by sampling location including dates of rainfall and automated sample collection are summarized for this storm in Table 3-3e. This storm was in accordance with the storm criteria set forth in the FSP, as summarized in Section 4.1 of the Round 3A FSR.

Two of the activated samplers provided adequate sample volume collected during the targeted period of the hydrograph meeting FSP storm flow sampling requirements (Table 3-2).

Samples were not collected during this storm event at Hwy 30A because the battery died before samples could be collected.

3.3.6 Response to Storm 6: Sample Date January 15, 2008

On the morning of January 14, 2008, two ISCO automated samplers were activated via cell phone modem in anticipation of a storm that was forecasted to provide between 0.2 and 0.35 inches of precipitation starting later that day. The sampler at Hwy 30A could not be contacted via cell phone to activate it. The samplers at OF-49, OF-22B, WR-96, WR-218, WR-142, and OF-22C were not activated because an adequate number (per

the FSP Addendum) of samples had already been collected from these stations. Detailed programming information is shown in the Site-Specific Sampling Reports (Appendices A to Y). Figure 3-6 shows a plot of the measured precipitation at rain gages operated in the project area for Storm 6.

The first measurable rainfall was recorded at 2:00 p.m. on January 14, 2008. The total rainfall for the storm was 0.34 inches and lasted 6 hours. The antecedent dry period was almost 2 days, with no rain in the 24 hours preceding the storm. Complete storm statistics by sampling location including dates of rainfall and automated sample collection are summarized for this storm in Table 3-3f. This storm was in accordance with the storm criteria set forth in the FSP, as summarized in Section 4.1 of the Round 3A FSR.

Both of the activated samplers provided adequate sample volume collected during the targeted period of the hydrograph meeting FSP storm flow sampling requirements (Table 3-2).

3.3.7 Response to Storm 7: Sample Date January 28, 2008

On the evening of January 25, 2008, two ISCO automated samplers were activated via cell phone modem and one ISCO (Hwy 30A) was activated manually by the field team in anticipation of a storm that was forecasted to provide between 0.75 and 1.25 inches of precipitation starting later that day. The samplers at OF-49, OF-22B, WR-96, WR-218, WR-142, and OF-22C were not activated because an adequate number (per the FSP Addendum) of samples had already been collected from these stations. Detailed programming information is shown in the Site-Specific Sampling Reports (Appendices A to Y). Figure 3-7 shows a plot of the measured precipitation at rain gages operated in the project area for Storm 7.

The first measurable rainfall was recorded at 9:00 a.m. on January 26, 2008. The total rainfall for the storm was 0.83 inches and lasted 21 hours. The antecedent dry period was almost 12 days, with no rain in the 24 hours preceding the storm. Complete storm statistics by sampling location including dates of rainfall and automated sample collection are summarized for this storm in Table 3-3g. This storm was in accordance with the storm criteria set forth in the FSP, as summarized in Section 4.1 of the Round 3A FSR.

Two of the activated samplers provided adequate sample volume collected during the targeted period of the hydrograph meeting FSP storm flow sampling requirements (Table 3-2). The sample collected from WR-4 was discarded because insufficient sampling volume was collected over the storm interval to meet the FSP criteria, or less than half of the storm hydrograph was sampled.

3.3.8 Response to Storm 8: Sample Date January 30, 2008

On the morning of January 28, 2008, three ISCO automated samplers were activated via cell phone modem in anticipation of a storm that was forecasted to provide between 0.35 and 0.50 inches of precipitation starting later that day. The samplers at OF-49, OF-22B, WR-96, WR-218, WR-142, and OF-22C were not activated because an adequate number (per the FSP Addendum) of samples had already been collected from these stations. Detailed programming information is shown in the Site-Specific Sampling Reports (Appendices A to Y). Figure 3-8 shows a plot of the measured precipitation at rain gages operated in the project area for Storm 8.

The first measurable rainfall was recorded at 10:00 p.m. on January 28, 2008. The total rainfall for the storm was 0.34 inches and lasted 21 hours. The antecedent dry period was almost 2 days, with 0.03 inches of rain in the 24 hours preceding the storm. Complete storm statistics by sampling location including dates of rainfall and automated sample collection are summarized for this storm in Table 3-3h. Note that for one sample location, WR-4, a longer duration storm with 0.79 inches of rain was sampled. This was due to the fact that the time of runoff for this site was overestimated, so it took longer for all of the bottles to be filled. However, this larger duration storm was still in accordance with the storm criteria set forth in the FSP summarized in Section 4.1 of the Round 3A FSR.

All three of the activated samplers provided adequate sample volume collected during the targeted period of the hydrograph meeting FSP storm flow sampling requirements (Table 3-2).

3.4 SEDIMENT TRAP INSPECTIONS

After sediment traps were installed as described in Section 3.2, they were inspected approximately once a month during the sampling period. The inspection dates and observations/actions from each inspection are summarized in Table 3-4, as well as in the Site-Specific Sampling Reports (Appendices A to Y). At each inspection, the sediment traps were removed, the amount of sediment was recorded, and the sediment traps were reinstalled. Also noted in Table 3-4 and the Site-Specific Sampling Reports are instances where samples were removed and archived.

Of particular note were the following actions that were not specifically anticipated by the FSP:

- Per recommendation of the Stormwater Technical Team with agreement by EPA (see emails in Appendix AA), the 1,000-mL narrow mouth sediment trap bottles at two sites (Hwy 30A and Hwy 30B) were replaced with 500-mL narrow mouth bottles. These smaller bottles had the same size mouth opening but were shorter and therefore allowed stormwater runoff to overtop the bottles at sites with low water levels. Both short and regular

sized bottles (two each) were redeployed at OF-18 and each bottle type analyzed for total organic carbon (TOC) to help check whether the shorter bottles collected sediments differently from the standard bottles. Bottle openings were installed at the same elevation to ensure both sets were subject to the same flows and scouring effects in the pipe.

3.5 REMOVAL OF THE SAMPLING NETWORK

Anchor and Integral staff began removing the ISCO automated samplers and the sediment trap hardware on February 11, 2008. The final pieces of equipment were removed on February 14, 2008.

Upon removal from the field, the final data were downloaded from each ISCO sampler and added to the Flowlink database. The samplers were decontaminated and stored at the LWG Field Laboratory for potential future use. Worn items, such as the peristaltic pump tubes and transfer arm tubes, were discarded, as were the sample pickup tubes.

Installation hardware such as slip rings, stainless steel catch basins, and sediment trap mounting hardware were also removed, decontaminated, and stored at the LWG Field Laboratory. Batteries were recharged to prevent deterioration and also stored at the lab.

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4.0 Stormwater Composite Sample Field Sampling Procedures

As described in Section 2.1.1 of the FSP, flow-weighted composite samples were collected to obtain Event Mean Concentrations (EMCs) of chemicals found in the stormwater. The following sections describe the general field sampling procedures as they applied to all stations. Site-specific details are provided in the Site-Specific Sampling Reports (Appendices A to Y).

4.1 WEATHER TRACKING

Information on weather tracking is discussed in Section 4.1 of the Round 3A FSR.

4.2 PROGRAM SELECTION AND ENABLING OF ISCO SAMPLERS

Detailed information on program selection and enabling of ISCO samplers is discussed in Section 4.2 of the Round 3A FSR. The runoff calculations for each sampling site can be found in their respective Site-Specific Sampling Reports (Appendices A to Y).

The programs selected for each event are identified in Section 3.3. A discussion of flow-based sampling versus time-based sampling is provided in Section 3.2 of the FSP Addendum. In summary, time-based sampling was used at all sites sampled during Round 3B sampling, except OF-22B. Flow-based programming was used during the second sampling event at OF-22B because adequate flow data was available.

The Site-Specific Sampling Reports (Appendices A to Y) describe the type and value for the triggers for each site and sampling event. Compositing information is also included in the Site-Specific Sampling Reports.

4.3 SAMPLE RETRIVAL AND DATA DOWNLOADING

As soon as practicable after a storm, sampling teams were deployed to recover the samples. Samples were recovered and data downloaded consistent with the procedures in the FSP.

In some cases, the time to retrieve samples was increased due to site access issues (e.g., over the weekend or the need to have traffic flaggers deployed to the site). The FSP required samples be retrieved within 24 hours after the end of sampling event and then processed within 12 hours after retrieval. Due to these issues, in some cases the target for sample retrieval was not met. The specific instances are shown in Table 4-1 and discussed more in Section 4.9. In all cases, the samples were processed within 12 hours after retrieval.

Early in the storm event response process, it was recognized that weekend site access could not easily be attained for the majority of sampling stations. Consequently, any storm events ending on Saturday or Sunday morning could not be retrieved within 24 hours with available Monday morning access. This created the potential to miss a number of storms and thereby cause substantial data gaps given the limited timeframe available for sampling. This issue was discussed with the Stormwater Technical Team on April 9, 2007. It was recommended and EPA agreed that the 24-hour retrieval time should be maintained whenever possible, but that if this was not possible for a weekend storm, the samples would be retrieved as soon as possible. Samples obtained after 24 hours would not be analyzed for filtered (dissolved) metals or dissolved organic carbon (DOC), but would be analyzed for total metals and TOC, as well as all other conventional and organic parameters. After the April 9, 2007 event, the Stormwater Technical Team recommended and EPA agreed that DOC could still be analyzed for samples retrieved after 24 hours. This deviation should have been included in the FSP Addendum as accepted standard practice for the project, but was inadvertently omitted. Therefore, this information (contained in the Round 3A FSR) is repeated here for clarity.

4.4 STORMWATER FLOW/RAINFALL EVALUATION AND COMPOSITING

Stormwater flow and rainfall evaluation and compositing is discussed in Section 4.4 of the Round 3A FSR. Rain gage information is presented in the Site-Specific Sampling Reports (Appendices A to Y), as well as Figures 3-1 through 3-8. Although City of Portland rain gage data is kept in Pacific Standard Time year-round, the data was adjusted to Daylight Savings Time before adding to the database. All rain gage information is the same as for Round 3A sampling, except the Swan Island rain gage was replaced with a new gage.

A summary of compositing for each site during each event is included in the Site-Specific Sampling Reports (Appendices A to Y) attached to this report. The chain-of-custody form for each sampling event is provided in Appendix Z.

4.5 SAMPLE PROCESSING AND HANDLING

Once the stormwater composite scheme was determined, as discussed above, the composite stormwater processing procedures generally followed those detailed in the FSP (Anchor and Integral 2007a) and FSP Addendum (Anchor and Integral 2007c). Table 4-2 summarizes composite stormwater collection by site, event, and analyte group. Deviations from the FSP are discussed in Section 4.9. As shown in Table 4-2, in a number of instances particular analytes were not collected at certain stations. In most cases, there was insufficient sample volume available at that station and, in these cases, the priority order of analyses required by the FSP was followed. Also, in some cases, retrieval target times were not met (as discussed previously), and consequently

dissolved metals analyses were not performed. In all cases, the samples were processed within 12 hours after retrieval.

4.6 FIELD PARAMETER MEASUREMENTS

As discussed in the FSP, individual stormwater sample containers were brought back from the field, composited in 20 L glass carboys and the water quality parameters were measured from the sample composites. Depending on the final composite volume, an aliquot of sample (approximately 100 to 200 mL) was either:

- Removed immediately for measurements of water quality parameters, or
- In cases of very limited composite volume, the aliquot was collected immediately after filling the priority sample containers for chemical analyses.

For Round 3B sampling, field water quality parameters were only collected during the November 16, 2007 composite water processing event due to available water volumes for testing. Water quality measurements were not taken during subsequent composite events because there was not enough sample volume left to conduct water quality measurements after analyte volumes for chemical analyses had been collected. This modification to the FSP procedures is included under deviations in Section 4.9.

4.7 FIELD QUALITY ASSURANCE/QUALITY CONTROL

Field quality control samples are used to assess sample method variability (e.g., matrix spike duplicates) and sample variability (e.g., field duplicates), evaluate potential sources of contamination (e.g., equipment rinsate and trip blanks), or confirm proper storage conditions (e.g., temperature blanks). Additional details on field duplicate samples and field QC samples are described in the QAPP Addendum 8 (Integral 2007). Field QC samples were collected for each sampling event in accordance with the FSP and FSP Addendum.

4.7.1 Field Duplicates

Field duplicate samples were collected during Storm 2 and 3 events (November 27 and November 29, 2007, respectively). In order to generate sufficient additional volume (6.2 L as per FSP Table 2-3) to analyze for the full suite of analytical parameters in the field duplicate sample, and because of limitations on the maximum sample volume that could be collected in each ISCO sampler, water for field duplicates was collected from multiple sample locations during the Storm 2 event. For this storm event, additional volume from one station was used to create field duplicates for total metals analysis,

additional volume from another station was used to create field duplicates for polycyclic aromatic hydrocarbon (PAH) analysis and other parameters as shown in Table 4-3.

Due to variations in actual runoff versus that predicted by the ISCO program or sampling approach used, it could not be determined in advance which stations would have sufficient volume for field duplicates. Consequently, the locations of field duplicates were determined based on the sample volumes available during each storm event. Any additional volume from a given station was aliquoted for field duplicate analysis in accordance with the analytical priorities established in the FSP (Table 2-4a). Once sufficient volume had been collected to create all field duplicate analyses, any additional sample volume from a given station was then used in the same manner to create laboratory quality control samples (i.e., matrix spike or laboratory duplicates following the analysis priority established in the FSP). Field duplicates are summarized for the stormwater composite samples in Table 4-3. Field duplicates were collected at the 5 percent frequency listed in the FSP (one per 20 samples). The following constituents did not meet the field replicate collection criteria; all other constituents met the collection criteria frequency:

- Total suspended solids (TSS) – one field duplicate collected out of 23 total samples
- TOC – one field duplicate collected out of 22 total samples
- Phthalates – field duplicate not collected due to limited stations slated for phthalate analysis and limited sample volume
- Pesticides – field duplicate not collected due to limited stations slated for pesticide analysis and limited sample volume.

Note that the TSS and TOC duplication frequency is very close to 5 percent and is not expected to measurably impact quality control assessment. As shown Table 4-3, duplicate samples were collected for Storm 2 and 3 events (four samples) Duplicate samples were not collected for Storm 1, 4, 5, 6, or 7 events because the total number of duplicate samples already available was sufficient to meet FSP requirements.

4.7.2 Equipment Rinsates and Temperature Blanks

The FSP requires one equipment rinsate blank prior to deployment of the ISCO samplers. The equipment blank on the ISCO setup collected for the Round 3A sampling event was utilized for this Round 3B FSR.

To provide additional information about the decontamination procedures and identify possible contamination sources throughout the sample compositing sequence, the following additional equipment and/or rinsate blanks were created and analyzed as discussed in Section 4.9:

- Stormwater composite equipment rinsate blank

In each case, all rinsate blank samples were treated identically to any other water samples described in the FSP and QAPP Addendum in terms of storage, transport, analyses, and laboratory quality assurance/quality control (QA/QC) procedures.

Per the FSP, temperature blanks are used to measure the temperature inside the cooler upon receipt to the laboratory. One temperature blank was prepared and submitted with each cooler shipped to the analytical laboratory. The temperature blank consisted of a sample jar containing deionized water and labeled "temp blank" and packed into the cooler in the same manner as the rest of the samples.

4.7.3 Field Blanks

As described previously in Section 4.2, a select number of ISCO samplers contained a collection vessel designated as a field blank. The field blank simply consisted of a blank bottle programmed to not collect a stormwater sample. Upon arriving at the lab, the field retrieval team determined if the field blank bottles were valid samples (i.e., no water was collected in container and jar intake). The field blank bottles were given to the composite team and processed. Columbia Analytical Service (CAS) deionized water was poured into each of the three (at a minimum) field blank bottles. Blank bottles were collected from several stations and used in the development of one blank sample as noted in Table 4-3. The water was then transferred to a carboy designated for a field blank and processed following the same procedures as completed for the composite samples. The locations from which field blanks were prepared for each sample event are shown in Table 4-3. Field blanks were collected at the 5 percent frequency listed in the FSP (one per 20 samples) for all sampling events with the exception of the January 30, 2008 event.

4.7.4 Laboratory QC Samples

Additional volume for laboratory quality control samples was not available for collection during any Round 3B stormwater sampling events.

4.8 FIELD DOCUMENTATION

All field activities and observations were noted in a field notebook. These notes included measurements taken when setting up the sampling equipment and during maintenance activities such as changing batteries or peristaltic pump tubes. Additional notes were taken on the chain-of-custody form regarding the time of retrieval and the appearance of the samples. Copies of key information can be found for each sampling site in their respective Site-Specific Sampling Reports (Appendices A to Y). The original field notebooks have been retained by Anchor in LWG project files.

4.9 DEVIATIONS FROM THE ROUND 3A FSP AND FSP ADDENDUM REGARDING STORMWATER COMPOSITE SAMPLINE

Several deviations have been made from the Round 3A (Anchor and Integral 2007a) and the Round 3A FSP Addendum (Anchor and Integral 2007c) during the course of the sampling activities. Some "deviations" reflect contingencies that were contemplated in the FSP and/or FSP Addendum. Many of these deviations were intended to improve data quality and are the same as those made during the Round 3A sampling event. As a result, they are not re-evaluated here in detail. Major deviations have been described in previous sections to provide context and rationale for the deviations. Deviations specifically associated with stormwater composite sampling during Round 3B are summarized in Table 4-4.

As detailed in Table 4-4 the following types of deviations from the Round 3A FSP Addendum (Anchor and Integral 2007c) occurred:

Minor Deviations:

- Field parameters were only measured during the November 16, 2007 sampling event due to limited volume and equipment availability.
- Additional volume for laboratory QC samples was not available for collection during any Round 3B stormwater sampling events.
- An equipment rinsate blank on the ISCO tubing, sampling arm, and collection bottle was not collected during the Round 3B sampling event as detailed in Table 4-4.
- Hwy 30 sample station was renamed Hwy 30A to distinguish it from the previous sampling very near the same location.

Overall, these changes did not substantially impact the quality of the study. Rinsate information from Round 3A provides a reasonable assessment of the decontamination procedures consistently used in both events. In many other cases (such as sampling station changes), the changes were made specifically to improve the quality of the study.

5.0 Stormwater Grab Sample Field Sampling Procedures

No additional grab samples were called for in the FSP Addendum and none were collected during Round 3B sampling. All grab samples required by the FSP were collected during Round 3A sampling. See the Round 3A FSP for more information.

6.0 Sediment Field Sampling Procedures

As described in Section 2.1.3 of the FSP, sediment traps are useful monitoring tools to help identify chemical concentrations in stormwater sediments. The sediment traps consist of a stainless steel bracket holding high density polyethylene (HDPE) bottles. Sediment traps were installed by bolting the bracket directly to the location junction, pipe, or catch basin.

6.1 WEATHER TRACKING

No specific weather monitoring was conducted for the sediment sampling. Precipitation records were gathered from the local precipitation gages operated by the City of Portland. All rain gage information is the same as Round 3A, except the Swan Island Rain Gage was replaced with a new gage. The precipitation data is contained in the project Flowlink database and may be used in the future when the chemical analyses of the samples are completed and the *Comprehensive Data Summary Report* is prepared.

6.2 ANCILLARY FLOW INFORMATION

Per the FSP, the ISCO samplers were set up to record depth, velocity, and flow at 5-minute increments throughout the sediment trap sampling period. Due to high variability in portable flow meters and the short deployment period that makes flow data review and refinement difficult, the technical team decided and EPA agreed that flow data was not intended for use beyond composite sample collection. This data is contained in the project Flowlink database and may be used in the future when the chemical analyses of the samples are completed and the *Comprehensive Data Summary Report* is prepared. During the October 10, 2007 Technical Team meeting (Appendix AA), the Stormwater Technical Team determined that flow meters were not needed at sites where only sediment trap sampling was proposed.

6.3 SAMPLE RETRIEVAL

The sediment traps were deployed from between 85 and 93 days depending on the particular location (Table 6-1). All traps were deployed for at least two months as required by the FSP Addendum. The sediment collection vessels were inspected monthly during the sampling period. At some stations, the observed level of sediment was slightly reduced from one month to the next, but this is most likely attributed to settling of the sediment.

The FSP called for retrieval of sediments in the traps if the bottles were half or over half full, archiving of those sediments, and continued deployment with new bottles. In all cases except one (OF-18 on December 10, 2007), the accumulations in the sediment

trap bottles were much less than one half (Table 3-4), and this procedure was not needed. However, the Stormwater Technical Team recommended during a January 10, 2008 meeting (see Appendix AA) and EPA agreed to employ the following additional procedure:

- At the end of January (approximately two months after sediment trap installation), remove existing bottles from any sediment trap with more than trace amounts of sediment, replace with clean bottles, and sample and analyze available sediments for total solids. Table 3-4 notes the locations where this was conducted during the "3rd inspection."
- It was agreed that sediment traps would be removed near the end of January. After discussing the results of the total solids analysis in early February, it was agreed that all sediment traps would be removed shortly thereafter. The sediment trap volumes from this final deployment period were combined with the initial volumes from each site.

All field activities and observations were noted in a field notebook during field work. No specific flow or precipitation data was downloaded for sediment sampling.

6.4 STORMWATER FLOW, RAINFALL, AND RIVER HEIGHT EVALUATION

No analysis of the stormwater flow has been completed for the sediment sampling. As previously mentioned, due to high variability in portable flow meters and the short deployment period that makes flow data review and scrubbing difficult, the technical team decided and EPA agreed that flow data was not intended for use beyond composite sample collection. The total rainfall during sediment trap deployment is summarized by site in Table 6-1.

Per the FSP, sample locations were chosen at elevations relative to the river water levels such that the risk of river water backing up into stormwater pipes at the sampling location was minimized. River height information was checked routinely as shown in real time by U.S. Geologic Service (USGS) Morrison Bridge River Gage (#14211720) and near term predictions of river height as provided by National Oceanic and Atmospheric Administration's (NOAA's) Advanced Hydrologic Prediction Service. The station at OF-18 had the lowest elevation of any location at an elevation of 13.4 feet (City of Portland datum). During the Round 3A, the river height data were compared to visual observations of water heights within the pipe at OF-18 and to flow sensor water level data on a routine basis, particularly as river water levels rose. The peak river water level observed during the Round 3A sampling period was 12.22 feet (City of Portland Datum, measured at 1.55 feet above National Geodetic Vertical

Datum [NGVD] of 1929) on March 21 and in-pipe water levels at OF-18 were checked both in the field and via the installed flow sensor. No reaction in standing water height in the pipe at station OF-18 was noted through this peak river level period during Round 3A. River levels returned to 9.28 feet on March 27, and the same checks again indicated no coincident changes in the water level in the OF-18 pipe. During Round 3B, the maximum river elevation was 8.37 feet (City of Portland Datum, measured at 1.55 feet above NGVD of 1929) on December 5, 2007, which is below the 12.22-foot water level established in Round 3A. Given that OF-18 was at the lowest elevation for Round 3B, it is concluded that there was no influence of river water on either sediment trap samples or stormwater samples, which were all collected at times of lower river height, at any sampling location for Round 3B.

6.5 SAMPLE PROCESSING AND COMPOSITING

Sediment trap samples were retrieved (as noted above) and archived at the field laboratory for compositing.

Per the FSP, sample processing was conducted at the field laboratory by filtering the entire contents of the sediment trap bottles and transferring the filter and/or solid residue into an 8- or 16-ounce glass sample jar. At each location there were, at a minimum, four sediment trap bottles to composite. In some cases, some traps had four 1L bottles and at three locations (OF-18, Hwy 30A and Hwy 30B) there were short bottles (500 ml) in addition to tall bottles (1 L). The short/smaller bottles were added to try to collect more sediment because the smaller bottles allowed more flow to be directed over the sediment bottles. This is discussed further in Section 6.8.

Samples from the short and tall bottles were processed in the following manner, which differed slightly from the Round 3A FSP (Anchor and Integral 2007a) and FSP Addendum (Anchor and Integral 2007c) description:

- For each station, an 8- or 16-ounce glass jar was labeled with the appropriate sample identification information.
- Using a decontaminated acrylic filter stand apparatus, glass flask, peristaltic pump and tubing, stainless steel spatula, and 6-micron cellulose filters, the contents of each of the sediment bottles were filtered.
- Once most of the water was decanted from the sediment trap bottle, the remaining sediment was then transferred directly to the sample jar.
- A stainless-steel spatula was used to scrape the remaining material off the filter and into the sample jar.
- The filtrate was discarded.

6.5.1 Special Compositing Situations

6.5.1.1 Collection of Inline Sediments

Due to insufficient volume collected in sediment traps through the third inspection at WR-96, the Stormwater Technical Team suggested the use of sediment collected from within the outfall structure at this location for sediment sample analysis because there was a large amount of sediment accumulated around the bottles (see Appendix AA). This was recognized by the team as a deviation from the FSP, but was judged to be preferable to no sediment sample at all at this location. The sediment results from this location will need to be flagged during data analysis as representing a different collection procedure and assessed for anomalies to the extent possible.

Sediment was collected using a stainless steel spoon and transferred into a glass jar from the outfall near where the sediment traps were installed at WR-96.

Samples were collected in the following manner:

- Water was siphoned from the catch basin.
- Stainless steel spoons and mixing bowls were used to collect and homogenize sediment from the bottom of catch basin.
- The sediment was transferred to multiple pre-labeled sampler jars and stored on ice for transfer to the field laboratory.
- Samples were stored in refrigerators at 4ºC ± 2ºC in the field laboratory and then shipped to CAS (Kelso, Washington) within 48 hours of retrieval.

The two jars of sediment collected were submitted as one sample. Due to the amount of sediment collected, the sediment was not processed in the field laboratory and rather was sent directly to the lab in the collection vessels on March 18, 2008. The lab was instructed to archive the sample at 4±2°C until further instructions were received. In follow-up correspondence with the lab, it was requested that the catch basin sediment sample be analyzed for the following constituents: TSS, TOC, total metals, polychlorinated biphenyl (PCB) congeners, pesticides, PAHs/phthatlates, and herbicides (consistent with the FSP Addendum analyte list for sediment trap samples).

6.5.1.2 Processing of Short Bottles

As discussed in Section 6.8, per recommendation of the Stormwater Technical Team and agreement by EPA (see emails in Appendix AA), the 1,000-mL narrow mouth sediment trap bottles at two sites (Hwy 30A and Hwy 30B) were replaced with 500-mL narrow mouth bottles on January 11, 2008. These smaller bottles had the same size mouth opening, but were shorter and therefore allowed stormwater runoff to overtop the bottles at sites with low water levels. Table 3-4 shows the sediment heights in the short bottles, which were able to collect between trace and ½ inch of sediment during the approximately 1-month long period they were installed.

Also on January 11, 2007, both short and regular sized bottles (two each) were redeployed at OF-18 to help determine whether shorter bottles collected sediments differently from standard bottles. Table 3-4 shows the sediment heights observed by field crew in the tall versus short bottles on January 28, 2008, and February 11, 2008. In general, there was no visible difference between the sediment heights.

Also, per the recommendation of the Stormwater Technical Team and agreement by EPA, during the February 7th Technical Team Meeting (Appendix AA), the bottles from OF-18 were proposed to be processed in the following way:

- The sediment from OF-18 short bottles deployed from January 11, 2008 to February 11, 2008 would be analyzed for total solids (TS), TOC, and PCBs.
- The sediment from OF-18 tall bottles deployed from January 11, 2008, to February 11, 2008 would be analyzed for TS, TOC, and PCBs, and the remaining sediment would be saved.
- The sediment from the OF-18 tall bottles deployed from November 12, 2007, to December 10, 2007, and December 10, 2007, to January 11, 2008 would be combined with the remaining sediment from the tall bottles deployed from January 11, 2008, to February 11, 2008.

However, during sediment trap processing, the sediment from tall bottles deployed from December 10, 2007, to January 11, 2008, was combined with the sediment from the tall bottles deployed from January 11, 2008, to February 11, 2008. Therefore, sediment chemistry data for short and tall bottles will not be available for identical deployment periods. However, the deployment period for the tall bottles (December 10, 2007, through February 11, 2008) includes the period the short bottles were deployed (January 11, 2008, through February 11, 2008), so comparisons can still be made.

6.5.2 Prioritization of Sediment Trap Analysis

Table 6-1 summarizes sediment trap and catch basin sediments collected by site.

As noted previously, insufficient sample volume was available to conduct all FSP-required analyses from all stations. Thus, once the samples were processed and composited, they were initially frozen to provide additional time for the Stormwater Technical Team to discuss the best use of the limited sample volumes available. To assist in these assessments, some sample volume was utilized to conduct a total solids analysis for each sample. This allowed the dry weight mass of each sample to be estimated, which in turn was used to estimate the number of analyses that could be conducted for each sample.

It was recommended by the Stormwater Technical Team and agreed by EPA on February 26 (Appendix AA) that, in general, the samples should be analyzed for chemical categories in the priority order described by the FSP. The exceptions to this rule are as follows:

- Gunderson WR-147 and Cascade General WR-161 – Use the mass proposed for PCBs to measure organochlorine pesticides (PCBs were measured during Round 3A sampling)
- OF-22B – Use the mass proposed for PCBs to measure pesticides at the detection limit and use the remaining mass to measure PAH/phthalates (PCBs were measured during Round 3A sampling)
- Hwy 30B – Take enough mass from the amount proposed for PAH/phthalates to measure metals at twice the detection limit. (This would increase the PAH/phthalate detection limit to about 2 times.)
- OF-49 and OF-22C – Take a small amount of mass from the PAH/phthalates analysis and use it to analyze metals.

Table 6-2 shows the analyses that are being conducted for each sediment sample location and where detection limits will likely be elevated above the FSP targets due to limited sample volumes.

6.6 FIELD QUALITY ASSURANCE/QUALITY CONTROL

Field QC information for the sediment trap samples is summarized in Table 6-3. Preliminary estimates of sediment volume collected for the sediment trap samples indicated that there was sufficient sediment volume available to fulfill all field QC sampling needs.

6.6.1 Field Duplicates

A field duplicate for sediment trap samples was created at CAS laboratory from sample LW3-STW2-S10-OF18T07. This duplicate was analyzed for the following constituents: TOC, total metals, PAHs/phthalates, PCB congeners, herbicides, and organochlorine pesticides.

The total number of original sediment samples submitted to the laboratory was 14 (not including the catch basin sample from WR-96). One field duplicate and one laboratory QC sample were submitted, which meets the requirements stated in the FSP.

6.6.2 Equipment Rinsates and Temperature Blanks

One equipment rinsate blank, as shown in Table 6-3, was collected from the sample processing setup described previously. Deionized water from CAS was passed through the filter setup using a peristaltic pump. Water was sampled from the setup directly into sample bottles and submitted for the analysis discussed in Section 7.

Temperature blanks were used to measure the temperature inside the cooler upon receipt to the laboratory as described in previous sections. Each sample cooler submitted to the lab contained a temperature blank.

6.6.3 Laboratory QC Samples

One laboratory QC sample, as shown in Table 6-3, was collected for sediment samples. The FSP calls for one QC sample per 20 normal samples. During Round 3B, 14 normal samples were collected for analysis. Because one laboratory QC sample was collected and submitted for each analyte, the FSP requirement was met.

6.7 FIELD DOCUMENTATION

Field documentation was collected in the same manner as described for stormwater composite sampling (Section 4.8).

6.8 DEVIATIONS FROM THE ROUND 3A FSP AND FSP ADDENDUM REGARDING SEDIMENT TRAP SAMPLING

Deviations that were recommended by the Stormwater Technical Team and agreed upon by EPA, as documented in Table 4-4 and Appendix AA, include:

- Note that no sediment traps were installed at the WR-4 location. The FSP Addendum stated that, "Sediment traps will be installed at WR-4 if field reconnaissance shows that it is feasible." Field reconnaissance determined that the outfall was submerged and the only access to the outfall pipe was through a catch basin with a 3.5-inch pipe in the bottom that connected into the main outfall pipe. Due to this limited access space, the installation of the sediment traps was not feasible. This was discussed at the November 27 Stormwater Technical Team meeting with EPA (see Appendix AA)
- As noted above, per the recommendation of the Stormwater Technical Team and agreement by EPA, catch basin sediments were collected from WR-96 due to insufficient volume in sediment traps, recognizing that this represents a different

sediment collection technique than all other sediments. Sediment was collected using a stainless steel spoon and transferred into a glass jar from the outfall near where the sediment traps were installed at WR-96.

- Per recommendation of the Stormwater Technical Team and agreement by EPA (see emails in Appendix AA), the 1,000-mL narrow mouth sediment trap bottles at two sites (Hwy 30A and Hwy 30B) were replaced by 500-mL narrow mouth bottles on January 11, 2008. These smaller bottles had the same size mouth opening but were shorter and therefore allowed stormwater runoff to overtop the bottles at sites with low water levels. Also on January 11, 2007, both short and regular sized bottles (two each) were redeployed at OF-18 to help check whether shorter bottles collected sediments differently from standard bottles.
- Sediments were frozen during analysis discussions to prolong the holding time (which was a carryover procedure from Round 3A)

In addition, the following minor deviations occurred:

- A sediment trap bottle rinsate was not collected during Round 3B sampling.
- Sediment was collected in either 8- or 16-ounce jars depending on volume.
- The sediment processing procedure was refined in the laboratory and differs slightly from the one described in the FSP Addendum as discussed above in Section 6.5, but follows that performed during Round 3A sampling.

These deviations are not expected to measurably impact the quality of the data collection and, in some cases, were specifically intended to increase sample completeness and/or improve data quality. Collection of in-line sediments at one location represents a different sediment collection procedure from all other sites, and therefore, these results will need to be examined carefully during data analysis.

7.0 Laboratory Analyses and Data Management

This section summarizes the chemical analyses that were and are being performed for the characterization of water and sediment samples from the Round 3B stormwater sampling event. Tables 4-2 and 6-3 summarize the analyses conducted on each sample. The analytical methods described in the FSP and QAPP are shown in Table 7-1 for water samples and Table 7-2 for sediment samples.

7.1 CHEMICAL ANALYSES

7.1.1 Stormwater Samples

CAS (Kelso, Washington) conducted the chemical analyses of all stormwater samples collected, except for the analysis of PCB congeners by EPA method 1668. All PCB congener analyses were performed by Vista Analytical Laboratory (El Dorado Hills, California). The *Comprehensive Data Summary Report* will describe the results of these analyses and related QC procedures.

7.1.2 Sediment Samples

CAS (Kelso, Washington) performed all chemical analyses for sediment samples, except for analysis of PCB congeners by EPA method 1668. All PCB congener analyses were performed by Vista Analytical Laboratory (El Dorado Hills, California). The *Comprehensive Data Summary Report* will describe the results of these analyses and related QC procedures.

7.2 FIELD LABORATORY ANALYSES

As noted in Section 4.6, water quality parameters (temperature, dissolved oxygen [DO], specific conductance, pH, turbidity, and oxidation/redox potential [ORP]) were measured in the field laboratory once during the November 16, 2007, sampling event. For other events, these measurements were not made due to insufficient volumes and equipment availability. The data for measured water quality parameters will be included along with the associated chemistry data in the *Comprehensive Data Summary Report* for this program.

8.0 Summary of Round 3A and Round 3B Stormwater Sampling Activities

This section summarizes the Round 3A and Round 3B Stormwater Sampling Activities conducted by LWG.

The first round of upland stormwater field sampling activities took place from February 2007 through July 2007 (Round 3A sampling). The second round of upland stormwater field sampling activities (Round 3B sampling) was conducted from November 2007 through February 2008.

The FSP Standard Operating Procedures (SOPs) describe the sampling procedures in detail. In summary, the planned sampling approach described by the FSP and FSP Addendum includes:

1. Flow-weighted composite stormwater samples – Per the FSP, composite samples were proposed for Round 3A sampling at 23 locations plus seven Terminal 4 locations and the GE Decommissioning Facility, for a total of 31 sites. Per the FSP Addendum, during the Round 3B sampling composite samples were proposed at nine locations (plus one Terminal 4 location).

2. One additional set of grab stormwater samples at 10 of the 23 planned sampling locations – This was completed during the first round (Round 3A) of sampling and no further grab samples were collected during Round 3B sampling.

3. Sediment trap deployment – Per the FSP, sediment trap samples were proposed for Round 3A sampling at 23 locations plus seven Terminal 4 locations and the GE Decommissioning Facility for a total of 31 sites. Per the FSP Addendum, during the Round 3B sampling, sediment traps were proposed at 13 sites (plus one Terminal 4 location).

8.1 STATION NAME CHANGES

During the course of the sampling activities, it was necessary to rename some sampling locations for clarity. These name changes are discussed here and will also be reiterated in the *Comprehensive Data Summary Report*. The following station names were changed:

- **Hwy 30 location sampling in Round 3A is renamed Yeon–NW35 –** The station was renamed to avoid confusion. During Round 3A sampling, the station at Highway 30 was intended to be representative of runoff primarily from a major transportation corridor. The actual sampling location was in a manhole that had input from both the highway and from a side branch draining an

industrial area. The intended location of sampling was just upstream of this side branch, when inadvertently the actual sampling location was placed just downstream of this same branch. Thus, the samples collected were influenced by both the highway runoff (5 acres) and industrial land use runoff (13 acres).

- **Hwy 30 location sampled in Round 3B is renamed Hwy 30A –** The station was renamed to avoid confusion, since two stations with the same name but representing different drainage basins and land uses were sampled in Round 3A and 3B sampling.
- **WR-4* is renamed WR-3** - During Round 3A, the WR-4 sampling location was sampled at the wrong outfall due to multiple conflicting storm drainage and outfall maps. At the publication date of the Round 3A FSR, it was not known what outfall was sampled, so samples from the location sampled during Round 3A sampling were referred to at WR-4*. It has since be determined that outfall WR-3 was sampled in Round 3A, so WR-4* is renamed WR-3.

8.2 SUMMARY OF ROUND 3A AND 3B FLOW-WEIGHTED COMPOSITE STORMWATER SAMPLE

Table 8-1 summarizes all composite sampling activities conducted by LWG by site and storm event during Round 3A and 3B sampling.

8.3 SUMMARY OF ROUND 3A AND 3B GRAB STORMWATER SAMPLES

No additional grab samples were collected during Round 3B sampling. All grab samples required by the FSP were collected during Round 3A sampling. Table 8-2 shows a summary of all samples collected by site and storm event.

8.4 SUMMARY OF ROUND 3A AND 3B SEDIMENT TRAP SAMPLE

Table 8-3 shows the analyses that are being conducted for each sediment sample location collected by LWG and where detection limits will likely be elevated above the FSP targets due to limited sample volumes. In cases where sediment samples were collected during both Round 3A and 3B, the analyses are combined.

9.0 References

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Integral. March 1, 2007. Round 2 Quality Assurance Project Plan Addendum 8: Round 3a Stormwater Sampling. Prepared for the Lower Willamette Group, Portland, OR. Anchor Environmental, Seattle, WA.

Tables

Table 3-1. Summary of Stormwater Equipment Installation Dates.

Appendix	Outfall	Facility or Location	ISCO Sampler Installation	Sediment Trap Installation
Industrial Locations (7)				
B	WR-123	Schnitzer International Slip	No composite samples required per FSP Addendum	11/15/2007
E	WR-96	Arkema	11/14/2007	11/13/2007
F	WR-14	Chevron - Transportation	No composite samples required per FSP Addendum	11/13/2007
G	WR-161	Portland Shipyard	No composite samples required per FSP Addendum	11/13/2007
H	WR-4[1]	Sulzer Pump	12/19/2007	no sediment traps installed because no feasible location
I	WR-142	Gunderson	11/14/2007	11/14/2007
J	WR-147	Gunderson	No composite samples required per FSP Addendum	11/14/2007
Land Use Locations (6)				
X	Hwy 30 A	Hwy 30 at 35th	11/12/2007	11/12/2007
Y	Hwy 30 B	Hwy 30 at Reed St	11/14/2007	11/14/2007
L	OF-49	City - St. Johns Area	11/12/2007	11/12/2007
N	OF-22C	City - Above Hwy 30, Forest Park Area	11/14/2007	No sediment traps required per FSP Addendum
O	OF-22B	City - Doane Lake Industrial Area	11/15/2007	11/15/2007
T	WR-218	Albina - UPRR	11/21/2007	11/21/2007
Multiple Land Use Locations (1)				
V	OF-18	City - Multiple Land Uses	No composite samples required per FSP Addendum	11/12/2007

Note:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

Table 3-2. Summary of Round 3B Stormwter Sampling and Programming by Site and Storm Event

Appendix	Outfall	Facility or Location	Sample Event 1 16-Nov-07	2 27-Nov-07	3 29-Nov-07	4 9-Jan-08	5 11-Jan-08	6 15-Jan-08	7 28-Jan-08	8 30-Jan-08
Industrial Locations (7)										
B	WR-123	Schnitzer International Slip	--	--	--	--	--	--	--	--
E	WR-96	Arkema	X	TIME	NC	NC	NC	NC	NC	NC
F	WR-14	Chevron - Transportation	--	--	--	--	--	--	--	--
G	WR-161	Portland Shipyard	--	--	--	--	--	--	--	--
H	WR-4 [1]	Sulzer Pump	NI	NI	NI	X	TIME	TIME	X	TIME
I	WR-142	Gunderson	TIME	TIME	TIME	TIME	NC	NC	NC	NC
J	WR-147	Gunderson	--	--	--	--	--	--	--	--
Land Use Locations (6)										
X	Hwy 30 A	Hwy 30 at 35th Street	TIME	TIME	X	X	X	X	TIME	TIME
Y	Hwy 30 B	Hwy 30 at Reed Street	X	TIME	X	X	TIME	TIME	TIME	TIME
L	OF-49	City - St. Johns Area	TIME	NC	NC	NC	NC	NC	NC	NC
N	OF-22C	City - Above Hwy 30, Forest Park Area	X	X	X	TIME	NC	NC	NC	NC
O	OF-22B	City - Doane Lake Industrial Area	TIME	FLOW	NC	NC	NC	NC	NC	NC
T	WR-218	Albina - UPRR	NI	TIME	TIME	NC	NC	NC	NC	NC
Multiple Land Use Locations (1)										
V	OF-18	City - Multiple Land Uses	--	--	--	--	--	--	--	--

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

NC: Samples were not collected during this sample event because adequate samples had been collected from the site, or no sampling was required.

NI: Samples were not collected during this sample event because the equipment was not installed due to site access issues or equipment unavailability.

X: Sampling effort failed due to either inability to activate the sampler, equipment failure, or insufficient sample volume was collected over the interval meeting FSP criteria.

FLOW: Flow based sampling was enabled

TIME: Time based sampling was enabled.

Shaded cell = No samples collected during Round 3B sampling

Table 3-3a. Storm Statistics for Storm 1 (Sample Date November 16th)

Appendix	Site	Rain Gage	Dates of Rainfall	Time of First Measurable Rain	Time of Last Measurable Rain	Duration of Rain (days)	Date of Previous Rainfall (Greater than 0.10 inch)	Antecedent Dry Period (days)	Rain in 24 hours before storm (1/100 in)	Rainfall During Storm (1/100 in)	Time of First Aliquot Collected by ISCO	Time of Last Aliquot Collected by ISCO	Sample Retrieval Date and Time
Industrial Locations (7)													
B	WR-123 Schnitzer International Slip	Terminal 4											
E	WR-96 Arkema	WPCL											
F	WR-14 Chevron	Yeon											
G	Shipyard	Swan Island											
H	WR-4 Sulzer Pump[1]	Yeon											
I	WR-142 Gunderson	Yeon	11/15-16/2007	11/15/2007 17:00	11/16/2007 20:00	1.13	11/12/2007 16:00	3.04	0	80	11/15/2007 19:00	11/16/2007 13:50	11/16/2007 17:15
J	WR-147 Gunderson	Yeon											
Land Use Locations (6)													
X	Hwy 30 A	Yeon	11/15-16/2007	11/15/2007 17:00	11/16/2007 20:00	1.13	11/12/2007 16:00	3.04	0	80	11/15/2007 19:02	11/16/2007 12:16	11/16/2007 16:50
Y	Hwy 30 B	Yeon											
L	OF-49 City	WPCL	11/15-16/2007	11/15/2007 21:00	11/16/2007 17:00	0.83	11/12/2007 13:00	3.33	4	78	11/16/2007 5:59	11/16/2007 17:21	11/16/2007 18:30
N	OF-22C City	WPCL											
O	OF-22B City	WPCL	11/15-16/2007	11/15/2007 21:00	11/16/2007 17:00	0.83	11/12/2007 13:00	3.33	4	78	11/16/2007 2:43	11/16/2007 15:32	11/16/2007 16:40
T	WR-218 Albina - UPRR	Albina											
Multiple Land Use Locations (1)													
V	OF-18 City	Yeon											

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

Shaded cell = no valid sample.

Table 3-3b. Storm Statistics for Storm 2 (Sample Date November 27th)

Appendix	Site	Rain Gage	Dates of Rainfall	Time of First Measurable Rain	Time of Last Measurable Rain	Duration of Rain (days)	Date of Previous Rainfall (Greater than 0.10 inch)	Antecedent Dry Period (days)	Rain in 24 hours before storm (1/100 in)	Rainfall During Storm (1/100 in)	Time of First Aliquot Collected by ISCO	Time of Last Aliquot Collected by ISCO	Sample Retrieval Date and Time
Industrial Locations (7)													
B	WR-123 Schnitzer International Slip	Terminal 4											
E	WR-96 Arkema	WPCL	11/26/2007	11/26/2007 16:00	11/26/2007 19:00	0.13	11/19/2007 23:00	6.71	0	29	11/26/2007 17:58	11/27/2007 5:28	11/27/2007 14:10
F	WR-14 Chevron	Yeon											
G	Shipyard	Swan Island											
H	WR-4 Sulzer Pump[1]	Yeon											
I	WR-142 Gunderson	Yeon	11/26/2007	11/26/2007 16:00	11/26/2007 19:00	0.13	11/20/2007 2:00	6.58	0	32	11/26/2007 18:00	11/26/2007 19:20	11/27/2007 14:37
J	WR-147 Gunderson	Yeon											
Land Use Locations (6)													
X	Hwy 30 A	Yeon	11/26/2007	11/26/2007 16:00	11/26/2007 19:00	0.13	11/20/2007 2:00	6.58	0	32	11/26/2007 16:30	11/26/2007 22:32	11/27/2007 14:47
Y	Hwy 30 B	Yeon	11/26/2007	11/26/2007 16:00	11/26/2007 19:00	0.13	11/20/2007 2:00	6.58	0	32	11/26/2007 17:38	11/26/2007 22:07	11/27/2007 16:40
L	OF-49 City	WPCL											
N	OF-22C City	WPCL											
O	OF-22B City	WPCL	11/26/2007	11/26/2007 16:00	11/26/2007 19:00	0.13	11/19/2007 23:00	6.71	0	29	11/26/2007 17:47	11/26/2007 20:20	11/27/2007 15:15
T	WR-218 Albina - UPRR	Albina	11/26/2007	11/26/2007 16:00	11/26/2007 19:00	0.13	11/20/2007 4:00	6.50	0	35	11/26/2007 17:33	11/27/2007 14:45	11/27/2007 16:05
Multiple Land Use Locations (1)													
V	OF-18 City	Yeon											

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

Shaded cell = no valid sample.

Table 3-3c. Storm Statistics for Storm 3 (Sample Date November 29th)

Appendix	Site	Rain Gage	Dates of Rainfall	Time of First Measurable Rain	Time of Last Measurable Rain	Duration of Rain (days)	Date of Previous Rainfall (Greater than 0.10 inch)	Antecedent Dry Period (days)	Rain in 24 hours before storm (1/100 in)	Rainfall During Storm (1/100 in)	Time of First Aliquot Collected by ISCO	Time of Last Aliquot Collected by ISCO	Sample Retrieval Date and Time
Industrial Locations (7)													
B	WR-123 Schnitzer International Slip	Terminal 4											
E	WR-96 Arkema	WPCL											
F	WR-14 Chevron	Yeon											
G	Shipyard	Swan Island											
H	WR-4 Sulzer Pump[1]	Yeon											
I	WR-142 Gunderson	Yeon	11/28/2007	11/28/2007 13:00	11/28/2007 20:00	0.29	11/27/2007 16:00	2.13	6	42	11/28/2007 18:40	11/28/2007 20:00	11/29/2007 15:00
J	WR-147 Gunderson	Yeon											
Land Use Locations (6)													
X	Hwy 30 A	Yeon											
Y	Hwy 30 B	Yeon											
L	OF-49 City	WPCL											
N	OF-22C City	WPCL											
O	OF-22B City	WPCL											
T	WR-218 Albina - UPRR	Albina	11/28/2007	11/28/2007 13:00	11/28/2007 21:00	0.33	11/27/2007 17:00	1.63	6	43	11/28/2007 14:22	11/29/2007 1:51	11/29/2007 13:00
Multiple Land Use Locations (1)													
V	OF-18 City	Yeon											

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

Shaded cell = no valid sample.

Table 3-3d. Storm Statistics for Storm 4 (Sample Date January 9th)

Appendix	Site	Rain Gage	Dates of Rainfall	Time of First Measurable Rain	Time of Last Measurable Rain	Duration of Rain (days)	Date of Previous Rainfall (Greater than 0.10 inch)	Antecedent Dry Period (days)	Rain in 24 hours before storm (1/100 in)	Rainfall During Storm (1/100 in)	Time of First Aliquot Collected by ISCO	Time of Last Aliquot Collected by ISCO	Sample Retrieval Date and Time
Industrial Locations (7)													
B	WR-123 Schnitzer International Slip	Terminal 4											
E	WR-96 Arkema	WPCL											
F	WR-14 Chevron	Yeon											
G	Shipyard	Swan Island											
H	WR-4 Sulzer Pump[1]	Yeon											
I	WR-142 Gunderson	Yeon	1/7-8/2008	1/7/2008 21:00	1/8/2008 15:00	0.75	1/7/2008 3:00	1.00	5	89	1/8/2008 15:00	1/8/2008 17:59	1/9/2008 17:20
J	WR-147 Gunderson	Yeon											
Land Use Locations (6)													
X	Hwy 30 A	Yeon											
Y	Hwy 30 B	Yeon											
L	OF-49 City	WPCL											
N	OF-22C City	WPCL	1/7-8/2008	1/7/2008 21:00	1/8/2008 14:00	0.71	1/7/2008 3:00	1.00	5	89	1/7/2008 20:13	1/8/2008 19:13	1/9/2008 16:20
O	OF-22B City	WPCL											
T	WR-218 Albina - UPRR	Albina											
Multiple Land Use Locations (1)													
V	OF-18 City	Yeon											

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

Shaded cell = no valid sample.

Table 3-3e. Storm Statistics for Storm 5 (Sample Date January 11th)

Appendix	Site	Rain Gage	Dates of Rainfall	Time of First Measurable Rain	Time of Last Measurable Rain	Duration of Rain (days)	Date of Previous Rainfall (Greater than 0.10 inch)	Antecedent Dry Period (days)	Rain in 24 hours before storm (1/100 in)	Rainfall During Storm (1/100 in)	Time of First Aliquot Collected by ISCO	Time of Last Aliquot Collected by ISCO	Sample Retrieval Date and Time
Industrial Locations (7)													
B	WR-123 Schnitzer International Slip	Terminal 4											
E	WR-96 Arkema	WPCL											
F	WR-14 Chevron	Yeon											
G	Shipyard	Swan Island											
H	WR-4 Sulzer Pump[1]	Yeon	1/9-10/2008	1/9/2008 16:00	1/10/2008 7:00	0.63	1/9/2008 3:00	1.00	7	39	1/9/2008 21:40	1/10/2008 14:54	1/11/2008 11:20
I	WR-142 Gunderson	Yeon											
J	WR-147 Gunderson	Yeon											
Land Use Locations (6)													
X	Hwy 30 A	Yeon											
Y	Hwy 30 B	Yeon	1/9-10/2008	1/9/2008 16:00	1/10/2008 13:00	0.88	1/9/2008 3:00	1.00	7	45	1/9/2008 18:42	1/10/2008 13:18	1/11/2008 10:55
L	OF-49 City	WPCL											
N	OF-22C City	WPCL											
O	OF-22B City	WPCL											
T	WR-218 Albina - UPRR	Albina											
Multiple Land Use Locations (1)													
V	OF-18 City	Yeon											

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

Shaded cell = no valid sample.

Table 3-3f. Storm Statistics for Storm 6 (Sample Date January 15th)

Appendix	Site	Rain Gage	Dates of Rainfall	Time of First Measurable Rain	Time of Last Measurable Rain	Duration of Rain (days)	Date of Previous Rainfall (Greater than 0.10 inch)	Antecedent Dry Period (days)	Rain in 24 hours before storm (1/100 in)	Rainfall During Storm (1/100 in)	Time of First Aliquot Collected by ISCO	Time of Last Aliquot Collected by ISCO	Sample Retrieval Date and Time
Industrial Locations (7)													
B	WR-123 Schnitzer International Slip	Terminal 4											
E	WR-96 Arkema	WPCL											
F	WR-14 Chevron	Yeon											
G	Shipyard	Swan Island											
H	WR-4 Sulzer Pump[1]	Yeon	1/14/2008	1/14/2008 14:00	1/14/2008 20:00	0.25	1/12/2008 15:00	1.71	0	34	1/14/2008 16:12	1/14/2008 17:11	1/15/2008 15:20
I	WR-142 Gunderson	Yeon											
J	WR-147 Gunderson	Yeon											
Land Use Locations (6)													
X	Hwy 30 A	Yeon											
Y	Hwy 30 B	Yeon	1/14/2008	1/14/2008 14:00	1/14/2008 20:00	0.25	1/12/2008 15:00	1.71	0	34	1/14/2008 15:27	1/14/2008 23:31	1/15/2008 15:40
L	OF-49 City	WPCL											
N	OF-22C City	WPCL											
O	OF-22B City	WPCL											
T	WR-218 Albina - UPRR	Albina											
Multiple Land Use Locations (1)													
V	OF-18 City	Yeon											

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

Shaded cell = no valid sample.

Table 3-3g. Storm Statistics for Storm 7 (Sample Date January 28th)

Appendix	Site	Rain Gage	Dates of Rainfall	Time of First Measurable Rain	Time of Last Measurable Rain	Duration of Rain (days)	Date of Previous Rainfall (Greater than 0.10 inch)	Antecedent Dry Period (days)	Rain in 24 hours before storm (1/100 in)	Rainfall During Storm (1/100 in)	Time of First Aliquot Collected by ISCO	Time of Last Aliquot Collected by ISCO	Sample Retrieval Date and Time
Industrial Locations (7)													
B	WR-123 Schnitzer International Slip	Terminal 4											
E	WR-96 Arkema	WPCL											
F	WR-14 Chevron	Yeon											
G	Shipyard	Swan Island											
H	WR-4 Sulzer Pump[1]	Yeon											
I	WR-142 Gunderson	Yeon											
J	WR-147 Gunderson	Yeon											
Land Use Locations (6)													
X	Hwy 30 A	Yeon	1/26-27/2008	1/26/2008 9:00	1/27/2008 6:00	0.88	1/14/2008 21:00	11.50	0	83	1/26/2008 11:15	1/26/2008 22:44	1/28/2008 14:35
Y	Hwy 30 B	Yeon	1/26-27/2008	1/26/2008 9:00	1/27/2008 6:00	0.88	1/14/2008 21:00	11.50	0	83	1/26/2008 10:47	1/26/2008 22:16	1/28/2008 13:45
L	OF-49 City	WPCL											
N	OF-22C City	WPCL											
O	OF-22B City	WPCL											
T	WR-218 Albina - UPRR	Albina											
Multiple Land Use Locations (1)													
V	OF-18 City	Yeon											

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

Shaded cell = no valid sample.

Table 3-3h. Storm Statistics for Storm 8 (Sample Date January 30th)

Appendix	Site	Rain Gage	Dates of Rainfall	Time of First Measurable Rain	Time of Last Measurable Rain	Duration of Rain (days)	Date of Previous Rainfall (Greater than 0.10 inch)	Antecedent Dry Period (days)	Rain in 24 hours before storm (1/100 in)	Rainfall During Storm (1/100 in)	Time of First Aliquot Collected by ISCO	Time of Last Aliquot Collected by ISCO	Sample Retrieval Date and Time
Industrial Locations (7)													
B	WR-123 Schnitzer International Slip	Terminal 4											
E	WR-96 Arkema	WPCL											
F	WR-14 Chevron	Yeon											
G	Shipyard	Swan Island											
H	WR-4 Sulzer Pump[1,2]	Yeon	1/28-29/2008	1/28/2008 22:00	1/30/2008 8:00	1.42	1/27/2008 7:00	1.63	3	79	1/29/2008 6:04	1/30/2008 10:08	1/30/2008 14:40
I	WR-142 Gunderson	Yeon											
J	WR-147 Gunderson	Yeon											
Land Use Locations (6)													
X	Hwy 30 A	Yeon	1/28-29/2008	1/28/2008 22:00	1/29/2008 8:00	0.42	1/27/2008 7:00	1.63	3	34	1/28/2008 17:20	1/29/2008 13:12	1/30/2008 13:45
Y	Hwy 30 B	Yeon	1/28-29/2008	1/28/2008 22:00	1/29/2008 8:00	0.42	1/27/2008 7:00	1.63	3	34	1/28/2008 17:27	1/29/2008 16:24	1/30/2008 15:30
L	OF-49 City	WPCL											
N	OF-22C City	WPCL											
O	OF-22B City	WPCL											
T	WR-218 Albina - UPRR	Albina											
Multiple Land Use Locations (1)													
V	OF-18 City	Yeon											

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

[2] Note that the sample from WR-4 is representative of a storm of larger duration than sampled at other locations.

Shaded cell = no valid sample.

Table 3-4. Summary of Sediment Trap Inspections and Removals

Appendix	Outfall(s)	Facility or Location	Installation Date	1st Inspection			2nd Inspection			3rd Inspection[1]			Final Collection		
				Date	% Full	Notes	Date	% Full	Notes	Date	% Full	Notes	Date	% Full	Notes
Industrial Locations (7)															
B	WR-123	Schnitzer International Slip	11/15/2007	12/11/2007	1/8"-3/4"	Rusty loose flocculent sediment, very difficult to see through bottles and determine exact volume of sediment	1/11/2008	?	Bottles were so opaque and rust colored that it was impossible to determine the amount or type of sediment.	1/30/2008	?	Bottles were stained a rusty color. Water inside was rusty and opaque and sediment volume was undeterminable. Collected four bottles and replaced with new ones.	2/13/2008	?	Loose, rusty flocculent material. Collected four bottles.
E	WR-96	Arkema	11/13/2007	12/11/2007	0	No sediment to classify	1/15/2008	trace	Barely a trace of sediment in any of the bottles. Water was slightly yellowish but mostly clear.	1/30/2008	trace	Slightly yellowish water with no measurable sediment in any of the eight bottles. Not enough sediment to collect.	2/11/2008	0-Trace	Slightly yellowish water, no measurable sediment. Collected all eight bottles. Scooped sediment into two 1.8 liter jars.
F	WR-14	Chevron - Transportation	11/13/2007	12/10/2007	1/8"	Dark, flocculent material	1/10/2008	1/8"-1/2"	Loose dark flocculent material	1/28/2008	1/8"-1/2"	Loose, dark flocculent material. Collected four bottles and replaced with new ones.	2/12/2008	1/8"	Dark sediment. Collected four bottles.
G	WR-161	Portland Shipyard (Cascade General Site)	11/13/2007	12/11/2007	1/8"-1/4"	Dark flocculent sediment, some rust coloration	1/10/2008	trace - 1/16"	Dark sediment	1/29/2008	1/16"	Dark sediment. Collected four bottles and replaced with new ones.	2/12/2008	Trace	Trace amounts of dark, flocculent sediment. Removed all four bottles.
H	WR-4	Sulzer	Not Installed - No Feasible Location												
I	WR-142	Gunderson	11/14/2007	12/10/2007	1/8"	Dark flocculent sediment	1/9/2008	1/8"-1/4"	Dark flocculent sediment.	1/29/2008	1/4"-1/8"	Dark, loose, flocculent material. Collected six bottles and replaced them with six new bottles.	2/11/2008	Trace- 1/4"	Dark, loose, flocculent material. Collected six bottles
J	WR-147	Gunderson (former Schnitzer)	11/14/2007	12/10/2007	1/8-1/4"	Dark flocculent sediment	1/9/2008	1/8"-1/2"	Dark flocculent sediment. Bottles opaque and hard to see through	1/29/2008	1/4"	Collected four bottles and replaced them with four new bottles.	2/11/2008	Trace- 1/4"	Dark, loose flocculent material. Collected four bottles
Land Use Locations (5)															
X	Hwy 30 A[2]	Hwy 30 A	11/12/2007	12/10/2007	0	Bottles have not been over-topped by water.	1/9/2008	0-trace	Replaced bottles with new shorter bottles. Only the angled tall bottles had any sediment.	1/28/2008	Trace	Trace amounts of dark flocculent sediment.	2/11/2008	Trace- 1/4"	Dark, loose, flocculent material. Collected four bottles
Y	Hwy 30 B[2]	Hwy 30 B	11/14/2007	12/10/2007	trace	Trace amounts of loose sediment	1/11/2008	trace-1/4"	Loose dark flocculent material. Replaced all bottles with short bottles.	1/28/2008	Trace	Trace amounts of dark flocculent sediment.	2/13/2008	1/4"-1/2"	Dark flocculent sediment. Collected four bottles.
L	OF-49	City - St. Johns Area	11/12/2007	12/11/2007	trace	Not enough material to classify	1/10/2008	trace-1/4"	Loose flocculent sediment.	1/28/2008	Trace-1/2"	Loose, flocculent material. Collected four bottles and replaced with four new ones.	2/11/2008	Trace- 1/4"	Dark, flocculent material. Collected all four bottles
N	OF-22C	City - Above Hwy 30, Forest Park Area	Sediment Trap Not Installed												

Table 3-4. Summary of Sediment Trap Inspections and Removals

Appendix	Outfall(s)	Facility or Location	Installation Date	1st Inspection			2nd Inspection			3rd Inspection[1]			Final Collection		
				Date	% Full	Notes	Date	% Full	Notes	Date	% Full	Notes	Date	% Full	Notes
O	OF-22B	City - Doane Lake Industrial Area	11/15/2007	12/11/2007	1/8"	Dark, flocculent material	1/3/2008	1/4"-1/2"	Loose flocculent sediment, bottles opaque and hard to see through. Terra Hydr modified wier to raise bottles 2.5". Bottle tops level with lip of wier	1/29/2008	?	Bottles were too opaque to determine sediment volume. Dark, stringy material was found on the outside of bottles. Everything had a strong sulfuric smell. Collected four bottles and replaced them with four new ones.	2/12/2008	1/8"-1/4"	Dark, stringy, flocculent sediment. Bottles were slightly opaque. Strong sulfur smell in bottles as well as coming out of the manhole. Collected four bottles.
T	WR-218	UPRR Albina	11/21/2007	12/11/2007	1/8"-3/4"	Very loose flocculent sediment	1/10/2008	Trace - 1/2"	Loose flocculent rust colored sediment.	1/30/2008	3/4"- 1"	Loose flocculent rusty material. Collected four bottles and replaced them with 4 new ones.	2/12/2008	1/8"	Loose, rusty flocculent material. Collected four bottles.
Multiple Land Use Locations (1)															
V	OF 18[2]	City - Multiple Land Uses	11/12/2007	12/10/2007	1/2-7/8 full	Consolidated, stratified layers of sandy sediment, organic material, and loose flocculent sediment BOTTLES ARCHIVED IN FIELD LAB	1/10/2008	3/4"-1.5"	Sandy sediment with some organic material. Top layer consisted of loose flocculent sediment. Removed all bottles to be archived, replaced with two tall and two short bottles.	1/28/2008	1/4"-1/2"	Dark, flocculent material. Collected four bottles and replaced them with two short bottles and two tall bottles.	2/11/2008	Tall - 1/4"-3/4" Short - 1/4" - 3/4"	Loose, dark, flocculent material. Collected four bottles.

Notes:

[1] As discussed in Section 6.3, sediment trap bottles with more than trace sediment were removed at the end of January and replaced with new bottles.

[2] At Hwy 30A, Hwy 30B, and OF-18, some or all of the 1000-mL narrow mouth sediment trap bottles were replaced 500-mL narrow mouth bottles. These smaller bottles had the same size mouth opening but were shorter and therefore allowed stormwater runoff to overtop the bottles at sites with low water levels.

Table 4-1. Summary of Sample Retrieval Times.

Appendix	Outfall	Facility or Location	Sample Event 1 16-Nov-07	2 27-Nov-07	3 29-Nov-07	4 9-Jan-08	5 11-Jan-08	6 15-Jan-08	7 28-Jan-08	8 30-Jan-08
Industrial Locations (7)										
B	WR-123	Schnitzer International Slip	--	--	--	--	--	--	--	--
E	WR-96	Arkema	--	OK	--	--	--	--	--	--
F	WR-14	Chevron - Transportation	--	--	--	--	--	--	--	--
G	WR-161	Portland Shipyard	--	--	--	--	--	--	--	--
H	WR-4[1]	Sulzer Pump	--	--	--	--	OK	OK	--	OK
I	WR-142	Gunderson	OK	OK	OK	OK	--	--	--	--
J	WR-147	Gunderson	--	--	--	--	--	--	--	--
Land Use Locations (6)										
X	Hwy 30 A	Hwy 30	OK	OK	--	--	--	--	>24	OK
Y	Hwy 30 B	Hwy 30	--	OK	--	--	OK	OK	>24	OK
L	OF-49	City - St. Johns Area	OK	--	--	--	--	--	--	--
N	OF-22C	City - Above Hwy 30, Forest Park Area	--	--	--	OK	--	--	--	--
O	OF-22B	City - Doane Lake Industrial Area	OK	OK	--	--	--	--	--	--
T	WR-218	Albina - UPRR	--	OK	OK	--	--	--	--	--
Multiple Land Use Locations (1)										
V	OF-18	City - Multiple Land Uses	--	--	--	--	--	--	--	--

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

OK - Sample was retrieved within 24 hours of the end of the sampling event

>24 - Sample was retrieved over 24 hours after the completion of the sampling event

-- - No sample was retreived

Shaded cell = no samples collected during Round 3B sampling

Table 4-2. Summary of Round 3B Stormwater Composite Samples Collected by Site and Storm Event.

Appendix	Outfall(s)	Facility or Location	Station ID	Sample Event ID	Date Retrieved	TSS	TOC	DOC (filtered)	Total Metals	Diss. Metals (filtered)	PAHs	Phthalates	PCB Congeners	Herbicides	Organo-chlorine Pesticides	Target # of Measured Storms
Industrial Locations (7)																
B	WR-123	Schnitzer International Slip	WR-123													
E	WR-96	Arkema	WR-96	LW3-STW2-CW10-WR96	27-Nov-07	X	X	X	X	X	X	X	X	X	X	1
F	WR-14	Chevron - Transportation	WR-14													
G	WR-161	Portland Shipyard	WR-161													
H	WR-4[1]	Sulzer Pump	WR-4	LW3-STW2-CW10-WR4	11-Jan-08	X	X	X	X	X	X	--	X	NC	--	3
			WR-4	LW3-STW2-CW20-WR4	15-Jan-08	X	X	NC	NC	NC	NC	--	NC	NC	--	
			WR-4	LW3-STW2-CW30-WR4	30-Jan-08	X	X	X	X	X	X	--	X	X	--	
I	WR-142	Gunderson	WR-142	LW3-STW2-CW10-WR142	16-Nov-07	X	X	X	X	X	X	X	X	X	--	2
			WR-142	LW3-STW2-CW20-WR142	27-Nov-07	X	X	X	X	NC	NC	NC	NC	NC	--	
			WR-142	LW3-STW2-CW30-WR142	29-Nov-07	X	NC	NC	NC	X	X	NC	NC	NC	--	
			WR-142	LW3-STW2-CW40-WR142	9-Jan-08	X	X	NC	X	NC	NC	X	X	X	--	
J	WR-147	Gunderson	WR-147													
Land Use Locations (6)																
X	Hwy 30	Hwy 30A	H30A	LW3-STW2-CW10-H30A	16-Nov-07	X	X	X	X	X	X	--	X	X	--	3
			H30A	LW3-STW2-CW20-H30A	27-Nov-07	X	X	X	X	X	NC	--	NC	NC	--	
			H30A	LW3-STW2-CW30-H30A	28-Jan-08	X	X	X	X	NC	X	--	X	X	--	
			H30A	LW3-STW2-CW40-H30A	30-Jan-08	X	X	X	X	X	X	--	X	X	--	
Y	Hwy 30	Hwy 30B[2]	H30B	LW3-STW2-CW10-H30B	27-Nov-07	X	X	X	X	X	X	--	NC	NC	--	3
			H30B	LW3-STW2-CW20-H30B	11-Jan-08	X	X	X	X	X	X	--	X	X	--	
			H30B	LW3-STW2-CW30-H30B	15-Jan-08	X	X	X	X	X	NC	--	X	X	--	
			H30B	LW3-STW2-CW40-H30B	28-Jan-08	X	X	X	X	NC	X	--	X	X	--	
			H30B	LW3-STW2-CW50-H30B	30-Jan-08	X	X	X	X	X	X	--	X	X	--	
L	OF-49	City - St. Johns Area	OF-49	LW3-STW2-CW10-OF49	16-Nov-07	X	X	X	X	X	X	X	X	X	--	1
N	OF-22C	City - Above Hwy 30, Forest Park Area	OF-22C	LW3-STW2-CW10-OF22C	9-Jan-08	X	X	X	X	X	X	X	X	X	--	1
O	OF-22B	City - Doane Lake Industrial Area	OF-22B	LW3-STW2-CW10-OF22B	16-Nov-07	X	X	X	X	NC	X	--	X	X	X	1
			OF-22B	LW3-STW2-CW20-OF22B	27-Nov-07	X	X	X	X	X	X	--	X	X	NC	
T	WR-218	Albina - UPRR	WR-218	LW3-STW2-CW10-WR218	27-Nov-07	X	X	X	X	X	X	--	NC	NC	--	1
			WR-218	LW3-STW2-CW20-WR218	29-Nov-07	X	X	X	X	X	X	--	X	X	--	
Multiple Land Use Locations (1)																
V	OF-18	City - Multiple Land Uses	OF-18													

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

[2] Hwy 30B is described in the FSP Addendum (Anchor and Integral 2007c) as Hwy 30 at Reed Street.

NC = Parameter not collected due logistical issues or beccause the sampling for this parameter was complete.

NA= Samples collected but not analyzed.

-- = The FSP does not require analysis of this parameter for this station.

Shaded cell = no samples collected during Round 3B sampling

Table 4-3. Summary of Field QC Samples for Round 3B Stormwater Composite Samples.

Sample Event ID	Station	Date Collected	QC Sample Type	Analyses									
				TSS	TOC	DOC (filtered)	Total Metals	Diss. Metals (filtered)	PAHs	Phthalates	PCB Congeners	Herbicides	Organo-chlorine Pesticides
LW3-STW2-CW10-WR96-2	NA	27-Nov-07	field duplicate	X	X	--	X	--	--	--	--	--	--
LW3-STW2-CW10-H30-2	NA	27-Nov-07	field duplicate	--	--	X	--	--	--	--	--	--	--
LW3-STW2-CW10-OF22B-2	NA	27-Nov-07	field duplicate	--	--	--	--	X	X	--	X	X	--
LW3-STW2-CW10-WR218-2	NA	29-Nov-07	field duplicate	--	--	X	X	X	--	--	--	--	--
LW3-STW2-CW10-W900	NA	16-Nov-07	Field blank of WR-142, Hwy 30, OF-22B	X	X	X	X	X	X	X	X	X	X
LW3-STW2-CW20-W900	NA	27-Nov-07	Field blank of WR-96, WR-218, Hwy 30B, WR-142	X	X	X	X	X	X	X	X	X	X
LW3-STW2-CW30-W900	NA	29-Nov-07	Field blank of WR-142, WR-218	X	X	X	X	X	X	NC	X	X	NC
LW3-STW2-CW40-W900	NA	9-Jan-08	Field blank of WR-142, OF-22C	X	X	X	X	X	X	X	X	X	NC
LW3-STW2-CW50-W900	NA	15-Jan-08	Field blank of Hwy 30B	X	X	X	X	X	NC	NC	X	X	NC
LW3-STW2-CW50-W900	NA	28-Jan-08	Field blank of Hwy 30, Hwy 30B	X	X	X	X	NC	X	NC	X	X	NC

Note:
NC = Parameter not analyzed due logistical issues or beccause the sampling for this parameter was complete.

Table 4-4. Summary of Deviations/Anticipated Contigencies for Round 3B Stormwater Sampling Program.
(From Round 3A FSP and Round 3B FSP Addendum - deviations that carried through are noted, but not reiterated, here)

Sampling Activity	Deviations	Samples Affected	Impact of Deviation or Modification	Date of Stormwater Technical Meeting or Email where discussed.*
Collection of Field Blanks				
Collection of composite stormwater equipment rinsate blank.	A composite stormwater equipment rinsate blank was not collected on the ISCO tubing, sampling arm, and collection bottle during the Round 3B sampling event.	Composite samples at all locations.	An equipment blank was collected on the ISCO setup during the Round 3A event. The results were mostly non-detect with some analytes detected between the MDL and MRL; therefore this deviation is not expected to substantially impact the investigation.	Not discussed
Collection of sediment trap rinsate blank	A sediment trap rinsate blank was not collected during the Round 3B sampling events.	All sediment trap locations	A sediment trap rinsate blank was collected during the Round 3A event. The results were mostly non-detect with some analytes detected between the MDL and MRL; therefore this deviation is not expected to substantially impact the investigation.	Not discussed
Collection of sediment trap bottle blank	A sediment trap bottle blank was not collected during the Round 3B sampling events.	All sediment trap locations	A sediment trap rinsate blank was collected during the Round 3A event. The results were mostly non-detect with some analytes detected between the MDL and MRL; therefore this deviation is not expected to substantially impact the investigation.	Not discussed
Lab QC				
Collection of Lab Replicates	Additional volume for laboratory QC samples was not available for collection during any Round 3B stormwater sampling events.	Composite samples at all locations.	Reproducibility will not be able to be assessed, but this deviation should not substantially impact the investigation.	Not discussed
Stormwater Sample Collection/Processing				
Measurement of field water quality parameters	Field water quality parameters (i.e., temperature, pH, conductivity, turbidity and oxidation/reduction potential [ORP]) were not measured in the field for any stormwater samples. Water quality measurements were performed at the field lab from the composited sample if sufficient volume was collected. Other deviations included selected incidences when the field water quality parameters could not be collected due to limited sample volumes. Field water quality parameters were only collected during the November 16, 2007 sampling event.	Composite stormwater samples at all locations.	Field water quality parameters are not *in-situ* measurements. However, measurement in the field may not have been representative of the actual water used in the composite sample. All field parameters except turbidity and conductivitiy would be expected to be impacted by the compositing process. Additional discussion on impact of this change will be included in the associated data quality report.	Not discussed

Table 4-4. Summary of Deviations/Anticipated Contigencies for Round 3B Stormwater Sampling Program.
(From Round 3A FSP and Round 3B FSP Addendum - deviations that carried through are noted, but not reiterated, here)

Sampling Activity	Deviations	Samples Affected	Impact of Deviation or Modification	Date of Stormwater Technical Meeting or Email where discussed.*
Sediment Sample Processing				
Sediment samples frozen for holding	The FSP specifies holding samples at 4 degrees C and analysis within certain holding times. Due to ongoing discussions with the Stormwater Technical Team regarding how to best utilize limited sample volumes. It was discussed and agreed that the samples should be frozen so that the holding times in the FSP would no longer apply and the samples would be acceptable for analyses	All sediment trap locations	These change did not impact the investiation.	May 18, 2007 -- Notes from May 18 call and June 4 Stormwater Technical Team Conf. Call
Quality Assurance/Quality Control				
	Collection of QA/QC sediment trap samples followed FSP.			
Sample Storage				
Storage temperature quality control	Refrigeration units were not monitored daily. All refrigerator temperatures were verified prior to storage of any samples collected during a particular storm event . Refrigerators were generally monitored at least once per week during the stormwater sampling events.	Composite and sediment trap samples at all locations.	These changes did not impact the investigation. Monitoring that was conducted did not indicate any abnormalities with the refrigeration units.	Not discussed
Sampling Locations				
	Not all stations with less than the target three storm events were collected for analysis during Round 3B.			
Installation of the sampling location at actual WR-4 on the Sulzer site.	The actual location of WR-4 was determined during outfall verification and was sampled during the Round 3B sampling events.	WR-4	This location was needed in the calculation of unique pollutant loads from the Sulzer site.	November 30, 2007 regarding Sulzer sampling approach, Hwy 30B, Port of Portland Field Sampling Report, and Loading Methods.
No sediment traps were installed at WR-4	The FSP Addendum stated that, "Sediment traps will be installed at WR-4 if field reconnaissance shows that it is feasible." Filed reconnaissance determined that the outfall was submerged and the only access to the outfall pipe was through a catch basin with a 3.5-inch pipe in the bottom that connected into the main outfall pipe. This made installation of the sediment traps unfeasible.	WR-4	This change will impact the investigation because there will be no sediment data available for WR-4, which is in the unique site category.	November 30, 2007 regarding Sulzer sampling approach, Hwy 30B, Port of Portland Field Sampling Report, and Loading Methods.
Hwy 30 name change	Hwy 30 name change to Hwy 30A. Station name change to distinctly identify Hwy 30A location from the Hwy 30 station collected during the previous mobilization.	Hwy 30	This change helped clarify station location sampled.	February 26, 2008 regarding LWG Stormwater - REVISED Sediment Trap Prioritization.

Note:
* Minor or uncontrollable deviations typical of any sampling program were not necessarily discussed with the Stormwater Technical Team in advance.
MRL = method reporting limit
MDL = method detection limit

Table 6-1 - Summary of Sediment Trap Installation and Collection Dates and Total Rainfall

Appendix	Outfall(s)	Facility or Location	Station ID	Sample ID	Date(s) Sediment Collected	Date Sediment Processed	Date Submitted to Laboratory for Analysis	Total Rainfall During Deployment (in.)	Days Deployed
Industrial Locations (7)									
B	WR-123	Schnitzer International Slip	WR-123	LW3-STW2-S10-WR123	1/30/2008, 2/13/2008	01/31/2008, 2/14/2008	2/1/2008, 2/15/2008	22.49	90.00
E	WR-96[1]	Arkema	WR-96	LW3-STW2-CB10-WR96	2/11/2008	2/12/2008	3/18/2008	24.32	90.00
F	WR-14	Chevron - Transportation	WR-14	LW3-STW2-S10-WR14	1/28/2008,2/12/2008	01/30/2008,2/13/2008	2/1/2008, 2/15/2008	23.97	91.00
G	WR-161	Portland Shipyard	WR-161	LW3-STW2-S10-WR161	1/29/2008,2/12/2008	01/30/2008,2/13/2008	2/1/2008, 2/15/2008	19.90	91.00
H	WR-4[2]	Sulzer Pump	WR-4						
I	WR-142	Gunderson	WR-145	LW3-STW2-S10-WR142	1/29/2008,2/11/2008	01/30/2008,2/12/2008	2/1/2008, 2/15/2008	23.97	89.00
J	WR-147	Gunderson	WR-147	LW3-STW2-S10-WR147	1/29/2008,2/11/2008	01/30/2008,2/12/2008	2/1/2008, 2/15/2008	23.97	89.00
Land Use Locations (6)									
X	Hwy 30 A	Hwy 30 A	H30	LW3-STW2-S10-H30	1/9/2008,2/11/2008	01/29/2008,2/12/2008	2/1/2008, 2/15/2008	24.07	91.00
Y	Hwy 30 B	Hwy 30 B	H30B	LW3-STW2-S10-H30B	1/11/2008,2/13/2008	01/30/2008,2/14/2008	2/1/2008, 2/15/2008	24.08	91.00
L	OF-49	City - St. Johns Area	OF-49	LW3-STW2-S10-OF49	1/28/2008,2/11/2008	01/30/2008,2/12/2008	2/1/2008, 2/15/2008	24.38	91.00
N	OF-22C	City - Above Hwy 30, Forest Park Area	OF-22C						
O	OF-22B	City - Doane Lake Industrial Area	OF-22B	LW3-STW2-S10-OF22B	1/29/2008,2/12/2008	01/29/2008,2/13/2008	2/1/2008, 2/15/2008	24.31	89.00
T	WR-218	Albina - UPRR	WR-218	LW3-STW2-S10-WR218	1/30/2008, 2/12/2008	01/30/2008,2/13/2008	2/1/2008, 2/15/2008	18.81	83.00
Multiple Land Use Locations (1)									
V	OF-18 T07	City - Multiple Land Uses	OF-18	LW3-STW2-S10-OF18 T07	12/10/2007	12/20/2007	2/1/2008	17.57	91.00
V	OF-18S	City - Multiple Land Uses	OF-18	LW3-STW2-S10-OF18S	1/28/2008,2/11/2008	02/01/2008,2/12/2008	2/1/2008, 2/15/2008	6.55	32.00
V	OF-18T	City - Multiple Land Uses	OF-18	LW3-STW2-S10-OF18T	1/28/2008,2/11/2008, 1/10/2008	01/31/2008,2/12/2008	2/4/2008, 2/15/2008	15.22	63.00

Notes:

[1] Sample collected from catch basin.

[2] During Round 3A sampling, WR-3 was sampled instead of WR-4.

OF-18T07 - Sediment trap samples collected and process in 2007

OF-18S - Short bottle sediment trap setup.

OF-18T - Tall (standard 1L) sediment trap setup.

Shaded cell = no samples collected during Round 3B sampling

Table 6-2. Sediment Trap Sample Prioritization Summary - Showing Target Detection Limit Factors[1]

Appendix	Outfall(s)	Facility or Location	PCB Congeners	TOC	Percent Solids	Organo-chlorine pesticides	PAHs and Phthalates	Metals	Herbicides	Grain Size
Industrial Locations (7)										
B	WR-123	Schnitzer International Slip	1	1	1	1	1	1	1	
E	WR-96[2]	Arkema								
F	WR-14	Chevron - Transportation	1	1	1	1	1	1	1	
G	WR-161	Portland Shipyard		1	1	1	1	1	1.4	
H	WR-4	Sulzer Pump								
I	WR-142	Gunderson	1.1	1	1					
J	WR-147	Gunderson (former Schnitzer)		1	1	1	2			
Land Use Locations (6)										
X	Hwy 30A	Hwy 30 A	1.4	1	1					
Y	Hwy 30B	Hwy 30 B[3]	1	1	1	1	1	1	1	
L	OF-49	City - St. Johns Area	1	1	1	1	1.5			
N	OF-22C	City - Above Hwy 30, Forest Park Area								
O	OF-22B	City - Doane Lake Industrial Area		1	1	1	1.4			
T	WR-218	UPRR Albina	1	1	1	1	1	1	1	
Multiple Land Use Locations (1)										
V	OF-18 T07	City - Multiple Land Uses	1	1	1	1	1	1	1	
V	OF-18T	City - Multiple Land Uses	1	1	1	1	1	1	1	
V	OF-18S	City - Multiple Land Uses	1	1	1	1	1	1	1	

Notes:

[1] Detection limit factor shows how the target detection limit (DL) will be exceeded with the sample mass remaining. A factor of 1 means the target detection limit will be achieved. A factor of 2 means the actual DL will be two times higher than the target DL.

[2] No sediment was accumulated in the sediment traps at Arkema, so inline catch basin solids were collected.

[3] Hwy 30B is described in the FSP Addendum (Anchor and Integral 2007c) as Hwy 30 at Reed Street.

Blank cells indicate that there was insufficient sample volume to conduct these analyses or for grain size the sample preservation requirements were not met because samples were frozen prior to analysis.

Shaded cell = no sediment trap samples collected during Round 3B sampling

Table 6-3. Summary of Field QC Samples for Round 3B Stormwater Sediment Trap and Catch Basin Sediment Samples

Sample Event ID	Date Collected	QC Sample Type	Station	Analyses						
				TOC	Total Metals	PAHs	Phthalates	PCB Congeners	Herbicides	Organo-chlorine Pesticides
LW3-STW2-S10-W900	1-Feb-08	Equipment blank of sample processing equipment	NA		X	X	X	X	X	X
LW3-STW2-S10-OF18T07	20-Dec-07	Duplicate sample	OF18T07	X	X	X	X	X	X	X
LW3-STW2-S10-OF18T	31-Jan-08	Lab QA/QC sample	OF18T	X	X	X	X	X	X	X

Note:
Blank cells indicate sample not collected for analysis.

Table 7-1. Laboratory Methods for Water Samples.

Analytes	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	**Procedure**	**Protocol**	**Procedure**
Conventional Analyses	CAS				
Total Suspended Solids		EPA 160.2	Filtration and drying	EPA 160.2	Balance
Total Organic Carbon		EPA 415.1	Chemical oxidation	EPA 415.1	Infrared detector
Metals	CAS				
Aluminum, antimony, cadmium, total chromium, copper, lead, nickel, selenium, silver, zinc		EPA 3005	Acid digestion	EPA 200.8	ICP/MS
Arsenic		EPA 3005A (Modified)	Acid Digestion/pre-concentration	EPA 200.8	ICP/MS
Mercury		EPA 7470	Acid digestion/oxidation	EPA 7470	CVAA
Phthalate Esters	CAS	EPA 525.2	Solid-phase extraction	EPA 525.2	GC/MS
Chlorinated Herbicides	CAS	EPA 8151A	Solvent extraction	EPA 8151A	GC/ECD
			Esterification		
Organochlorine pesticides and selected SVOCs	CAS	EPA 3545	Pressurized fluid extraction	EPA 8081A	GC/ECD
		EPA 3640A	Gel permeation chromatography		
		EPA 3630C	Florisil® cleanup		
		EPA 3660B	Sulfur cleanup (as needed)		
Polycyclic Aromatic Hydrocarbons	CAS	EPA 3520C	Continuous liquid-liquid extraction	EPA 8270C	GC/MS-SIM
PCB congeners[1]	Vista	EPA 1668A	Florisil® cleanup	EPA 1668A	HRGC/HRMS
			Extract fractionation		
			Layered Acid/Base SiO_3 Alumina		

Notes:

[1]Analysis will be completed for all 209 PCB congeners.

CAS - Columbia Analytical Services
EPA - U.S. Environmental Protection Agency
GC/ECD - gas chromatography/electron capture detection
GC/MS - gas chromatography/mass spectrometry
HRGC/HRMS - high resolution gas chromatography/high resolution mass spectrometry
ICP/MS - inductively coupled plasma - mass spectrometry
LVI - large-volume injector
SIM - selected ion monitoring
SOP - standard operating procedures

Table 7-2. Laboratory Methods for Sediment Samples.

Analysis	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Conventional Analyses	CAS Kelso				
Total solids		--	--	PSEP 1986	Balance
Grain size		--	--	PSEP 1986	Sieve and pipette method
Total organic carbon		Plumb 1981	Acid pre-treatment	Plumb et al. 1981	Combustion; coulometric titration
Metals	CAS Kelso				
Antimony, arsenic[1], cadmium, lead, silver		EPA 3050	Strong acid digestion	EPA 6020	ICP/MS
Aluminum, chromium, copper, nickel, zinc		EPA 3050	Strong acid digestion	EPA 6010B	ICP/AES
Selenium		EPA 3050	Strong acid digestion	EPA 7742	AAS
		EPA 7742	Hydride generation		
Arsenic[1]		EPA 3050	Strong acid digestion	EPA 7062	AAS
Mercury		EPA 7471A	Acid digestion/oxidation	EPA 7471A	CVAA
Chlorinated herbicides	CAS Kelso	EPA 8151A	Solvent extraction	EPA 8151A	GC/ECD
			Esterification		
Organochlorine pesticides and selected SVOCs	CAS Kelso	EPA 3541	Soxhlet extraction	EPA 8081A	GC/ECD
		EPA 3620B	Florisil® cleanup		
		EPA 3660B	Sulfur cleanup		
PCB Aroclors	CAS Kelso	EPA 3541	Soxhlet extraction	EPA 8082	GC/ECD
		EPA 3665A	Sulfuric acid cleanup		
		EPA 3620B	Florisil® cleanup		
		EPA 3660B	Sulfur cleanup		

Table 7-2. Laboratory Methods for Sediment Samples.

Analysis	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Semivolatile organic compounds	CAS Kelso				
PAHs and phthalates		EPA 3541	Automated Soxhlet Extraction	EPA 8270C	GC/MS-LVI
		EPA 3640A	Gel permeation chromatography		
PCB Congeners[2]	Vista	EPA 1668A	Soxhlet/Dean Stark extraction	EPA 1668A	HRGC/HRMS
			Sulfuric acid cleanup		
			Silica column cleanup		

Notes:

[1] Arsenic will be analyzed by EPA Method 7062 if it is not detected at the MRL by EPA Method 6020.

[2] Analysis will be completed for all 209 PCB congeners.

AAS - Atomic absorption spectrometry
CAS - Columbia Analytical Services
CVAA - cold vapor atomic absorption spectrometry
EPA - U.S. Environmental Protection Agency
GC/ECD - gas chromatography/electron capture detection
GC/FID - gas chromatography/flame ionization detection
GC/MS - gas chromatography/mass spectrometry
HRGC/HRMS - high-resolution gas chromatography/high-resolution ma
ICP/AES - inductively coupled plasma/atomic emission spectrometry
ICP/MS - inductively coupled plasma - mass spectrometry
LVI - large-volume injector
TPH - total petroleum hydrocarbon
PAH - polycyclic aromatic hydrocarbon
PCB - polychlorinated biphenyl
PSEP - Puget Sound Estuary Program
SIM - selected ion monitoring
STL - Severn Trent Laboratories
SVOC - semivolatile organic compound

Table 8-1. Summary of Round 3A and Round 3B Stormwater Composite Samples Collected by Site and Storm Event.

Appendix	Outfall(s)	Facility or Location	Station ID	Sample Event ID (STW = Round 3a STW2 = Round 3b)	Date Retrieved	TSS	TOC	DOC (filtered)	Total Metals	Diss. Metals (filtered)	PAHs	Phthalates	PCB Congeners	Herbicides	Organo-chlorine Pesticides
Industrial Locations (12)															
A	WR-22	OSM	WR-22	LW3-STW-CW20-WR22	9-Apr-07	X	X	NC	X	NC	X	X	X	X	--
			WR-22	LW3-STW-CW30-WR22	18-Apr-07	X	X	X	X	X	X	X	X	X	--
			WR-22	LW3-STW-CW40-WR22	3-May-07	X	X	X	X	X	NC	NC	NC	NC	--
			WR-22	LW3-STW-CW10-WR22	26-Mar-07	X	X	X	X	X	X	X	X	X	--
B	WR-123	Schnitzer International Slip	WR-123	LW3-STW-CW10-WR123	9-Apr-07	X	X	NC	X	NC	X	NC	NA	X	--
			WR-123	LW3-STW-CW20-WR123	18-Apr-07	X	X	X	X	X	X	X	X	NC	--
			WR-123	LW3-STW-CW30-WR123	23-Apr-07	X	X	X	X	NC	X	X	NC	NC	--
			WR-123	LW3-STW-CW40-WR123	3-May-07	X	X	X	X	X	NC	X	X	X	--
			WR-123	LW3-STW-CW50-WR123	11-Jun-07	X	X	X	NC	NC	NC	NC	X	X	--
C	WR-384	Schnitzer - Riverside	WR-384	LW3-STW-CW10-WR384	9-Apr-07	X	X	NC	X	NC	X	--	X	X	--
			WR-384	LW3-STW-CW20-WR384	18-Apr-07	X	X	X	X	X	X	--	X	NC	--
			WR-384	LW3-STW-CW30-WR384	23-Apr-07	X	X	X	X	NC	X	--	NC	NC	--
			WR-384	LW3-STW-CW40-WR384	3-May-07	X	X	X	X	X	X	--	X	X	--
			WR-384	LW3-STW-CW50-WR384	11-Jun-07	X	X	X	NC	NC	NC	--	NC	X	--
D	WR-107	GASCO	WR-107	LW3-STW-CW10-WR107	26-Mar-07	X	X	X	X	X	X	--	NC	NC	--
			WR-107	LW3-STW-CW20-WR107	9-Apr-07	X	X	NC	X	NC	X	--	X	X	--
			WR-107	LW3-STW-CW30-WR107	18-Apr-07	X	X	X	X	X	X	--	X	X	--
			WR-107	LW3-STW-CW40-WR107	3-May-07	X	X	X	X	X	NC	--	X	X	--
E	WR-96	Arkema	WR-96	LW3-STW-CW10-WR96	26-Mar-07	X	X	X	X	X	X	X	NC	NC	X
			WR-96	LW3-STW-CW20-WR96	23-Apr-07	X	X	X	X	NC	X	NC	NC	NC	X
			WR-96	LW3-STW-CW30-WR96	3-May-07	X	X	X	X	X	X	X	X	NC	X
			WR-96	LW3-STW-CW40-WR96	10-Jun-07	X	X	X	X	X	NC	X	X	X	NC
			WR-96	LW3-STW2-CW10-WR96	27-Nov-07	X	X	X	X	X	X	X	X	X	X
F	WR-14	Chevron - Transportation	WR-14	LW3-STW-CW10-WR14	26-Mar-07	X	X	X	X	X	X	--	X	X	--
			WR-14	LW3-STW-CW20-WR14	9-Apr-07	X	X	NC	X	NC	X	--	NC	NC	--
			WR-14	LW3-STW-CW30-WR14	23-Apr-07	X	X	X	X	NC	X	--	X	NC	--
			WR-14	LW3-STW-CW40-WR14	3-May-07	X	X	X	X	X	NC	--	X	X	--
			WR-14	LW3-STW-CW50-WR14	10-Jun-07	X	X	X	X	X	NC	--	NC	X	--
G	WR-161	Portland Shipyard	WR-161	LW3-STW-CW10-WR161	26-Mar-07	X	X	X	X	X	X	NC	NC	NC	--
			WR-161	LW3-STW-CW20-WR161	9-Apr-07	X	X	NC	X	NC	X	X	X	X	--
			WR-161	LW3-STW-CW30-WR161	3-May-07	X	X	X	X	X	X	X	X	X	--
			WR-161	LW3-STW-CW40-WR161	10-Jun-07	X	X	X	X	X	NC	X	X	X	--
H	WR-3[1]	Sulzer Pump	WR-4*	LW3-STW-CW10-WR4	26-Mar-07	X	X	X	X	X	X	--	X	X	--
			WR-4*	LW3-STW-CW20-WR4	9-Apr-07	X	X	NC	X	NC	X	--	X	X	--
			WR-4*	LW3-STW-CW30-WR4	18-Apr-07	X	X	X	X	X	X	--	X	X	--
			WR-4*	LW3-STW-CW40-WR4	3-May-07	X	X	X	X	X	NC	--	NC	NC	--
H	WR-4	Sulzer Pump	WR-4	LW3-STW2-CW10-WR4	11-Jan-08	X	X	X	X	X	X	--	X	NC	--
			WR-4	LW3-STW2-CW20-WR4	15-Jan-08	X	X	NC	NC	NC	NC	--	NC	NC	--
			WR-4	LW3-STW2-CW30-WR4	30-Jan-08	X	X	X	X	X	X	--	X	X	--
I	WR-145	Gunderson	WR-145	LW3-STW-CW10-WR145	9-Apr-07	X	X	NC	X	NC	X	NC	NC	NC	--

Table 8-1. Summary of Round 3A and Round 3B Stormwater Composite Samples Collected by Site and Storm Event.

Appendix	Outfall(s)	Facility or Location	Station ID	Sample Event ID (STW = Round 3a STW2 = Round 3b)	Date Retrieved	TSS	TOC	DOC (filtered)	Total Metals	Diss. Metals (filtered)	PAHs	Phthalates	PCB Congeners	Herbicides	Organo-chlorine Pesticides
I	WR-142[2]	Gunderson	WR-142	LW3-STW-CW10-WR142	10-Jun-07	X	X	X	X	X	X	X	X	X	--
			WR-142	LW3-STW2-CW10-WR142	16-Nov-07	X	X	X	X	X	X	X	X	X	--
			WR-142	LW3-STW2-CW20-WR142	27-Nov-07	X	X	X	X	NC	NC	NC	NC	NC	--
			WR-142	LW3-STW2-CW30-WR142	29-Nov-07	X	NC	NC	NC	X	X	NC	NC	NC	--
			WR-142	LW3-STW2-CW40-WR142	9-Jan-08	X	X	NC	X	NC	NC	X	X	X	--
J	WR-147	Gunderson	WR-147	LW3-STW-CW10-WR147	9-Apr-07	X	X	NC	X	NC	X	X	X	NC	--
			WR-147	LW3-STW-CW20-WR147	18-Apr-07	X	X	X	X	X	X	X	X	NC	--
			WR-147	LW3-STW-CW30-WR147	23-Apr-07	X	X	X	X	NC	X	X	X	NC	--
			WR-147	LW3-STW-CW40-WR147	3-May-07	X	X	X	X	X	NC	NC	NC	X	--
			WR-147	LW3-STW-CW50-WR147	10-Jun-07	X	X	X	X	X	NC	NC	NC	X	--
Land Use Locations (12)															
X	Hwy 30A	Hwy 30A	H30A	LW3-STW2-CW10-H30A	16-Nov-07	X	X	X	X	X	X	--	X	X	--
			H30A	LW3-STW2-CW20-H30A	27-Nov-07	X	X	X	X	X	NC	--	NC	NC	--
			H30A	LW3-STW2-CW30-H30A	28-Jan-08	X	X	X	X	NC	X	--	X	X	--
			H30A	LW3-STW2-CW40-H30A	30-Jan-08	X	X	X	X	X	X	--	X	X	--
Y	Hwy 30 B	Hwy 30B[(2)]	H30B	LW3-STW2-CW10-H30B	27-Nov-07	X	X	X	X	X	X	--	NC	NC	--
			H30B	LW3-STW2-CW20-H30B	11-Jan-08	X	X	X	X	X	X	--	X	X	--
			H30B	LW3-STW2-CW30-H30B	15-Jan-08	X	X	X	X	X	NC	--	X	X	--
			H30B	LW3-STW2-CW40-H30B	28-Jan-08	X	X	X	X	NC	X	--	X	X	--
			H30B	LW3-STW2-CW50-H30B	30-Jan-08	X	X	X	X	X	X	--	X	X	--
L	OF-49	City - St. Johns Area	OF-49	LW3-STW-CW10-OF49	9-Apr-07	X	X	NC	X	NC	X	X	X	X	--
			OF-49	LW3-STW-CW20-OF49	23-Apr-07	X	X	X	X	NC	X	X	X	X	--
			OF-49	LW3-STW-CW30-OF49	9-Jun-07	X	X	X	X	X	X	NC	NC	NC	--
			OF-49	LW3-STW2-CW10-OF49	16-Nov-07	X	X	X	X	X	X	X	X	X	--
M	WR-67	Siltronic	WR-67	LW3-STW-CW10-WR67	9-Apr-07	X	X	NC	X	NC	X	--	NA	X	--
			WR-67	LW3-STW-CW20-WR67	9-Apr-07	X	X	X	X	X	X	--	X	NC	--
			WR-67	LW3-STW-CW30-WR67	18-Apr-07	X	X	X	X	X	X	--	X	X	--
			WR-67	LW3-STW-CW40-WR67	23-Apr-07	X	X	X	NA	NC	NC	--	X	NC	--
			WR-67	LW3-STW-CW50-WR67	3-May-07	X	X	X	X	X	NC	--	NC	NC	--
			WR-67	LW3-STW-CW60-WR67	10-Jun-07	X	X	X	X	X	X	--	X	X	--
N	OF-22C	City - Above Hwy 30, Forest Park Area	OF-22C	LW3-STW-CW10-OF22C	18-Apr-07	X	X	X	X	X	X	X	X	X	--
			OF-22C	LW3-STW-CW20-OF22C	23-Apr-07	X	X	X	X	NC	X	X	X	X	--
			OF-22C	LW3-STW2-CW10-OF22C	9-Jan-08	X	X	X	X	X	X	X	X	X	--
O	OF-22B	City - Doane Lake Industrial Area	OF-22B	LW3-STW-CW10-OF22B	26-Mar-07	X	X	X	X	X	X	--	X	X	X
			OF-22B	LW3-STW-CW20-OF22B	3-May-07	X	X	X	X	X	X	--	X	X	X
			OF-22B	LW3-STW2-CW10-OF22B	16-Nov-07	X	X	X	X	NC	X	--	X	X	X
			OF-22B	LW3-STW2-CW20-OF22B	27-Nov-07	X	X	X	X	X	X	--	X	X	NC
P	OF-M1	City - Mocks Bottom	OF-M1	LW3-STW-CW10-OFM1	26-Mar-07	X	X	X	X	X	X	--	X	X	--
			OF-M1	LW3-STW-CW20-OFM1	9-Apr-07	X	X	NC	X	NC	X	--	X	X	--
			OF-M1	LW3-STW-CW30-OFM1	18-Apr-07	X	X	X	X	X	X	--	X	X	--
			OF-M1	LW3-STW-CW40-OFM1	10-Jun-07	X	X	X	X	X	NC	--	NC	NC	--

Table 8-1. Summary of Round 3A and Round 3B Stormwater Composite Samples Collected by Site and Storm Event.

Appendix	Outfall(s)	Facility or Location	Station ID	Sample Event ID (STW = Round 3a STW2 = Round 3b)	Date Retrieved	TSS	TOC	DOC (filtered)	Total Metals	Diss. Metals (filtered)	PAHs	Phthalates	PCB Congeners	Herbicides	Organo-chlorine Pesticides
Q	OF-M2	City - Mocks Bottom	OF-M2	LW3-STW-CW10-OFM2	9-Apr-07	X	X	NC	X	NC	X	X	X	X	--
			OF-M2	LW3-STW-CW20-OFM2	9-Apr-07	X	X	X	X	X	X	X	X	NC	--
			OF-M2	LW3-STW-CW30-OFM2	23-Apr-07	X	X	X	X	NC	X	X	X	X	--
			OF-M2	LW3-STW-CW40-OFM2	3-May-07	X	X	X	X	X	X	X	X	X	--
R	OF-22	City - Willbridge Industrial Area	OF-22	LW3-STW-CW10-OF22	9-Apr-07	X	X	NC	X	NC	X	--	X	X	--
			OF-22	LW3-STW-CW20-OF22	3-May-07	X	X	X	X	X	X	--	X	X	--
			OF-22	LW3-STW-CW30-OF22	9-Jun-07	X	X	X	X	X	X	--	X	X	--
S	OF-16	City - Heavy Industrial	OF-16	LW3-STW-CW10-OF16	9-Apr-07	X	X	NC	X	NC	X	--	X	X	--
			OF-16	LW3-STW-CW20-OF16	18-Apr-07	X	X	X	X	X	X	--	X	X	--
			OF-16	LW3-STW-CW30-OF16	23-Apr-07	X	X	X	X	NC	X	--	X	X	--
			OF-16	LW3-STW-CW40-OF16	3-May-07	X	X	X	X	X	NC	--	NC	NC	--
			OF-16	LW3-STW-CW50-OF16	10-Jun-07	X	NC	NC	X	X	NC	--	NC	NC	--
T	WR-218	Albina - UPRR	WR-218	LW3-STW-CW20-WR218	10-Jun-07	X	X	X	X	X	X	--	X	NC	--
			WR-218	LW3-STW-CW10-WR218	3-May-07	X	X	X	X	X	X	--	X	X	--
			WR-218	LW3-STW2-CW10-WR218	27-Nov-07	X	X	X	X	X	X	--	NC	NC	--
			WR-218	LW3-STW2-CW20-WR218	29-Nov-07	X	X	X	X	X	X	--	X	X	--
U	St. Johns Bridge	Highway drainage	SJB	LW3-STW-CW10-SJB	26-Mar-07	X	X	X	X	X	X	NC	NC	NC	--
			SJB	LW3-STW-CW20-SJB	9-Apr-07	X	X	NC	X	NC	X	X	NC	NC	--
			SJB	LW3-STW-CW30-SJB	18-Apr-07	X	X	X	X	X	X	X	X	NC	--
			SJB	LW3-STW-CW40-SJB	23-Apr-07	X	X	X	NA	NC	NC	X	X	X	--
			SJB	LW3-STW-CW50-SJB	3-May-07	X	X	X	X	X	NC	NC	X	X	--
			SJB	LW3-STW-CW60-SJB	10-Jun-07	X	X	X	NC	NC	NC	NC	NC	X	--
Multiple Land Use Locations (3)															
V	OF-18	City - Multiple Land Uses	OF-18	LW3-STW-CW10-OF18	26-Mar-07	X	X	X	X	X	X	X	X	X	--
			OF-18	LW3-STW-CW20-OF18	9-Apr-07	X	X	NC	X	NC	X	X	X	X	--
			OF-18	LW3-STW-CW30-OF18	18-Apr-07	X	X	X	X	X	X	X	X	X	--
			OF-18	LW3-STW-CW40-OF18	3-May-07	X	X	X	X	X	NC	NC	NC	NC	--
W	OF-19	City - Multiple Land Uses	OF-19	LW3-STW-CW10-OF19	26-Mar-07	X	X	X	X	X	X	--	X	X	--
			OF-19	LW3-STW-CW20-OF19	9-Apr-07	X	X	NC	X	NC	X	--	NA	X	--
			OF-19	LW3-STW-CW30-OF19	18-Apr-07	X	X	X	X	X	X	--	X	X	--
			OF-19	LW3-STW-CW40-OF19	23-Apr-07	X	X	X	NA	NC	NC	--	X	X	--
			OF-19	LW3-STW-CW50-OF19	3-May-07	X	X	X	X	X	NC	--	NC	NC	--
K	Yeon NW35[3]	Hwy 30	H30	LW3-STW-CW10-H30	9-Apr-07	X	X	NC	X	NC	X	--	NA	X	--
			H30	LW3-STW-CW20-H30	3-May-07	X	X	X	X	X	X	--	X	X	--
			H30	LW3-STW-CW30-H30	10-Jun-07	X	X	X	X	X	X	--	NC	NC	--

Notes:

[1] During Round 3A sampling, WR-3 was sampled instead of WR-4.

[2] Station WR-145 moved WR-142 after first storm event.

[3] Yeon-NW35 was referred to as Hwy 30 in the Round 3A FSP and FSR. The wrong location was sampled and it was changed to Yeon-Mixed Use.

-- = The FSP does not require analysis of this parameter for this station.

NC = Parameter not collected due logistical issues or beccause the sampling for this parameter was complete.

NA= Samples collected but not analyzed.

Table 8-2. Summary of Round 3A Stormwater Grab Samples Collected by Site and Storm Event.

Appendix	Outfall(s)	Facility or Location	Station ID	Grab Sample ID	Date Collected	TSS	TOC	DOC (filtered)	PAHs	PAHs (filtered)	Phthalates	Phthalates (filtered)	PCB Congeners	PCB Congeners (filtered)	Herbicides	Herbicides (filtered)	OC Pesticides	OC Pesticides (filtered)
Industrial Locations (7)																		
A	WR-22	OSM	WR-22	LW3-STW-GW10-WR22	5/21/2007	X	X	X	X	X	X	X	X	X	X	X	--	--
B	WR-123	Schnitzer International Slip	WR-123	LW3-STW-GW10-WR123	5/21/2007	X	X	X	X	X	X	X	X	X	X	X	--	--
D	WR-107	GASCO	WR-107	LW3-STW-GW10-WR107	5/21/2007	X	X	X	X	X	--	--	X	X	X	X	--	--
E	WR-96	Arkema	WR-96	LW3-STW-GW10-WR96	6/5/2007	X	X	X	X	X	X	X	X	X	X	X	X	X
G	WR-161	Portland Shipyard	WR-161	LW3-STW-GW10-WR161	5/21/2007	X	X	X	X	X	X	X	X	X	X	X	--	--
G	WR-161	Portland Shipyard	WR-161	LW3-STW-GW20-WR161	6/5/2007	X	X	X	X	X	X	X	X	X	X	X	--	--
I	WR-142	Gunderson	WR-142	LW3-STW-GW10-WR142	5/21/2007	X	X	X	X	X	X	X	X	X	X	X	--	--
Land Use Locations (3)																		
O	OF-22B	City - Doane Lake Industrial Area	OF-22B	LW3-STW-GW10-OF22B	6/5/2007	X	X	X	X	X	--	--	X	X	X	X	X	X
R	OF-22	City - Willbridge Industrial Area	OF-22	LW3-STW-GW10-OF22	6/5/2007	X	X	X	X	X	--	--	X	X	NC	NC	--	--
U	St. Johns	Highway	SJB	LW3-STW-GW10-SJB	5/21/2007	X	X	X	X	X	X	X	X	X	X	X	--	--
Multiple Land Use Locations (1)																		
V	OF-18	City - Multiple Land Uses	OF-18	LW3-STW-GW10-OF18	5/21/2007	X	X	X	X	X	X	X	X	X	X	X	--	--

Notes:

NC = Parameter not collected due to insufficient volume.

-- = The FSP does not require analysis of this parameter for this station.

Table 8-3. LWG Sediment Trap Sample Prioritization Summary - Showing Target Detection Limit Factors[1]

Appendix	Outfall(s)	Facility or Location	PCB Congeners	TOC	Percent Solids	Organo-chlorine pesticides	PAHs and Phthalates	Metals	Herbicides	Grain Size
Industrial Locations (10)										
A	WR-22	OSM	1	1	1	1	1	1	1.3	
B	WR-123	Schnitzer International Slip	1	1	1	1	1	1	1	
C	WR-384	Schnitzer - Riverside	1	1	1	1	1	1	1	
D	WR-107	GASCO	1	1	1	1	1	1	1	
E	WR-96[2]	Arkema	1	1	1	1	1	1	1	
F	WR-14	Chevron - Transportation	1	1	1	1	1	1	1	
G	WR-161	Portland Shipyard	1	1	1	1	1	1	1.4	
H	WR-4[3]	Sulzer Pump	no sediment traps installed							
I	WR-142/145	Gunderson	1.1	1	1					
J	WR-147	Gunderson (former Schnitzer)	1	1	1	1	2			
Land Use Locations (12)										
X	Hwy 30A	Hwy 30A	1.4	1	1					
Y	Hwy 30B	Hwy 30B[2]	1	1	1	1	1	1	1	
L	OF-49	City - St. Johns Area	1	1	1	1	1.5			
M	WR-67	Siltronic	1	1	1	4.8				
N	OF-22C, above Hwy 30	City - Forest Park Area	1	1	1	1	1	1	1	
O	OF-22B	City - Doane Lake Industrial Area	1.5	1	1	1	1.4			
P	OF-M1 (combined)	City - Mocks Bottom Industrial Area	1	1	1	1	1.6			
Q	OF-M2	City - Mocks Bottom Industrial Area	1	1	1	1	1.6			
R	OF-22 (combined)	City - Willbridge Industrial Area	1.3	1	1					

Table 8-3. LWG Sediment Trap Sample Prioritization Summary - Showing Target Detection Limit Factors[1]

Appendix	Outfall(s)	Facility or Location	PCB Congeners	TOC	Percent Solids	Organo-chlorine pesticides	PAHs and Phthalates	Metals	Herbicides	Grain Size
S	OF-16	City - Heavy Industrial	1	1	1	1	1.2			
T	WR-218	UPRR Albina	1	1	1	1	1	1	1	
U	St. Johns Bridge	Highway drainage	1	1	1	1	2.4			
Multiple Land Use Locations (3)										
V	OF-18	City - Multiple Land Uses	1	1	1	1	1	1	1	
W	OF-19 (combined)	City - Multiple Land Uses	1	1	1	1	1	1	1	
K	Yeon NW35[4]	Hwy 30	1.8	1	1					

Notes:

[1] Detection limit factor shows how the target detection limit (DL) will be exceeded with the sample mass remaining. A factor of 1 means the target detection limit will be achieved. A factor of 2 means the actual DL will be two times higher than the target DL. These target detection limits are based on estimated mass of sediment, and actual detection limits will be determined at the laboratory. Actual detection limits may be higher or lower, or there may be insufficient sediment to measure an analyte.

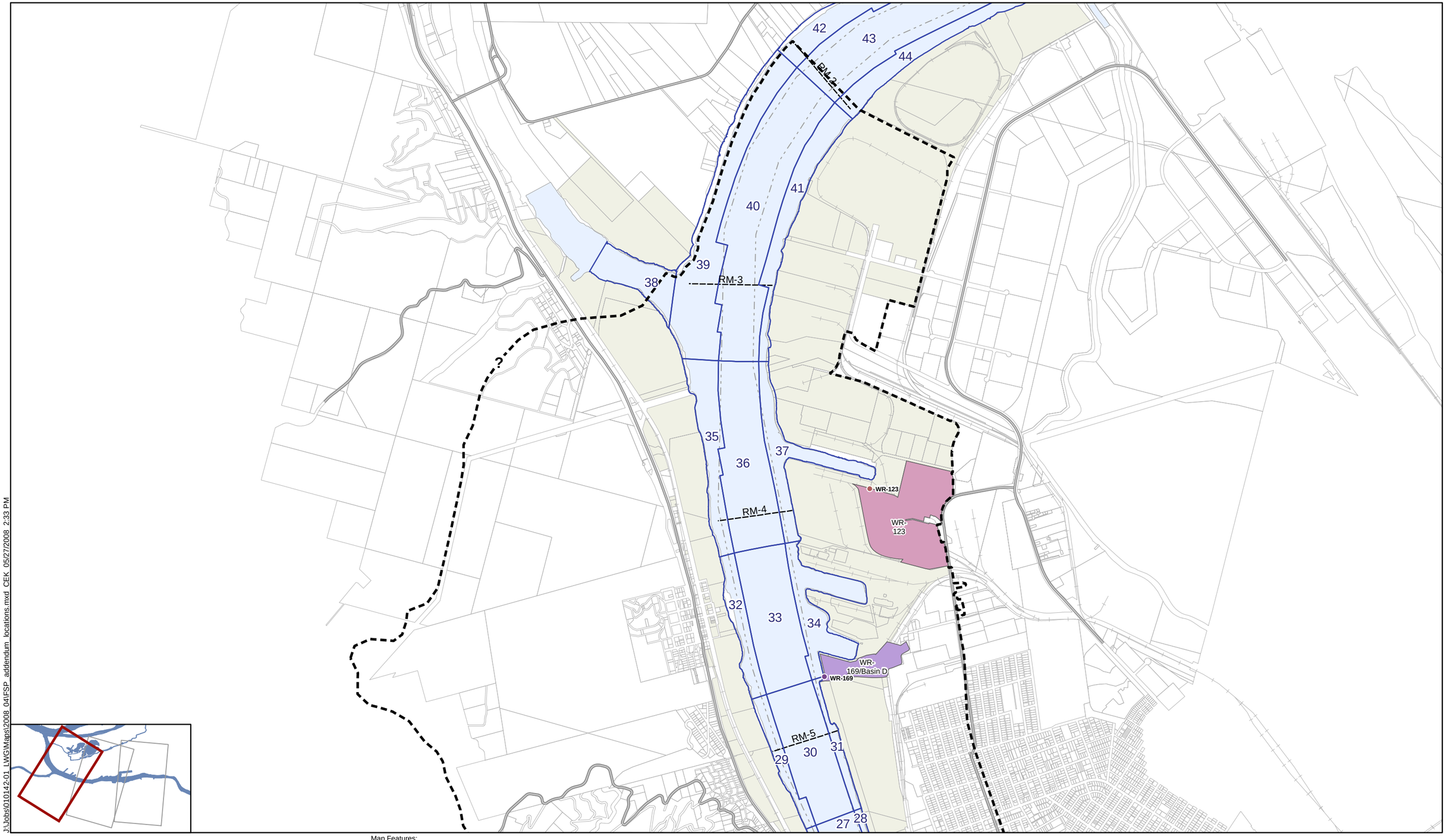
[2] No sediment was accumulated in the sediment traps at Arkema, so inline catch basin solids were collected.

[3] During Round 3A sampling, WR-3 was sampled instead of WR-4.

[4] Yeon-NW35 was referred to as Hwy 30 in the Round 3A FSP and FSR. The wrong location was sampled and it was changed to Yeon-Mixed Use.

Blank cells indicate that there was insufficient sample volume to conduct these analyses.

Figures



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ANCHOR ENVIRONMENTAL, L.L.C.

LWG LOWER WILLAMETTE GROUP

N

0 500 1,000 1,500 2,000 Feet

Map Features:

2007 Stormwater Sampling Location
- Heavy Industrial - Land Use Category
- Heavy Industrial - Site Specific
- Light Industrial
- Major Transportation
- Multiple Land Uses
- Residential
- Open Space

2007 Stormwater Sampling Basin Land Use
- Heavy Industrial - Land Use Category
- Heavy Industrial - Site Specific
- Light Industrial
- Major Transportation
- Multiple Land Uses
- Residential
- Open Space

- Hybrid Model Cells
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

Figure 2-1a
Stormwater and Sediment Trap Sampling Locations
Round 3B Stormwater Field Sampling Report
River Mile 02 to 05

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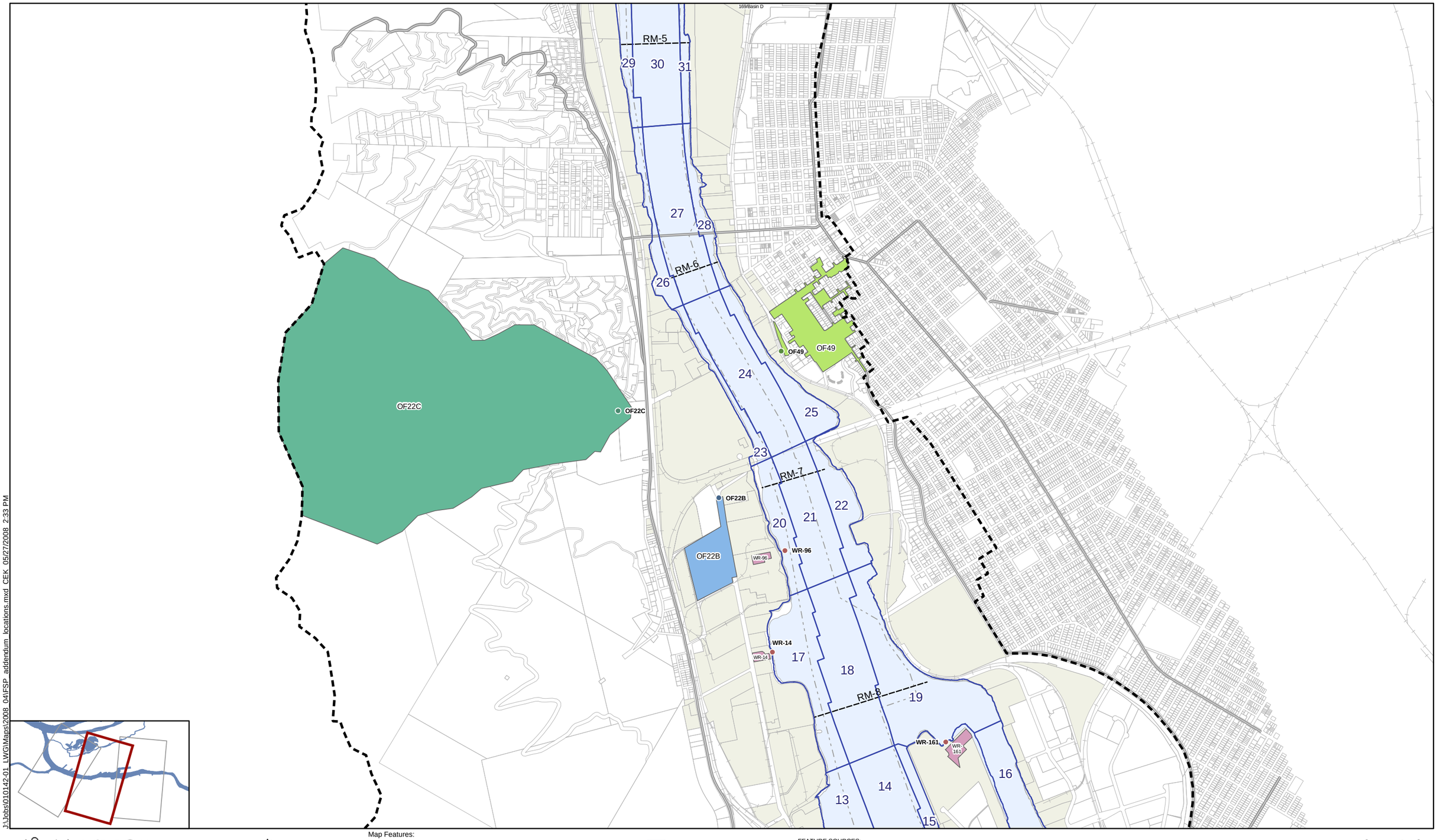


ANCHOR ENVIRONMENTAL, L.L.C.

LWG LOWER WILLAMETTE GROUP

0 500 1,000 1,500 2,000 Feet

Map Features:

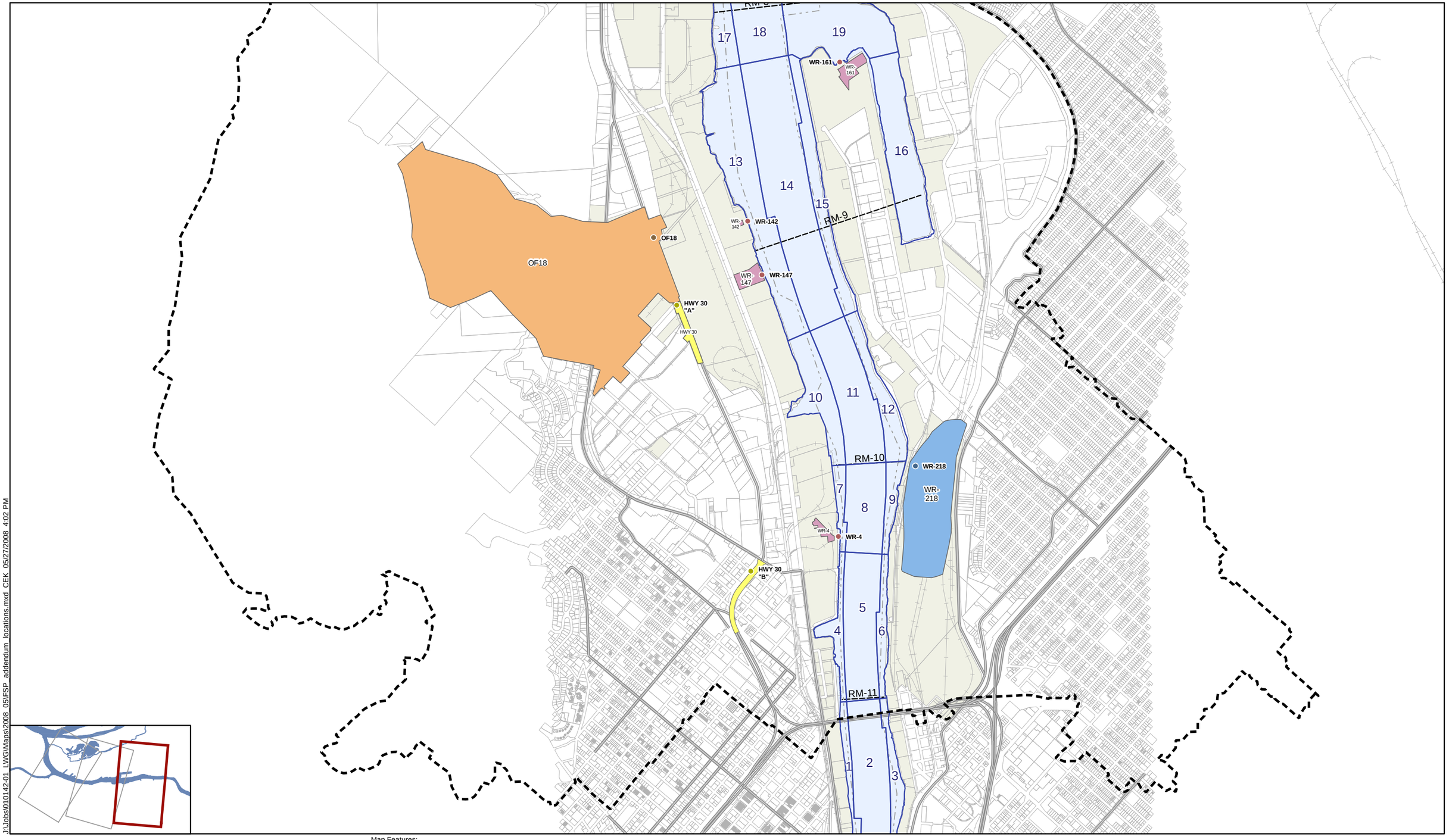
2007 Stormwater Sampling Location
- Heavy Industrial - Land Use Category
- Heavy Industrial - Site Specific
- Light Industrial
- Major Transportation
- Multiple Land Uses
- Residential
- Open Space

2007 Stormwater Sampling Basin Land Use
- Heavy Industrial - Land Use Category
- Heavy Industrial - Site Specific
- Light Industrial
- Major Transportation
- Multiple Land Uses
- Residential
- Open Space

- Hybrid Model Cells
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

Figure 2-1b
Stormwater and Sediment Trap Sampling Locations
Round 3B Stormwater Field Sampling Report
River Mile 05 to 08



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ANCHOR ENVIRONMENTAL, L.L.C.

LWG LOWER WILLAMETTE GROUP

0 500 1,000 1,500 2,000 Feet

Map Features:

2007 Stormwater Sampling Location
- Heavy Industrial - Land Use Category
- Heavy Industrial - Site Specific
- Light Industrial
- Major Transportation
- Multiple Land Uses
- Residential
- Open Space

2007 Stormwater Sampling Basin Land Use
- Heavy Industrial - Land Use Category
- Heavy Industrial - Site Specific
- Light Industrial
- Major Transportation
- Multiple Land Uses
- Residential
- Open Space

- Hybrid Model Cells
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

Figure 2-1c
Stormwater and Sediment Trap Sampling Locations
Round 3B Stormwater Field Sampling Report
River Mile 08 to 11

Figure 3-1 - Measured Precipitation at Rain Gages, November 15th-16th

November 16th Sampling Event

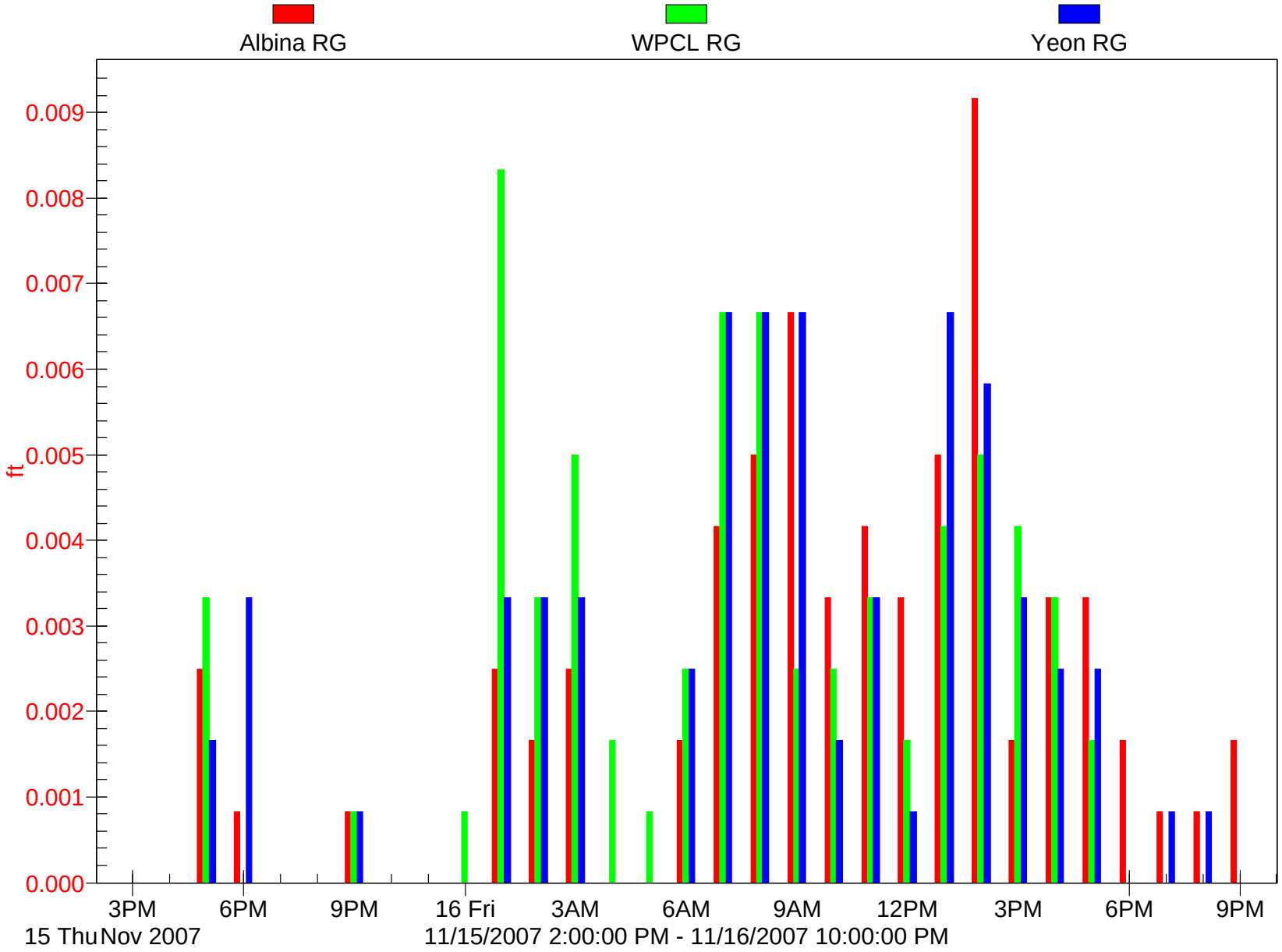


Figure 3-2 - Measured Precipitation at Rain Gages, November 26th

November 27th Sampling Event

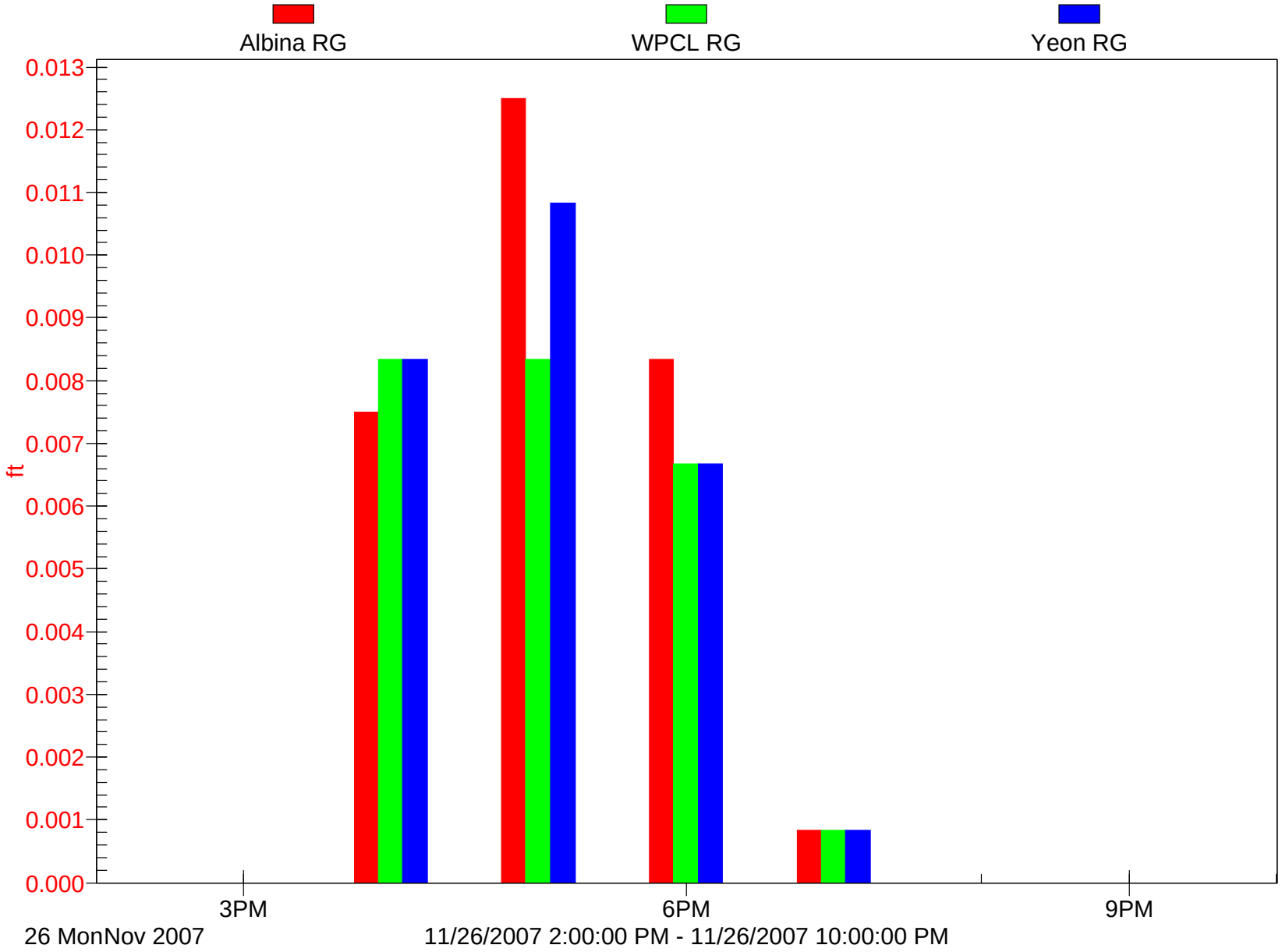


Figure 3-3 - Measured Precipitation at Rain Gages, November 28th

November 29th Sampling Event

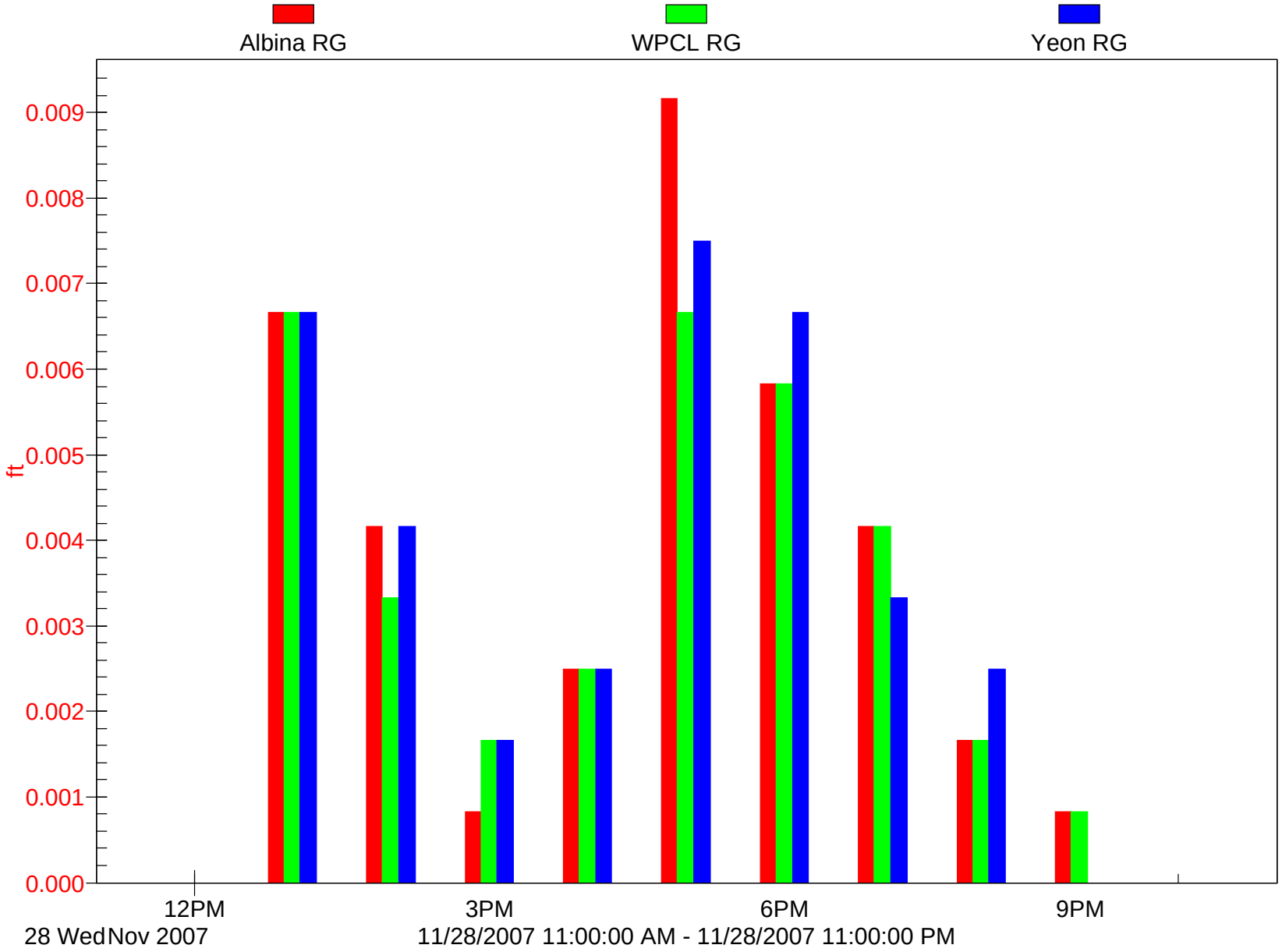


Figure 3-4 - Measured Precipitation at Rain Gages, January 7th-8th

January 9th Sampling Event

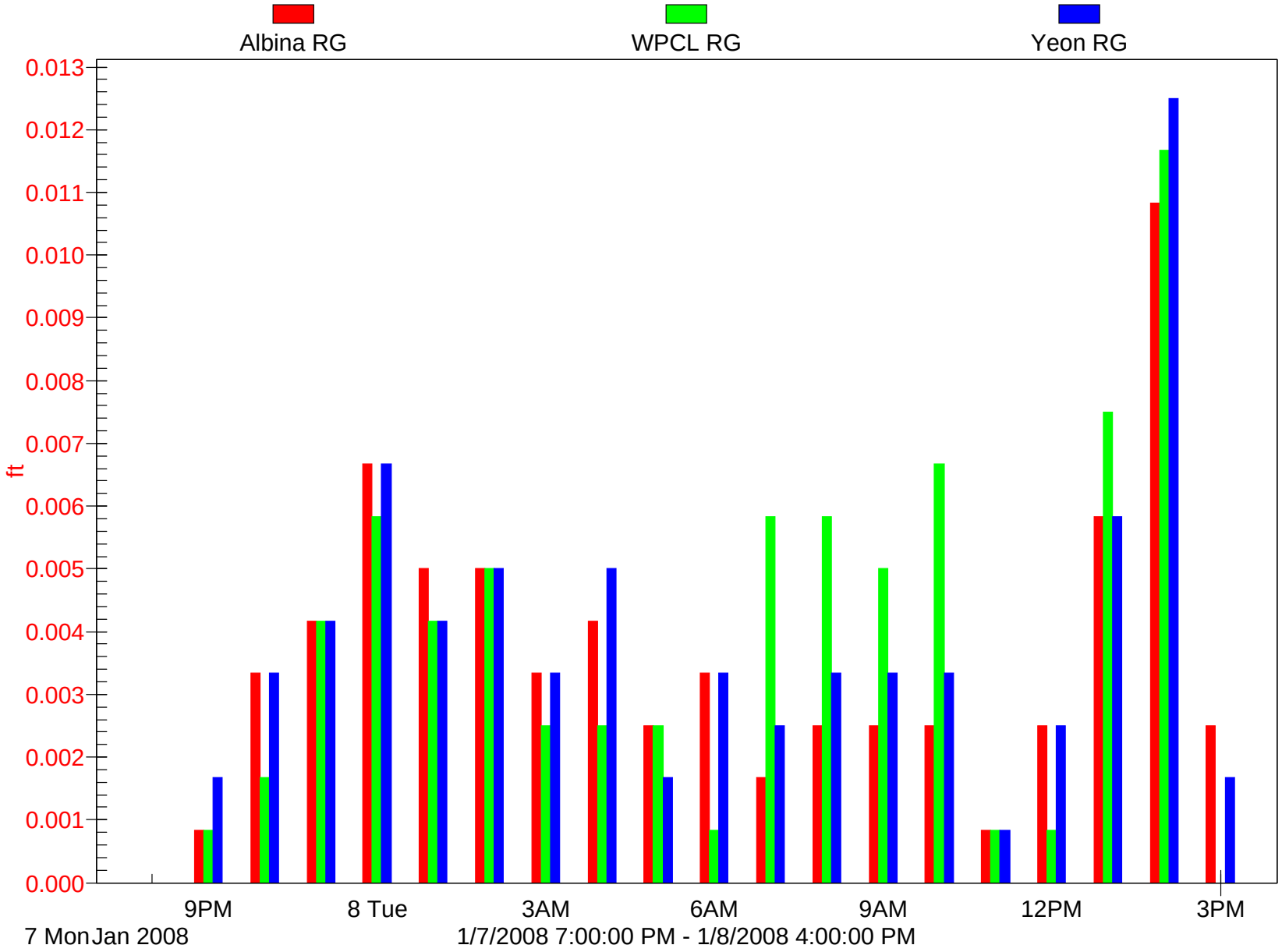


Figure 3-5 - Measured Precipitation at Rain Gages, January 9th-10th

January 11th Sampling Event

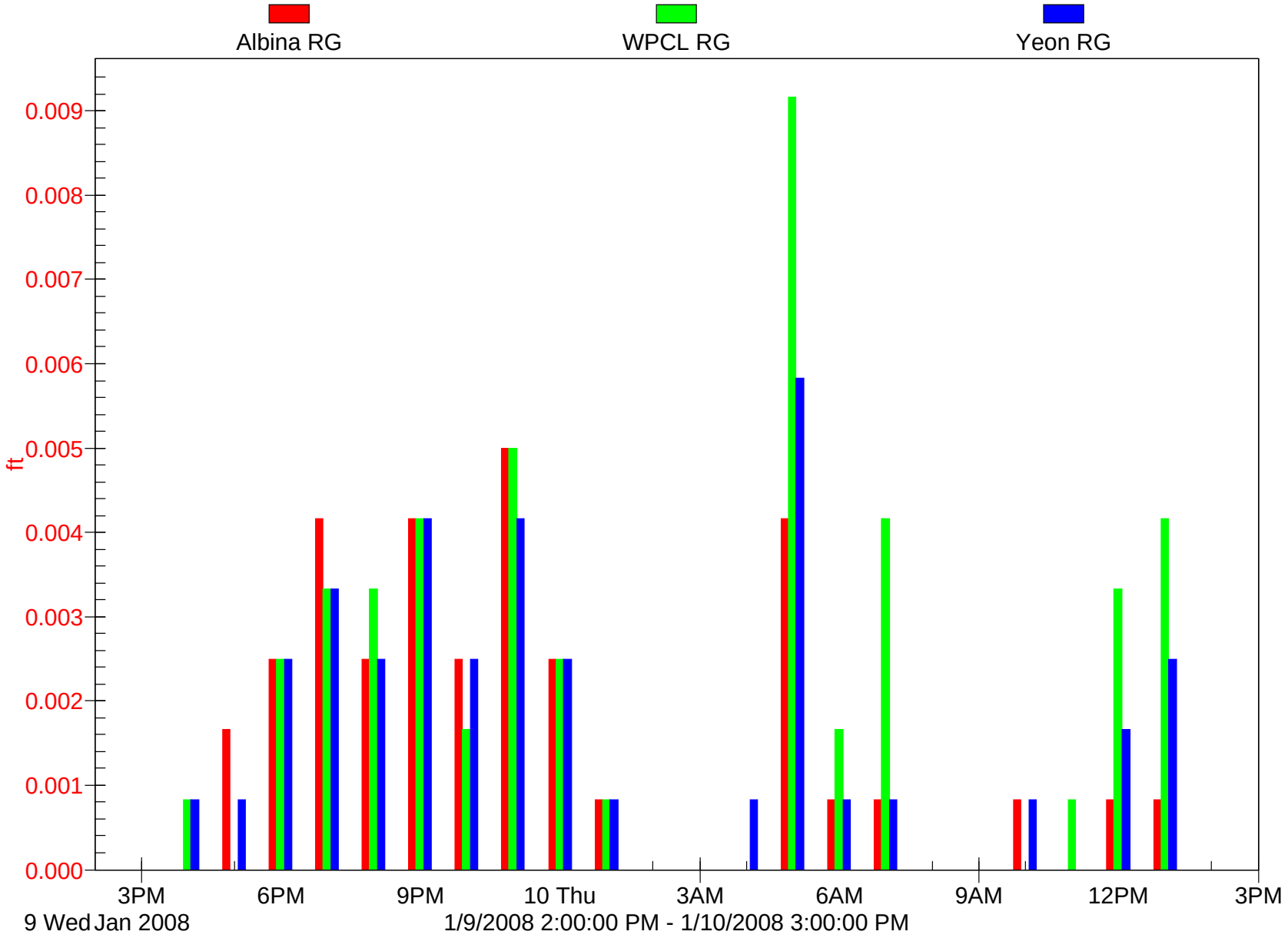


Figure 3-6 - Measured Precipitation at Rain Gages, January 14th

January 15th Sampling Event

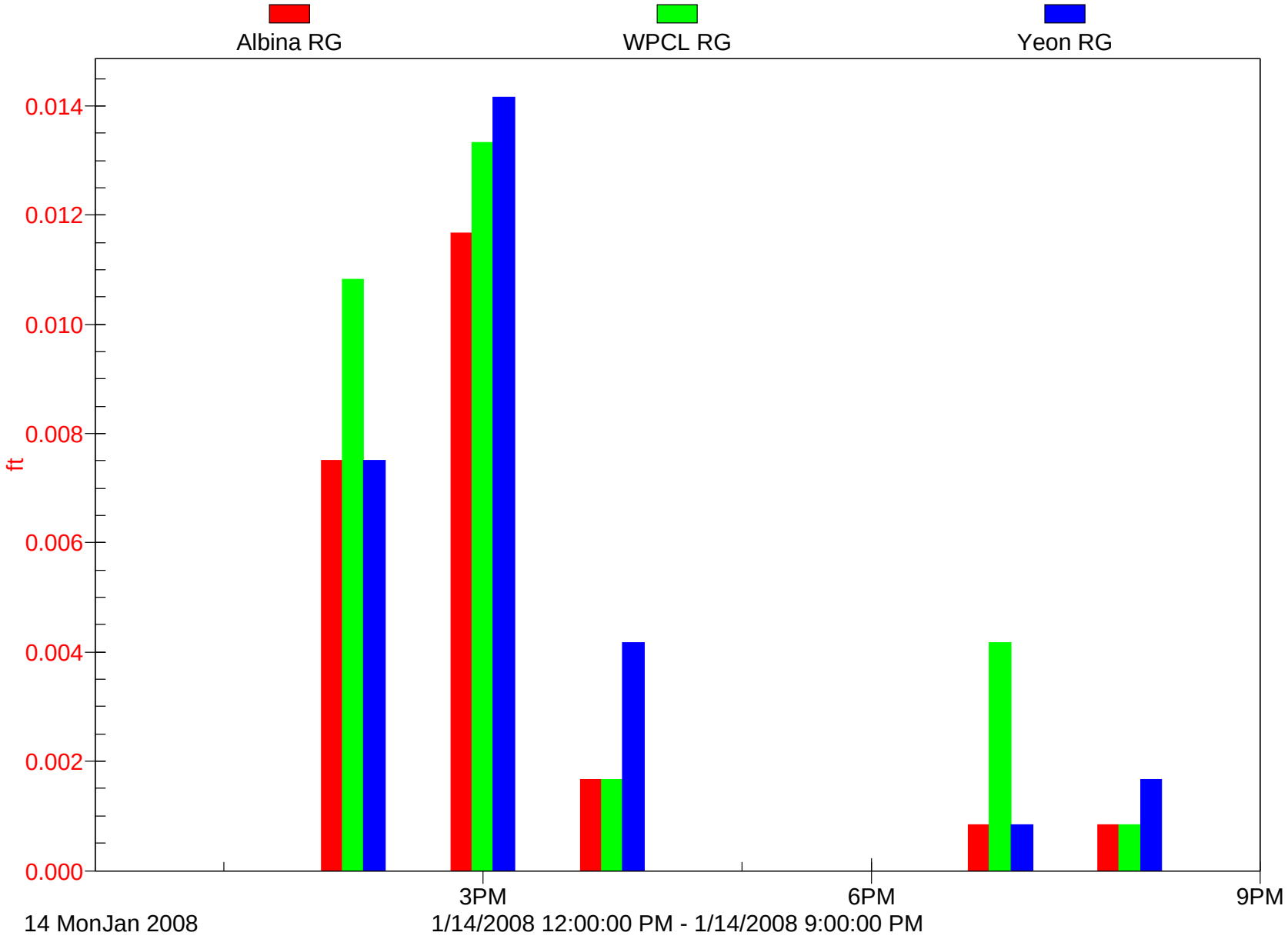


Figure 3-7 - Measured Precipitation at Rain Gages, January 26th-27th

January 28th Sampling Event

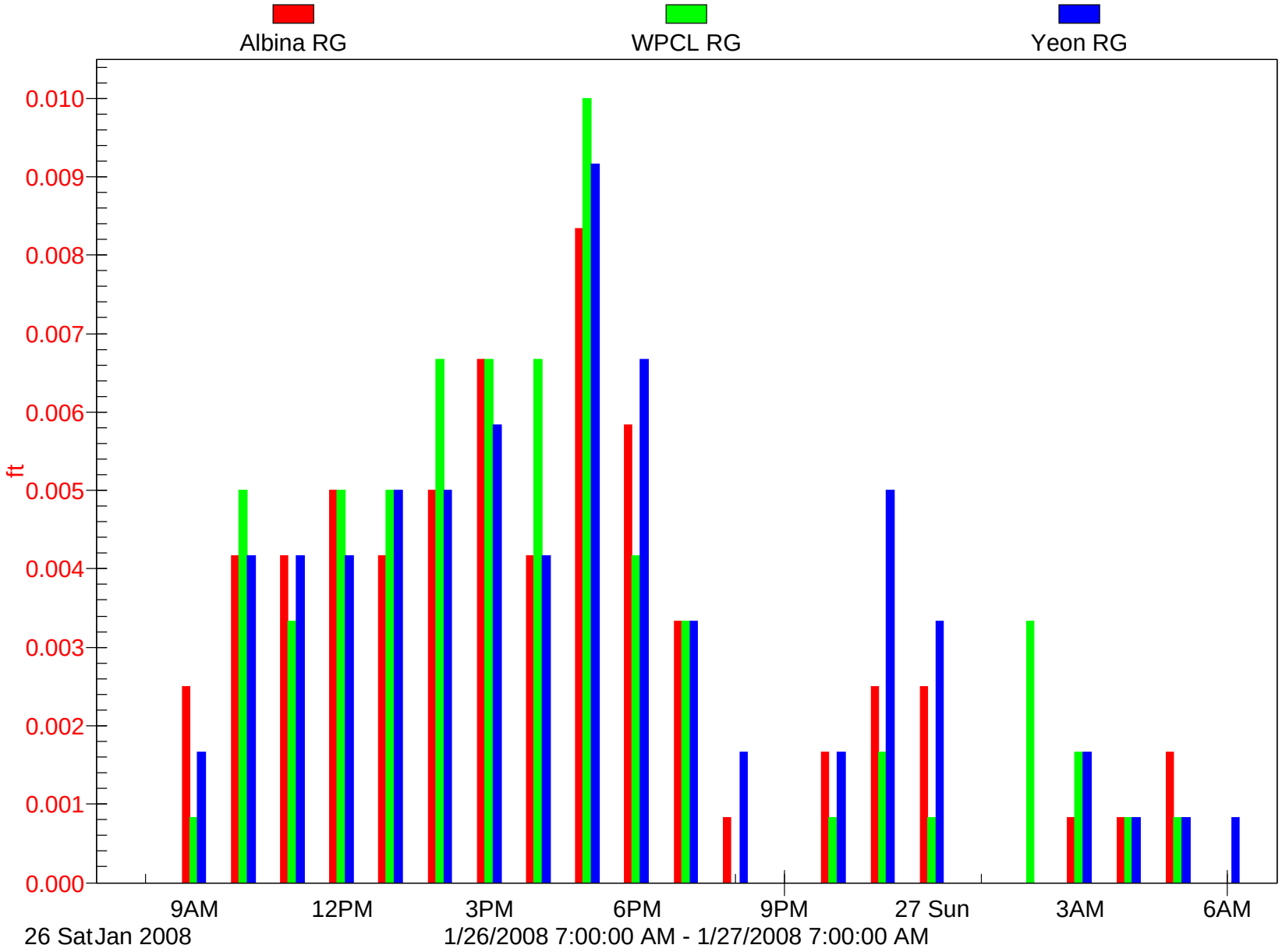
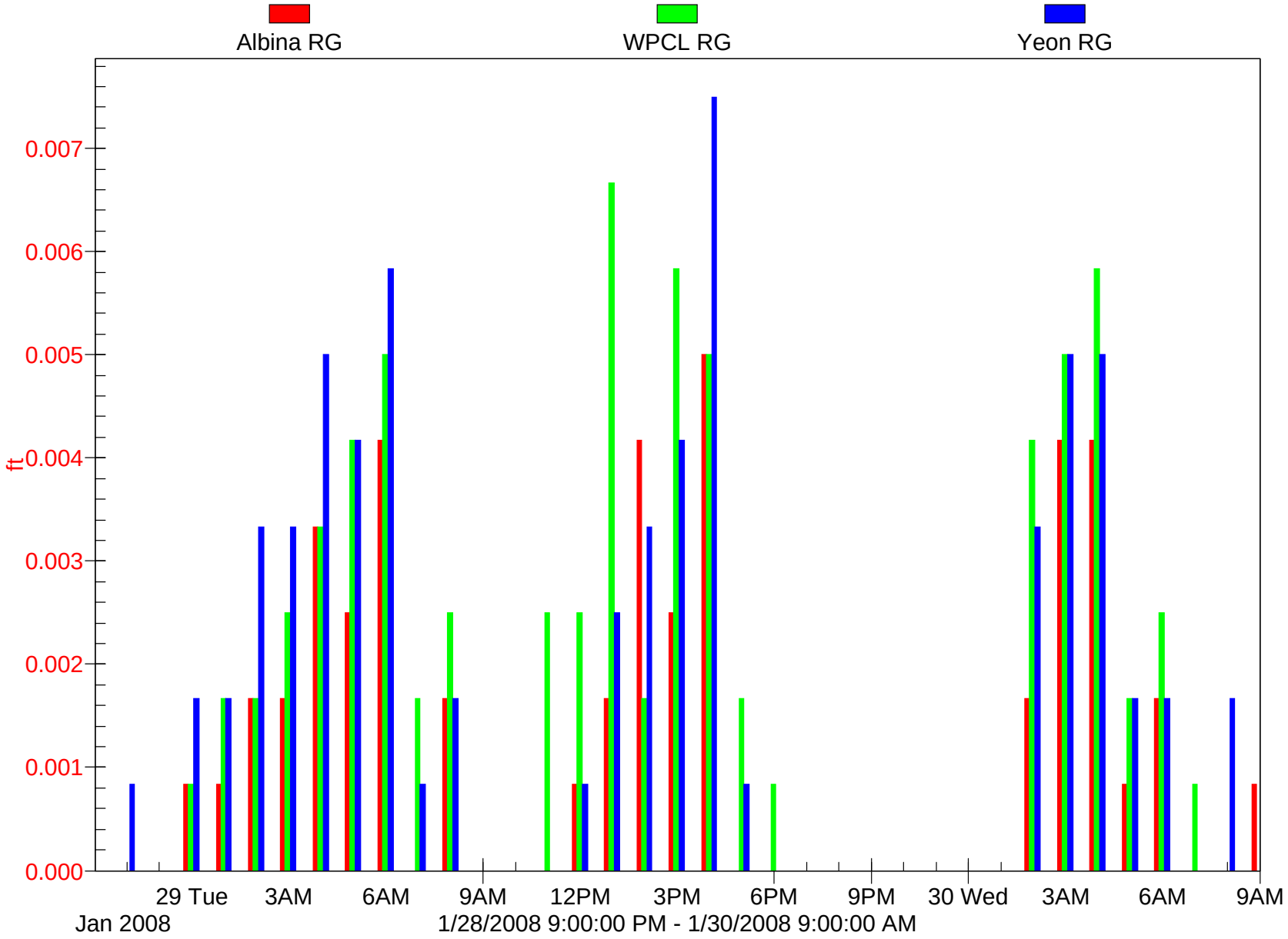
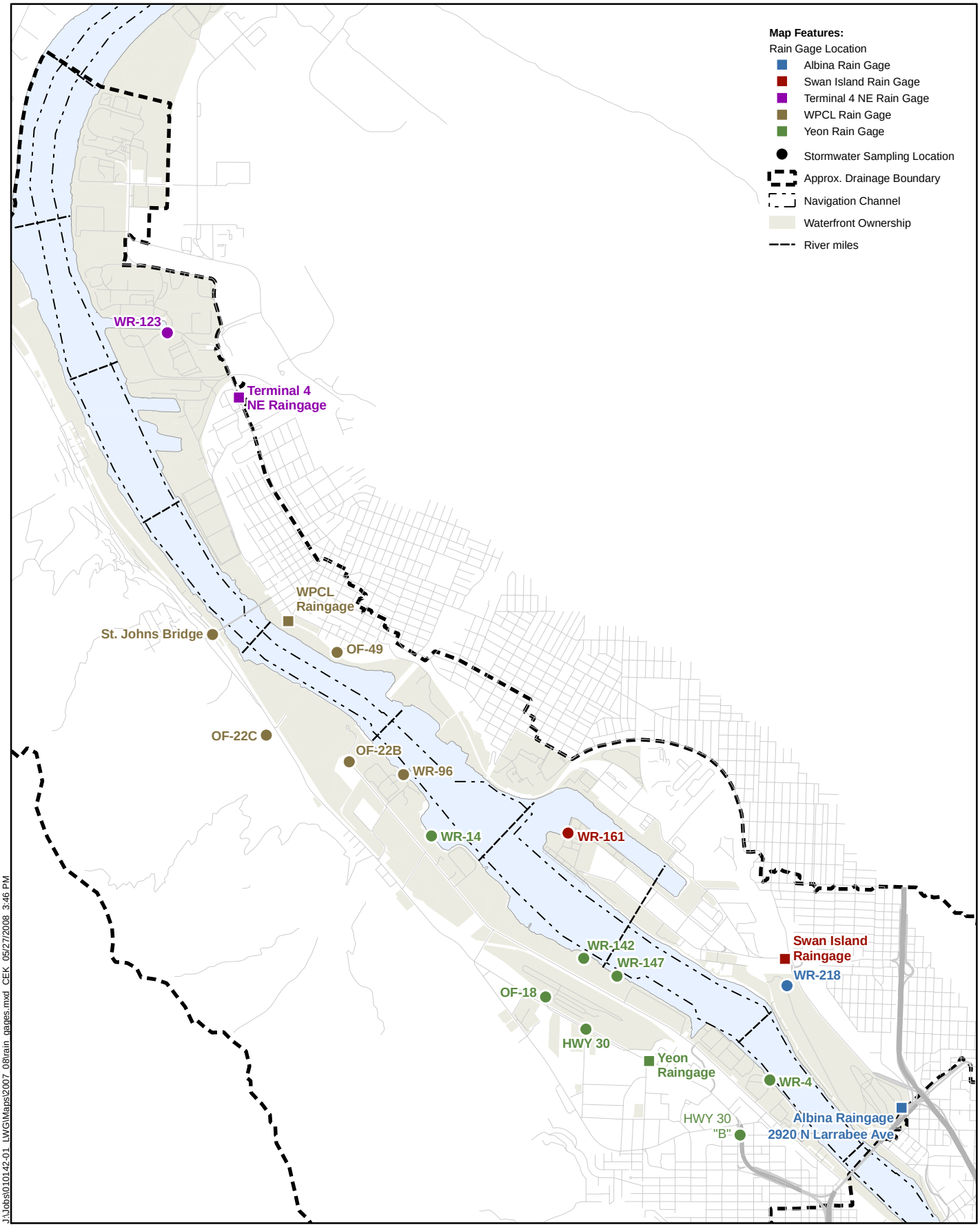


Figure 3-8 - Measured Precipitation at Rain Gages, January 28th-30th

January 30th Sampling Event





ANCHOR ENVIRONMENTAL, L.L.C.

LWG LOWER WILLAMETTE GROUP

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

* Swan Island Rain Gage was retired 9/27/2007 and replaced by new rain gage at Swan Island pump station. Location shown is approximate.

0 2,000 4,000 Feet

N

Figure 4-1
Rain Gages Assigned to Each Sampling Site
Round 3B Stormwater Field Sampling Report
Lower Willamette Group

Table of Contents

Note: The naming and ordering of Appendices A to W has been kept consistent with the Round 3A FSR so that sampling sites can easily be referenced. Consequently, there are gaps in the appendix lettering that represent locations that were not sampled in Round 3B. Thus, Appendices A, C, D, M, P, Q, R, S, U, and W are not included in this document since no sampling occurred at these stations during Round 3B Sampling. In the Round 3A FSR, these appendices presented Site-Specific Sampling Reports for the following sites:

- APPENDIX A - WR-22 OSM Site-Specific Sampling Report
- APPENDIX C – WR-384 Schnitzer - Riverside Site-Specific Sampling Report

- APPENDIX D - WR-107 GASCO Site-Specific Sampling Report
- APPENDIX M - WR-67 Siltronic Site-Specific Sampling Report
- APPENDIX P - OF-M1 City Site-Specific Sampling Report
- APPENDIX Q - OF-M2 City Site-Specific Sampling Report
- APPENDIX R - OF-22 City Site-Specific Sampling Report
- APPENDIX S - OF-16 City Site-Specific Sampling Report
- APPENDIX U - St. Johns Bridge Highway Drainage Site-Specific Sampling Report
- APPENDIX W - OF-19 City Site-Specific Sampling Report

APPENDIX B

WR-123
Schnitzer International Slip
Site-Specific Sampling Report

Appendix B – WR-123 Schnitzer International Slip Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the WR-123 outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix B for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the WR-123 outfall sampling location, located at the manhole just upstream of the outfall on the Schnitzer site:

- Flow weighted composite sampling (first round only)
- Grab water sampling (first round only)
- Sampling of stormwater suspended sediments using sediment traps (first/second rounds)

This report contains the following information:

- Table B-1 – Key Parameters for Sampling Programming
- Table B-2 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure B-1 – Drainage Basin and Sampling Location
- Figure B-2 – Diagram of Sample Equipment Setup
- Figure B-3 – Photographs of Installation
- Attachment B-1 – Reconnaissance Survey Data Sheet

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

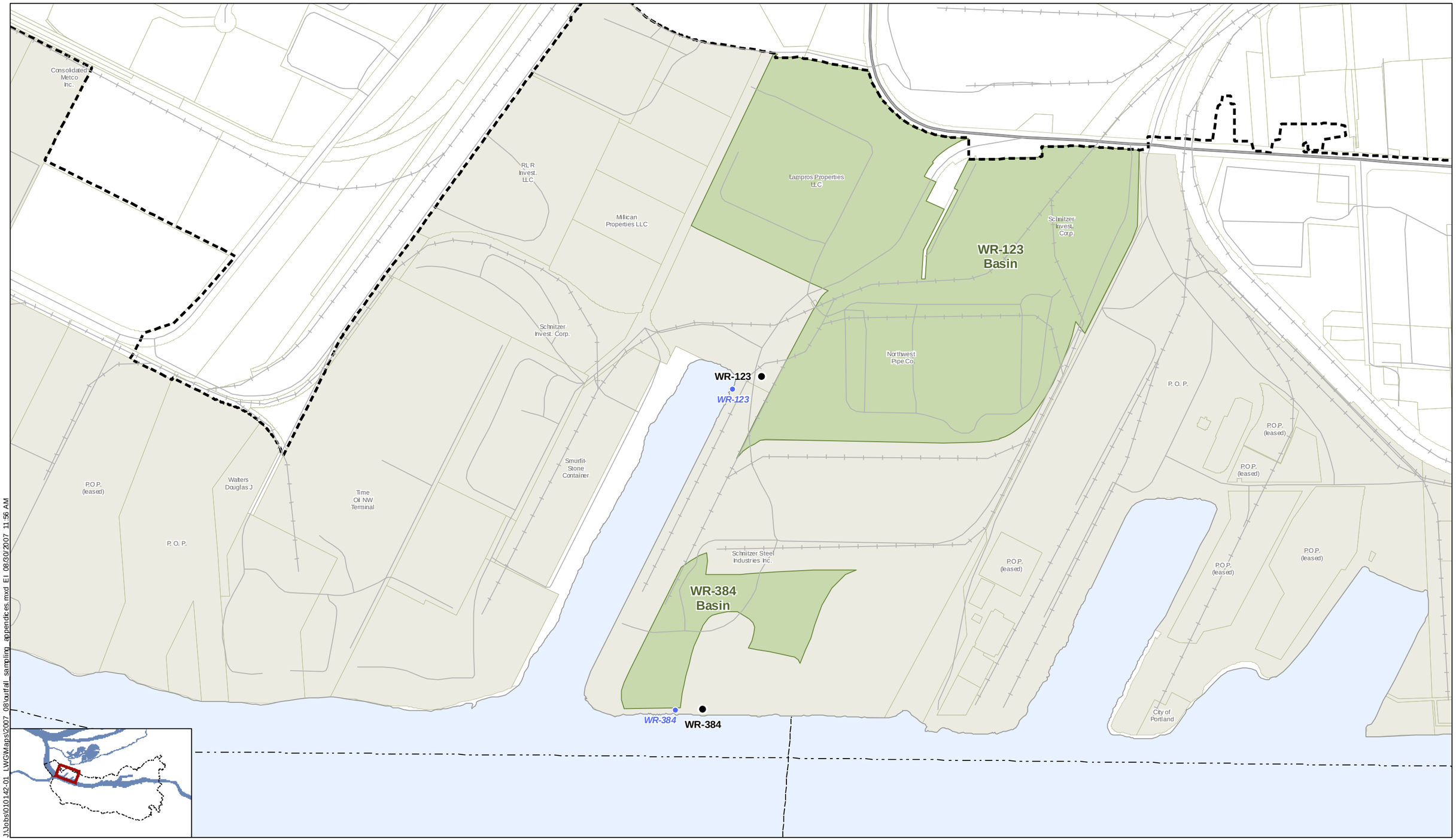
Table B-1. Key Parameters for Sampling Programming.

Parameter	
Site	WR-123: Schnitzer International Slip
Sampler Phone Number	206-450-8431
Outfall Pipe Size	48 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	25 ft

Table B-2. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	**Date**	**Depth of Sediment (in)**	**Observation/Notes**
Installation	11/15/2007		
Interim Inspection 1	12/11/2007	1/8-3/4	Rusty loose flocculent sediment, very difficult to see through bottles and determine exact volume of sediment.
Interim Inspection 2	1/11/2008	Unknown	Bottles were so opaque and rust colored that it was impossible to determine the amount or type of sediment.
Interim Inspection 3	1/30/2008	Unknown	Bottles were stained a rusty color. Water inside was rusty and opaque and sediment volume was undeterminable. Collected four bottles and replaced with new ones.
Final Removal	2/13/2008	Unknown	Loose, rusty flocculent material. Collected four bottles.

FIGURES



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ANCHOR ENVIRONMENTAL L.L.C.

LWG LOWER WILLAMETTE GROUP

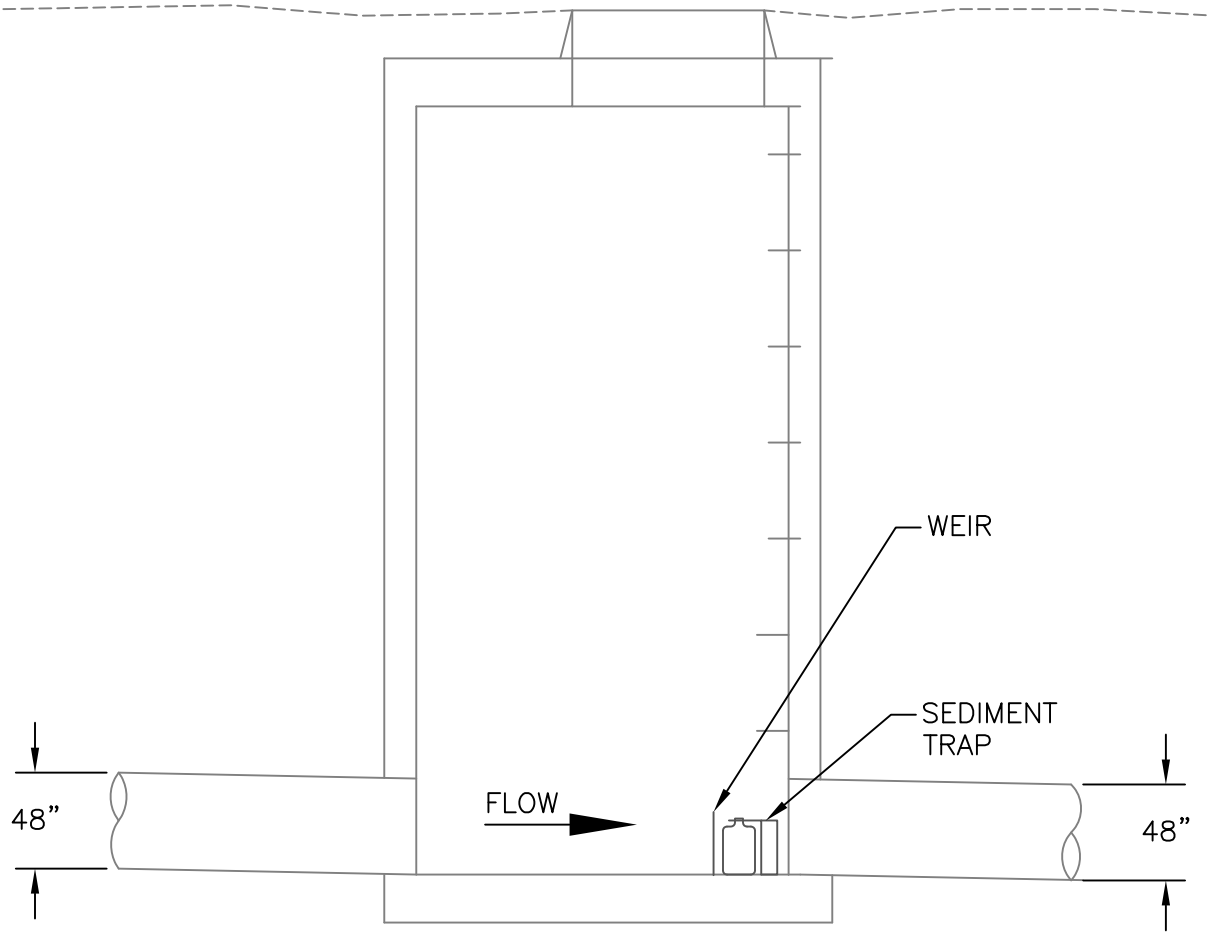
0 150 300 450 600 Feet

Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

NOTES:

Figure B-1
Drainage Basin and Sampling Location
WR-123 Schnitzer International Slip
Lower Willamette Group



INSTALLATION SECTION

NOT TO SCALE

Note: During the first round of sampling, 2 sediment trap bottles were installed at WR-123, whereas during the second round of sampling, 4 sediment trap bottles were installed.

Figure B-2

Diagram of Sampling Equipment
WR-123 Schnitzer International Slip

Sediment Traps

Sampling Manhole

Figure B-3
Photographs of the Installation
WR-123 Schnitzer International Slip

ATTACHMENT B-1

Reconnaissance Survey Data Sheet

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Outfall ID: WR-123 Schnitzer		
Contact: Mat Cusma	Cell: 503-286-5771	Office:
Team Lead: Dennis Hanzlick		

Site Access

Address:	International Terminal 12005 N. Burgard Rd. 97203
Directions:	
Access Procedure:	Contact Matt Cusma 3 days prior to access
Restrictions:	Need company vehicle to drive on-site, no Sunday access

Sampling Specifics

Sediment Trap Location:	In MH upstream of outfall
Flow Meter Location:	In MH upstream of outfall
ISCO Sampler Location:	In MH upstream of outfall

APPENDIX E

WR-96
Arkema
Site-Specific Sampling Report

Appendix E – WR-96 Arkema Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the WR-96 outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix E for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the WR-96 outfall sampling location, located at the outfall on the bank of the LWR:

- Flow weighted composite sampling (first/second rounds)
- Grab water sampling (first round only)
- Sampling of stormwater suspended sediments using sediment traps (first/second rounds)

This report contains the following information:

- Table E-1 – Key Parameters for Sampling Programming
- Table E-2 – Composite Sampling – Sampling Details for Each Second Round Event
- Table E-3 – Composite Sampling – Estimated Runoff Quantity Calculations
- Table E-4 – Composite Sampling – Summary and Compositing of Second Round Sampling Activities
- Table E-5 – Composite Sampling – Second Round Compositing Calculations
- Table E-6 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure E-1 – Drainage Basin and Sampling Location
- Figure E-2 – Diagram of Sample Equipment Setup
- Figure E-3 – Photographs of Installation
- Figure E-4 – Flowlink Graph (11/27/07)
- Attachment E-1 – Reconnaissance Survey Data Sheet

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented

by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

Table E-1. Key Parameters for Sampling Programming.

Parameter	
Site	WR-96: Arkema
Sampler Phone Number	206-450-8849
Outfall Pipe Size	41.5 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	20 ft

Table E-2. Composite Sampling – Sampling Details for Each Second Round Event.

Date of Sample Collection	**Trigger**	**Type of Sample Program**
11/27/2007	0.015 ft	Time-based

Table E-3. Composite Sampling – Estimated Runoff Quantity Calculations.

	Precipitation (in)				
Parameter	**0.2**	**0.35**	**0.5**	**0.75**	**1.50**
Impervious Area (acres)	1.54	1.54	1.54	1.54	1.54
Pervious Area (acres)	0.34	0.34	0.34	0.34	0.34
Impervious CN	96	96	96	96	96
Pervious CN	80	80	80	80	80
$Length_{sheet}$ (ft)	100	100	100	100	100
$Slope_{sheet}$	0.01	0.01	0.01	0.01	0.01
n_{sheet}	0.011	0.011	0.011	0.011	0.011
T_{sheet} (min)	6.4	6.4	6.4	6.4	6.4
$Length_{channel}$ (min)	100	100	100	100	100
$k_{channel}$	27	27	27	27	27
$Slope_{channel}$	0.005	0.005	0.005	0.005	0.005
$T_{channel}$ (min)	0.9	0.9	0.9	0.9	0.9
Time of Conc. (min)	7.3	7.3	7.3	7.3	7.3
Peak Discharge (cfs)	0.00	0.03	0.07	0.16	0.25
Peak Discharge (gpm)	1	13	33	72	114
Volume (cf)	143	581	1,164	2,320	3,624
Volume (gallons)	1,066	4,349	8,707	17,356	27,109

Table E-4. Composite Sampling – Summary and Compositing of Second Round Sampling Activities.

Sample Event ID	Date Collected	Retrieval Time	Composite Instructions	Notes
No sample	11/16/2007	None	None	No samples collected.
LW3-STW2-CW10-WR96	11/27/2007	1035	A - 1426 ml	A-F - 100% full, clear to slightly yellow, no sediment, H - 0% full.
			B - 1820 ml	
			C - 1576 ml	
			D - 1397 ml	
			E - 1113 ml	
			F - 992 ml	
			G - 975 ml	
			H - field blank	

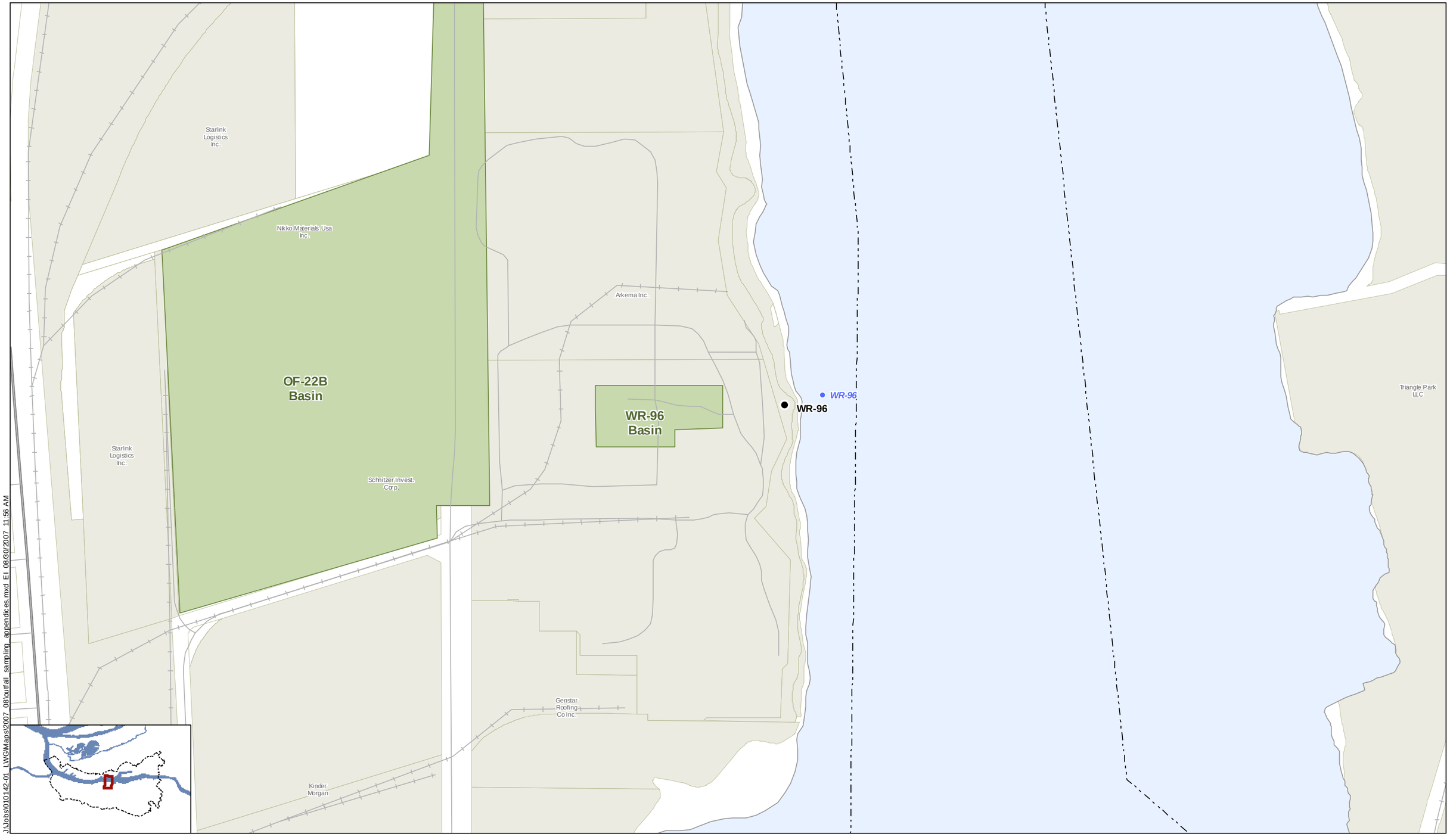
Table E-5. Composite Sampling – Second Round Compositing Calculations.

Date	Bottle	Total Level During Time Period (ft in 5 minute increments)	Volume of Sample in Jar (mL)	Jar Contribution to Sample	Volume from Jar (mL)	Normalized to Largest Bottle Volume (mL)
11/27/2007	A	0.994	1820	0.15	1953	1426
	B	1.269	1820	0.20	2493	1820
	C	1.099	1830	0.17	2159	1576
	D	0.974	1830	0.15	1914	1397
	E	0.776	1810	0.12	1525	1113
	F	0.692	1820	0.11	1360	992
	G	0.68	1810	0.10	1336	975
	Total	**6.5**	**12740.0**	**1.0**	**12740.0**	**9299**

Table E-6. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	Date	Depth of Sediment (in)	Observation/Notes
Installation	11/13/2007		
Interim Inspection 1	12/11/2007	0	No sediment to classify.
Interim Inspection 2	1/15/2008	Trace	Barely a trace of sediment in any of the bottles. Water was slightly yellowish but mostly clear.
Interim Inspection 3	1/30/2008	Trace	Slightly yellowish water with no measurable sediment in any of the eight bottles. Not enough sediment to collect.
Final Removal	2/11/2008	0-Trace	Slightly yellowish water, no measurable sediment. Collected all eight bottles. Scooped sediment into two 1.8 liter jars.

FIGURES



ANCHOR ENVIRONMENTAL L.L.C.

LWG LOWER WILLAMETTE GROUP

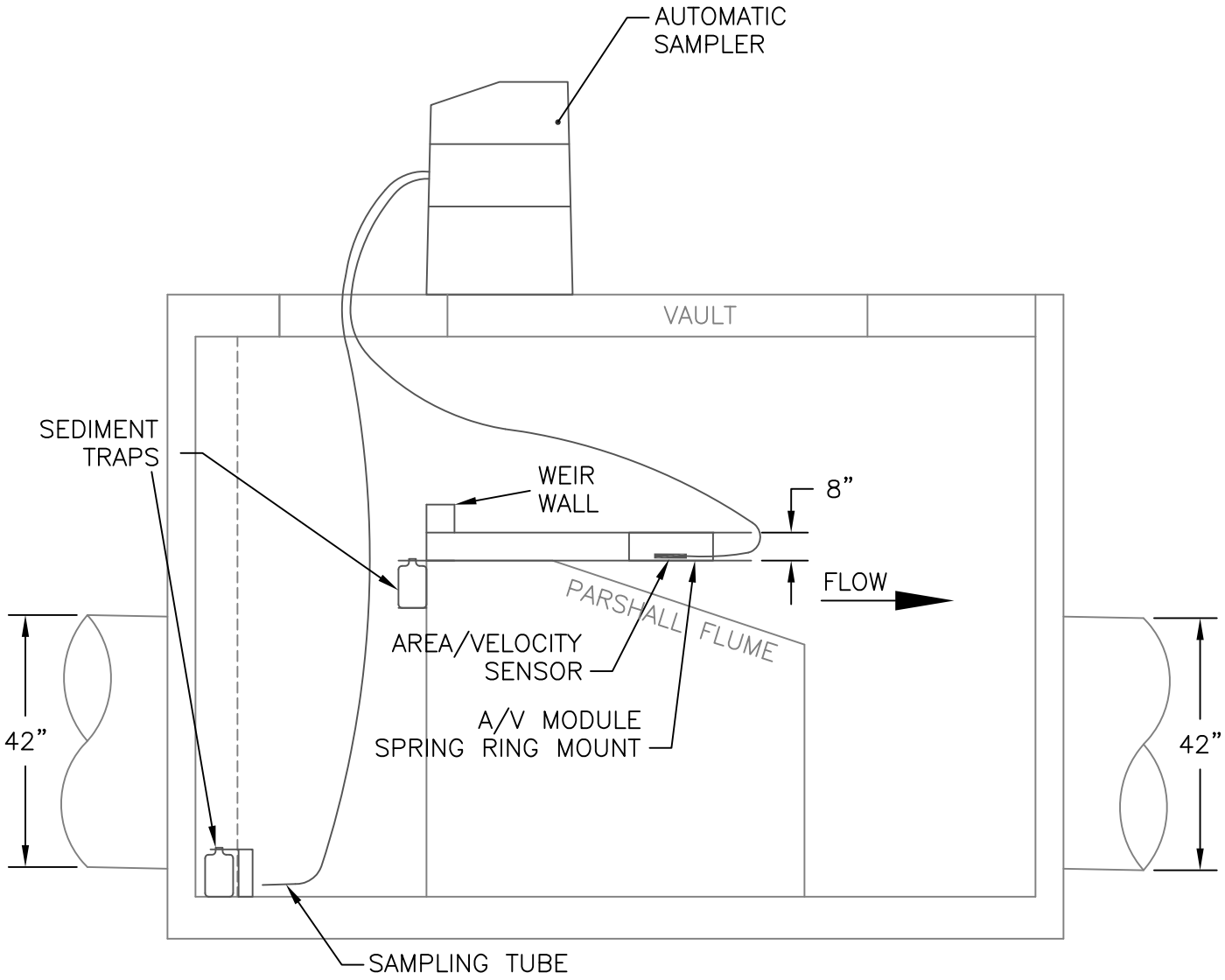
0 90 180 270 360 Feet

Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

NOTES:

Figure E-1
Drainage Basin and Sampling Location
WR-96 Arkema
Lower Willamette Group



INSTALLATION
SECTION

NOT TO SCALE

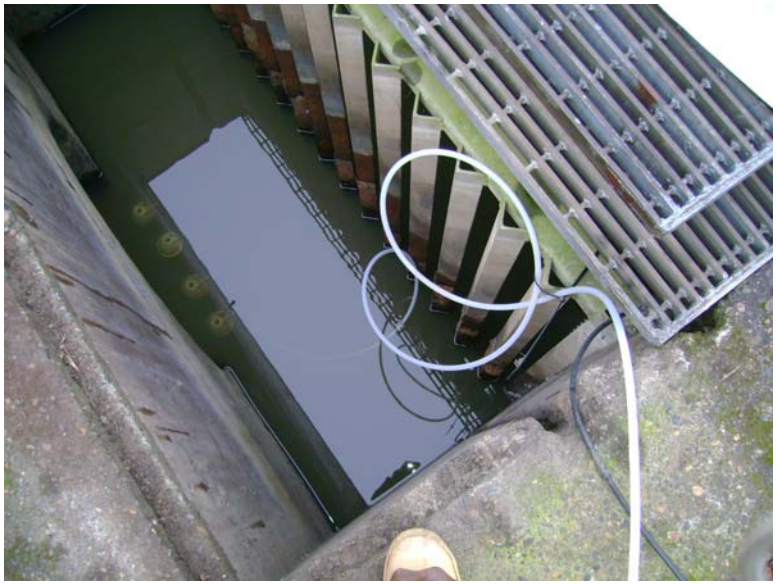
Note: During the first round of sampling, 2 sediment trap bottles were installed at WR–96, whereas during the second round of sampling, 8 sediment trap bottles were installed.

Apr 29, 2008 12:18pm bhayworth C:\Documents and Settings\bhayworth\Desktop\LWG Round 2 Sampling Figure alpha-2 04292008 bw.dwg WR-96

Figure E-2

Diagram of Sampling Equipment
WR-96 Arkema

Sediment Traps with Standing Water



Vault with Sediment Traps and ISCO Cabling

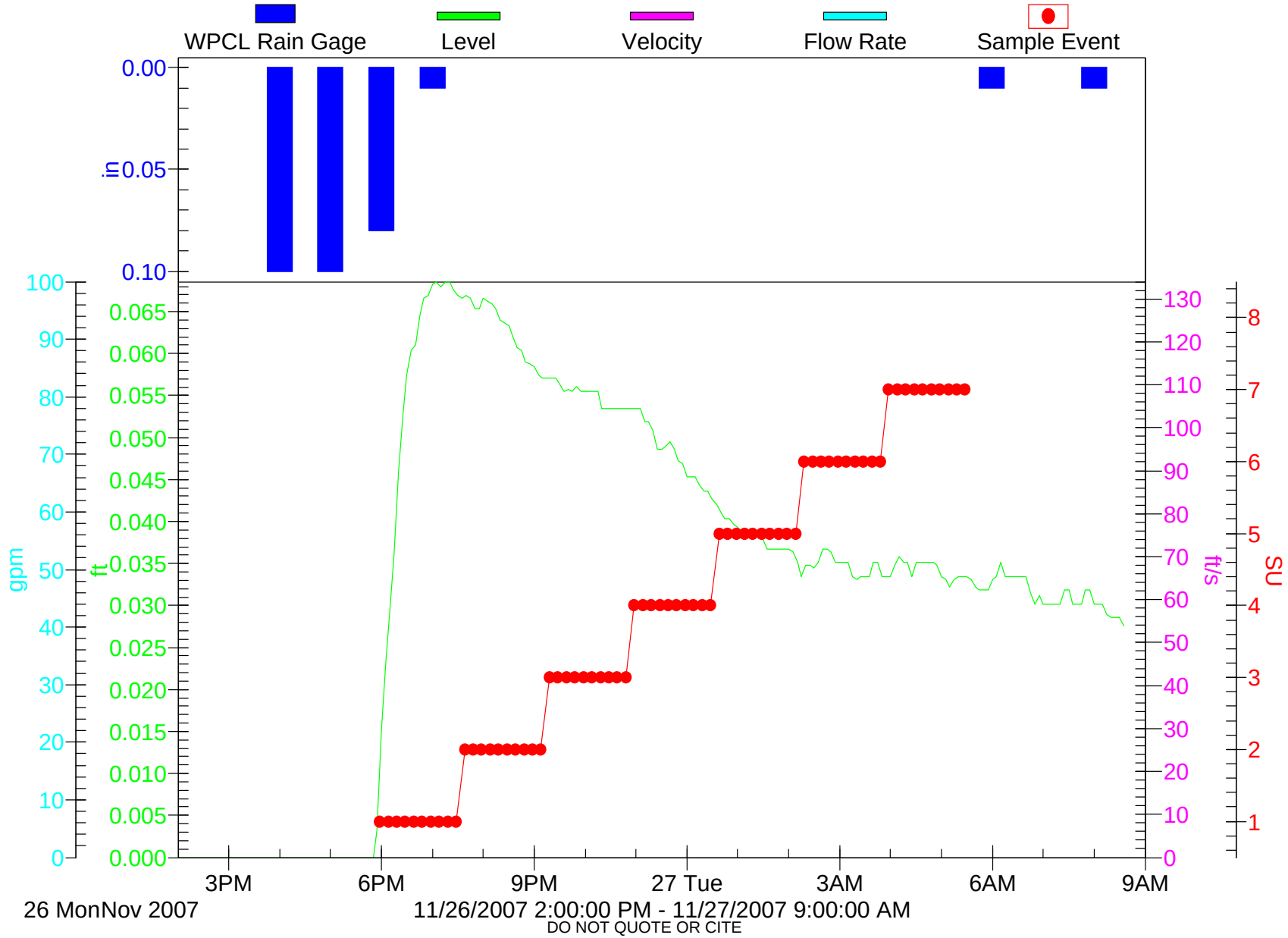
Weir

ANCHOR ENVIRONMENTAL, L.L.C.

Figure E-3
Photographs of the Installation
WR-96 Arkema

Figure E-4 WR-96 Arkema

November 27th Sampling Event



ATTACHMENT E-1

Reconnaissance Survey Data Sheet

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Outfall Reference Sheet – Lower Willamette Group

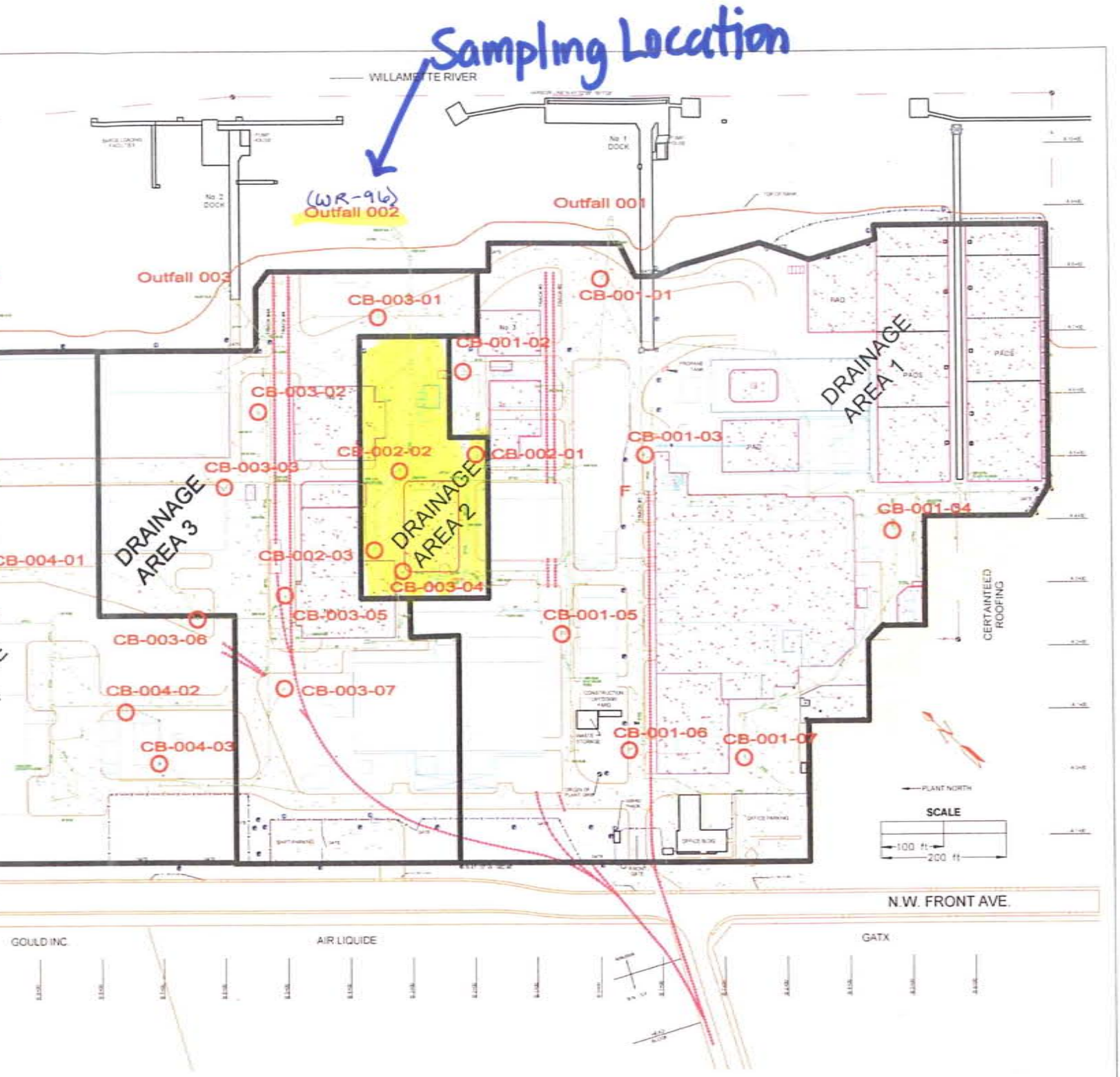
Outfall ID: WR-96 Arkema		
Contact: Larry Patterson	Cell: 503-539-5112	Office: 503-225-7210
Team Lead: Shawn Hinz		

Site Access

Address:	**NW CULEBRA ST AT NW 61ST AVE, PORTLAND**
Directions:	Turn R **Right** on **NW 19TH AVE** - **go 0.0** mi Turn R **Right** on **US-30 W** - **go 0.4** mi Continue on **NW VAUGHN ST** - **go 0.5** mi Continue on **NW WARDWAY ST** - **go 0.1** mi Bear L **Left** on **NW NICOLAI ST** - **go 0.1** mi Continue on **NW ST HELENS RD** - **go 2.4** mi Turn R **Right** on **NW BALBOA AVE** - **go 0.1** mi Continue on **NW CULEBRA AVE** - **go 0.1** mi Arrive at site
Access Procedure:	Gate is immediately on right, labeled as Atofina. Pull up to gate and honk.
Restrictions:	Confined Space

Sampling Specifics

Sediment Trap Location:	In Stainless Steel Catch Basin to be placed in vault
Flow Meter Location:	In outlet pipe from catch basin
ISCO Sampler Location:	Mounted in Vault, or Above Ground



WR-96

WATER LEGEND

DRAINAGE AREA (approx)

LEGEND

LEGAL BOUNDARY EASEMENT

FOUNDATIONS ASPHALT PADS IMPERVIOUS

STREETS PARKING AREAS IMPERVIOUS

RAILROAD

FENCE

LIGHT POLE, POWER POLE

ARKEMA

Arkema Inc. 6400 NW Front Ave, Portland, OR 97210

Figure 1. Outfall and Catch Basin Sampling Locations

DRAWN BY JMB DATE 05/31/05 SCALE 1" = 100'

DWG No. P - 003 - 00052 REV. 4 APPROVED

APPENDIX F

WR-14
Chevron - Transportation
Site-Specific Sampling Report

Appendix F – WR-14 Chevron – Transportation Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the WR-14 outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix F for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the WR-14 outfall sampling location, located at the outfall on the bank of the LWR:

- Flow weighted composite sampling (first round only)
- Sampling of stormwater suspended sediments using sediment traps (first/second rounds)

This report contains the following information:

- Table F-1 – Key Parameters for Sampling Programming
- Table F-2 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure F-1 – Drainage Basin and Sampling Location
- Figure F-2 – Diagram of Sample Equipment Setup
- Figure F-3 – Photographs of Installation
- Attachment F-1 – Reconnaissance Survey Data Sheet

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

Table F-1. Key Parameters for Sampling Programming.

Parameter	
Site	WR-14: Chevron - Transportation
Sampler Phone Number	206-450-8437
Outfall Pipe Size	3.875 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	14 ft

Table F-2. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	**Date**	**Depth of Sediment (in)**	**Observation/Notes**
Installation	11/13/2007		
Interim Inspection 1	12/10/2007	1/8	Dark, flocculent material.
Interim Inspection 2	1/10/2008	1/8-1/2	Loose dark flocculent material.
Interim Inspection 3	1/28/2008	1/8-1/2	Loose, dark flocculent material. Collected four bottles and replaced with new ones.
Final Removal	2/12/2008	1/8	Dark sediment. Collected four bottles.

FIGURES

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ANCHOR ENVIRONMENTAL L.L.C.

0 90 180 270 360 Feet

LWG LOWER WILLAMETTE GROUP

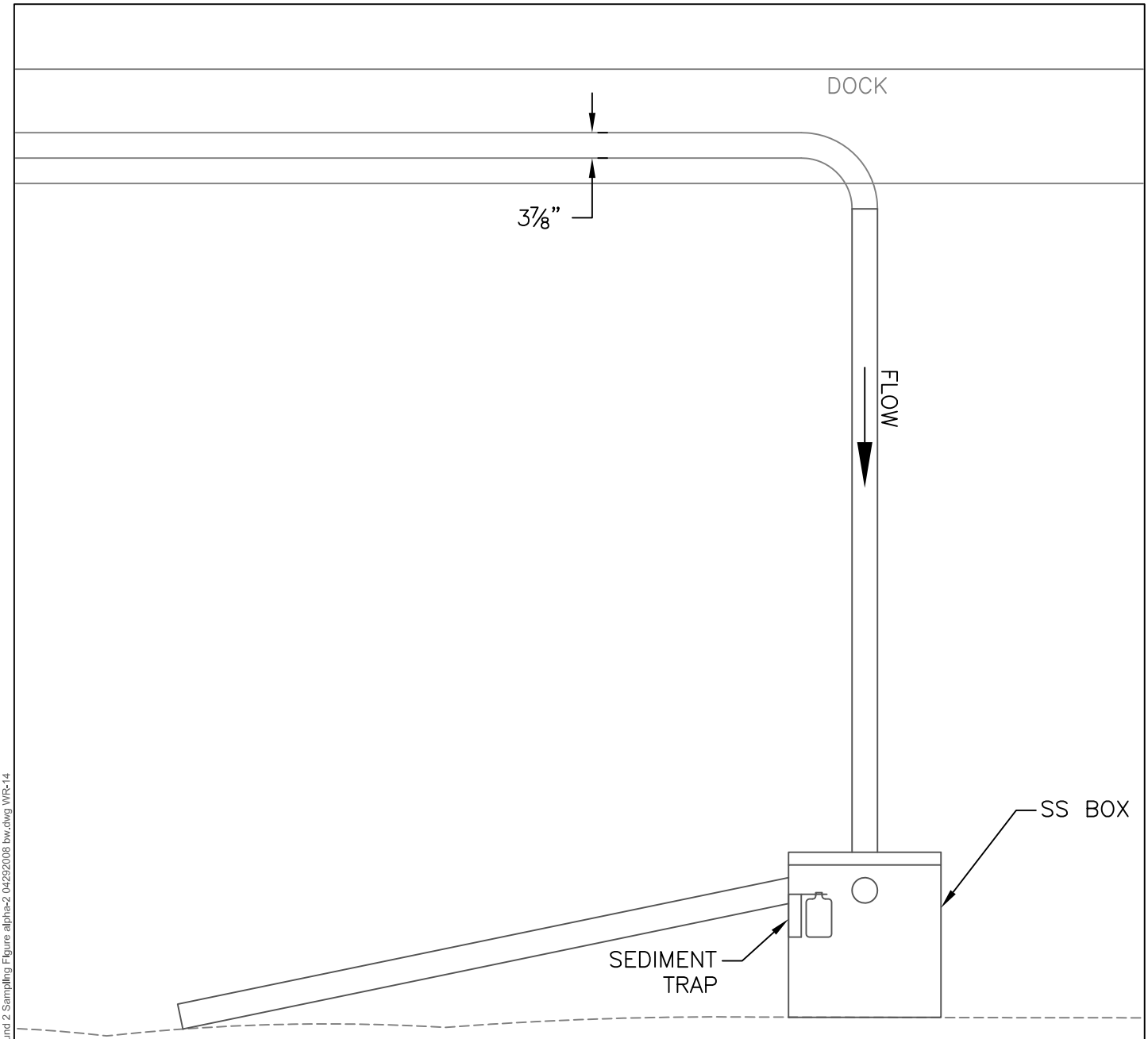
Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

NOTES:

DO NOT QUOTE OR CITE
This document is currently under review by U.S. EPA and its federal, state and tribal partners and is subject to change in whole or in part

Figure F-1
Drainage Basin and Sampling Location
WR-14 Chevron - Transportation
Lower Willamette Group



INSTALLATION SECTION

NOT TO SCALE

Note: During the first round of sampling, 2 sediment trap bottles were installed at WR-14, whereas during the second round of sampling, 4 sediment trap bottles were installed.

Figure F-2

Diagram of Sampling Equipment
WR-14 Chevron

Site Setup
Note: This photograph is from the first round installation.

Stainless Steel Catch Basin with Sediment Traps

Figure F-3
Photographs of the Installation
WR-14 Chevron – Transportation

ATTACHMENT F-1

Reconnaissance Survey Data Sheet

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Outfall Reference Sheet – Lower Willamette Group

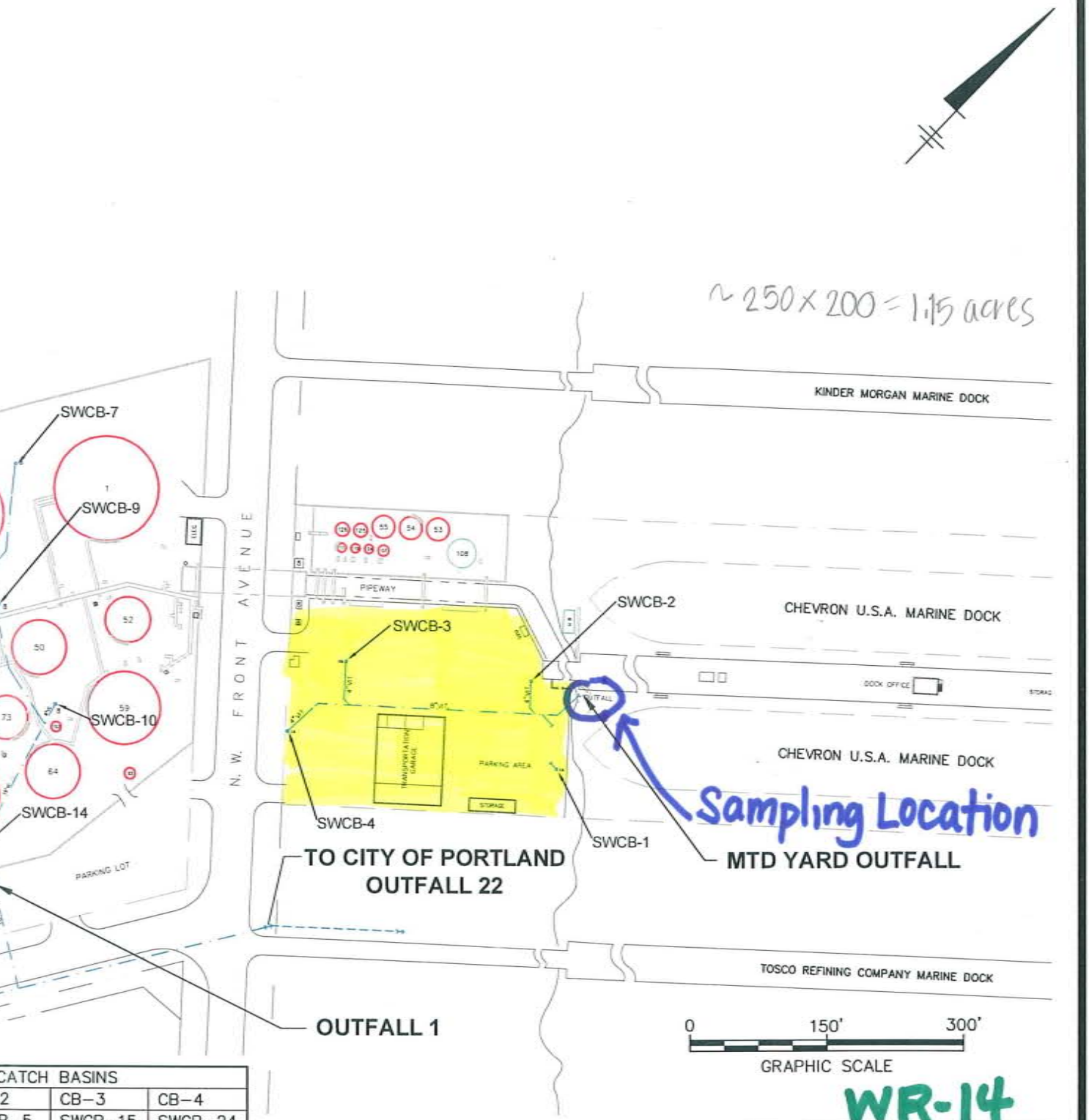
Outfall ID: WR-14 Chevron		
Contact: Grant Sprick	Office: 503-220-8201	Extension 1104
Team Lead: Amanda Shellenberger		

Site Access

Address:	**5924 NW FRONT AVE, PORTLAND**
Directions:	Bear (R) **Right** on **NW 20TH AVE** - **go 0.2** mi Turn (L) **Left** on **NW YORK ST** - **go 0.1** mi Turn (R) **Right** on **NW 21ST AVE** - **go 0.2** mi Turn (L) **Left** on **NW FRONT AVE** - **go 2.8** mi Arrive at site on the (R) **Right**
Access Procedure:	Park in parking lot in front of shop, and check in with guard.
Restrictions:	

Sampling Specifics

Sediment Trap Location:	In stainless steel catch basin bolted to bridge pier
Flow Meter Location:	In catch basin outlet pipe
ISCO Sampler Location:	Next to catch basin on bridge pier



CATCH BASINS		
2	CB–3	CB–4
B–5	SWCB–15	SWCB–24
B–6	SWCB–16	SWCB–25
B–7	SWCB–17	SWCB–26
B–8	SWCB–18	
B–9	SWCB–19	
B–10	SWCB–20	
B–11	SWCB–21	
B–12	SWCB–22	
B–13	SWCB–23	
B–14		

LEGEND:
- STORM DRAIN
- REFINED PRODUCTS TANK
- LUBE PRODUCTS TANK

WR-14

CHEVRON ENVIRONMENTAL MANAGEMENT COMPANY
CHEVRON WILLBRIDGE DISTRIBUTION CENTER
SITE NO. 100-1868
5531 NW DOANE AVE, PORTLAND, OREGON
STORMWATER EVALUATION WORK PLAN

STORMWATER DRAINAGE SYSTEM MAP

BBL ENVIRONMENTAL SERVICES, INC. an ARCADIS company

FIGURE **2**

APPENDIX G

WR-161
Portland Shipyard
Site-Specific Sampling Report

Appendix G – WR-161 Portland Shipyard Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the WR-161 outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix G for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the WR-161 outfall sampling location, located in the manhole just upstream of the outfall on the Portland Shipyard site:

- Flow weighted composite sampling (first round only)
- Grab water sampling (first round only)
- Sampling of stormwater suspended sediments using sediment traps (first/second rounds)

This report contains the following information:

- Table G-1 – Key Parameters for Sampling Programming
- Table G-2 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure G-1 – Drainage Basin and Sampling Location
- Figure G-2 – Diagram of Sample Equipment Setup
- Figure G-3 – Photographs of Installation
- Attachment G-1 – Reconnaissance Survey Data Sheet

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

Table G-1. Key Parameters for Sampling Programming.

Parameter	
Site	WR-161: Portland Shipyard
Sampler Phone Number	206-450-8441
Outfall Pipe Size	8 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	12 ft

Table G-2. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	**Date**	**Depth of Sediment (in)**	**Observation/Notes**
Installation	11/13/2007		
Interim Inspection 1	12/11/2007	1/8-1/4	Dark flocculent sediment, some rust coloration.
Interim Inspection 2	1/10/2008	Trace-1/16	Dark sediment.
Interim Inspection 3	1/29/2008	1/16	Dark sediment. Collected four bottles and replaced with new ones.
Final Removal	2/12/2008	Trace	Trace amounts of dark, flocculent sediment. Removed all four bottles.

FIGURES

ANCHOR ENVIRONMENTAL L.L.C.

LWG LOWER WILLAMETTE GROUP

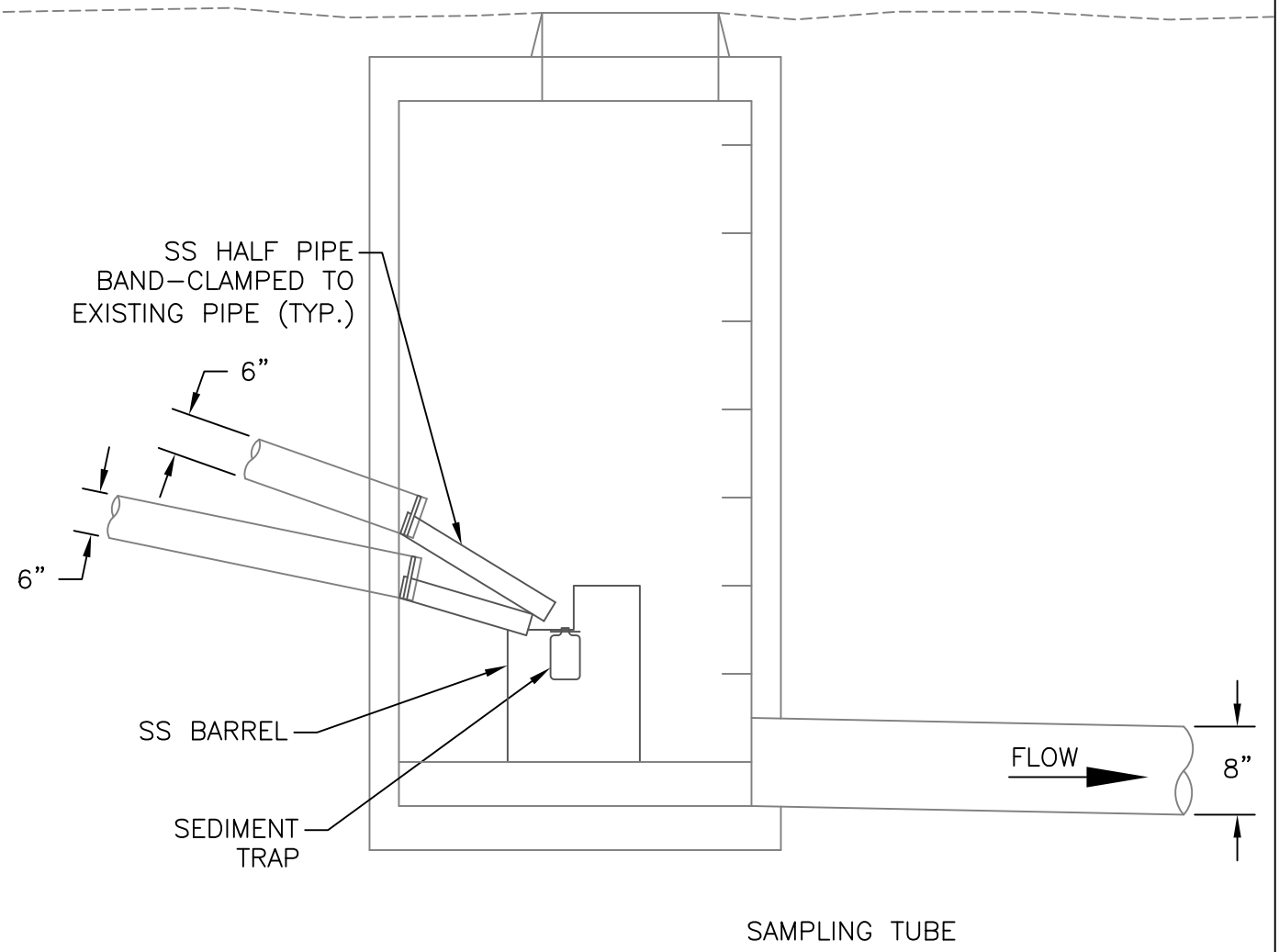
0 125 250 375 500 Feet

Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

NOTES:

Figure G-1
Drainage Basin and Sampling Location
WR-161 Portland Shipyard
Lower Willamette Group



INSTALLATION
SECTION

NOT TO SCALE

Note: During the first round of sampling, 2 sediment trap bottles were installed at WR–161, whereas during the second round of sampling, 4 sediment trap bottles were installed.

Figure G-2

Diagram of Sampling Equipment
WR-161 Portland Shipyard

Stainless Steel Catch Basin with Sediment Traps

Sampling Manhole

ANCHOR ENVIRONMENTAL, L.L.C.

Figure G-3
Photographs of the Installation
WR-161 Portland Shipyard

ATTACHMENT G-1

Reconnaissance Survey Data Sheet

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Outfall Reference Sheet – Lower Willamette Group

Outfall ID: WR-161 Port of Portland Cascade General		
Contact: Jim McKenna	Office: 503-944-7353	
Team Lead: Amanda Shellenberger		

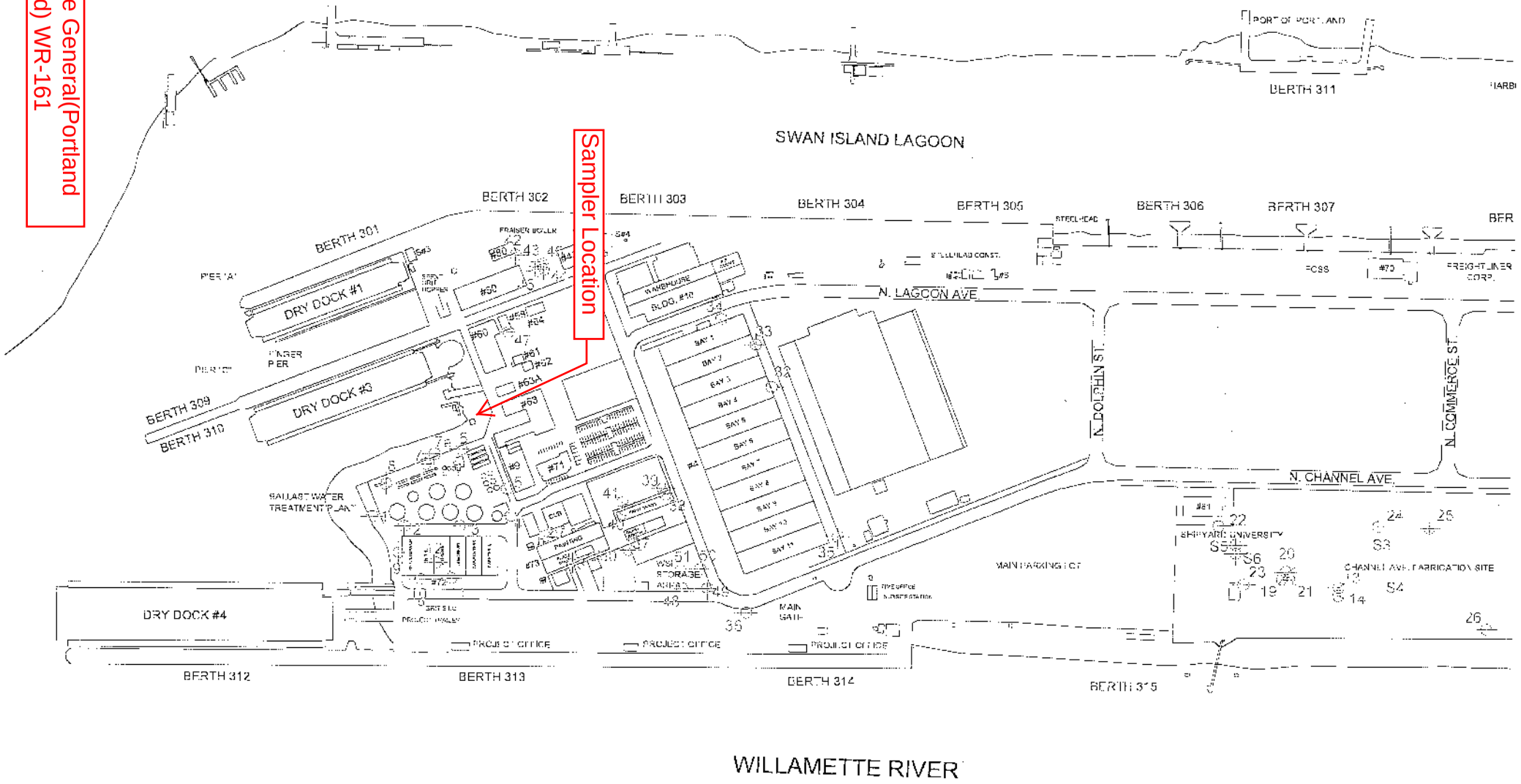
Site Access

Address:	**5555 N CHANNEL AVE, PORTLAND**
Directions:	Bear **Right** on **NW 20TH AVE** - **go 0.1** mi Turn **Left** on **NW WILSON ST** - **go 0.3** mi Turn **Left** on **NW 23RD AVE** - **go 0.0** mi Turn **Left** on **US-30 E** toward **THURMAN ST.** - **go 0.1** mi Take **Left** ramp onto **US-30 EAST** toward **I-405** - **go 0.3** mi Take the **I-405 NORTH** **Left** exit toward **SEATTLE/THE DALLES** - **go 0.9** mi Take the **I-5 NORTH** exit toward **SEATTLE** - **go 0.7** mi Take exit **#303/KILLINGSWORTH ST.** onto **N GOING ST** toward **SWAN ISLAND** - **go 1.3** mi Bear **Right** on **N LAGOON AVE** - **go 0.9** mi Turn **Left** on **N DOLPHIN ST** - **go 0.1** mi Turn **Right** on **N CHANNEL AVE** - **go 0.1** mi Arrive at site
Access Procedure:	Wait at gate for representative to meet us.
Restrictions:	

Sampling Specifics

Sediment Trap Location:	In MH upstream of outfall, one hanging from each inlet (2 total)
Flow Meter Location:	In 8-inch outlet pipe in upstream MH
ISCO Sampler Location:	Hanging in MH, or next to MH (need to secure)

Cascade General(Portland Shipyard) WR-161



APPENDIX H

WR-4
Sulzer Pump
Site-Specific Sampling Report

Appendix H – WR-4 Sulzer Pump Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the WR-4 outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix H for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the WR-4 outfall sampling location, located at the outfall on the bank of the LWR:

- Flow weighted composite sampling (first/second rounds)
- Sampling of stormwater suspended sediments using sediment traps (first round only)

This report contains the following information:

- Table H-1 – Key Parameters for Sampling Programming
- Table H-2 – Composite Sampling – Sampling Details for Each Second Round Event
- Table H-3 – Composite Sampling – Estimated Runoff Quantity Calculations
- Table H-4 – Composite Sampling – Summary and Compositing of Second Round Sampling Activities
- Table H-5 – Composite Sampling – Second Round Compositing Calculations
- Table H-6 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure H-1 – Drainage Basin and Sampling Location
- Figure H-2 – Diagram of Sample Equipment Setup
- Figure H-3 – Photographs of Installation
- Figure H-4 – Flowlink Graph (01/11/08)
- Figure H-5 – Flowlink Graph (01/15/08)
- Figure H-6 – Flowlink Graph (01/30/08)

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented

by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

Table H-1. Key Parameters for Sampling Programming.

Parameter	
Site	WR-4: Sulzer Pump
Sampler Phone Number	206-450-8436
Outfall Pipe Size	~12 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	25 ft

Table H-2. Composite Sampling – Sampling Details for Each Second Round Event.

Date of Sample Collection	**Trigger**	**Type of Sample Program**
1/11/2008	0.15 ft	Time-based
1/15/2008	0.15 ft	Time-based
1/30/2008	0.15 ft	Time-based

Table H-3. Composite Sampling – Estimated Runoff Quantity Calculations.

	Precipitation (in)				
Parameter	**0.2**	**0.35**	**0.5**	**0.75**	**1.50**
Impervious Area (acres)	3	3	3	3	3
Pervious Area (acres)	0	0	0	0	0
Impervious CN	98.5	98	97.5	96.5	96
Pervious CN	80	80	80	80	80
$Length_{sheet}$ (ft)	100	100	100	100	100
$Slope_{sheet}$	0.01	0.01	0.01	0.01	0.01
n_{sheet}	0.011	0.011	0.011	0.011	0.011
T_{sheet} (min)	6.4	6.4	6.4	6.4	6.4
$Length_{channel}$ (min)	100	100	100	100	100
$k_{channel}$	27	27	27	27	27
$Slope_{channel}$	0.005	0.005	0.005	0.005	0.005
$T_{channel}$ (min)	0.9	0.9	0.9	0.9	0.9
Time of Conc. (min)	7.3	7.3	7.3	7.3	7.3
Peak Discharge (cfs)	0.06	0.14	0.22	0.34	0.50
Peak Discharge (gpm)	28	63	98	153	222
Volume (cf)	972	2,027	3,108	4,803	6,860
Volume (gallons)	7,272	15,164	23,249	35,926	51,313

Table H-4. Composite Sampling – Summary and Compositing of Second Round Sampling Activities.

Sample Event ID	Date Collected	Retrieval Time	Composite Instructions	Notes
LW3-STW2-CW10-WR4	1/11/2008	830	A - 1226 ml	A,B - 110% full, clear.
			B - 1741 ml	
			C - 80 ml	C - 5% full, clear.
			D - 1132 ml	D - 70% full, clear.
			E, F, G, H – discard*	E - 10% full, clear. F - 5% full, clear. G -20% full, clear. H - 2% full, clear.
LW3-STW2-CW20-WR4	1/15/2008	1320	A - collect sample for TSS and TOC	A - 80% full, clear with dusting of sediment.
				B-H - 0% full.
No sample	1/28/2007	920	A, B-discard	A - 100% full, clear. B - 10% full, clear. C, D, E, F, G, H - 0% full.
LW3-STW2-CW30-WR4	1/30/2008	1200	A - 834 ml	A, B, C - 100% full, clear with trace sediment.
			B - 1233 ml	
			C - 1950 ml	
			D - 928 ml	D - 110% full, clear with less sediment.
			E - 315 ml	E - 30% full, clear.
			F, G, H - blank	F, G, H - 0% full.

*Bottles E, F, G, H were discarded because due to very low liquid levels, the sampler failed to collect water each time it sampled…therefore it would be difficult to composite correctly. By using the samples from bottles A, B, C, and D, FSP requirements were still met because more than 50% of the storm was sampled, and portions of both the rising and falling limbs of the hydrograph were sampled. The sampled portion of the storm (collected in bottles A, B, C, and D) is approximately 20,000 gallons out of a total storm volume of 26,000 gallons, which is 75% of the storm. Additionally, bottle C had limited volume, so could only contribute 3% instead of 20%. However, overall over 50% of storm was sampled so it should still be considered a representative sample.

Table H-5. Composite Sampling – Second Round Compositing Calculations.

Date	Bottle	Total Flow in Time Period (gal) [1]; Total Level During Time Period (ft in 5 minute increments)[2]	Volume of Sample in Jar (mL)	Jar Contribution to Sample	Volume from Jar (mL)	Normalized to Largest Bottle Volume (mL)
1/11/2008[1]	A	962	1900	0.24	1226	1226
	B	1366	1910	0.34	1741	1741
	C	786	80	0.20	1002	80
	D	888	1210	0.22	1132	1132
	Total	**4002**	**5100**	**1**	**5100**	**2952**
1/30/2008[2]	A	0.80	1945	0.16	1336	834
	B	1.19	1950	0.23	1975	1233
	C	1.88	1950	0.37	3123	1950
	D	0.89	1930	0.18	1486	928
	E	0.30	650	0.06	504	315
	Total	**5.06**	**8425.00**	**1.00**	**8425.00**	**5259.91**

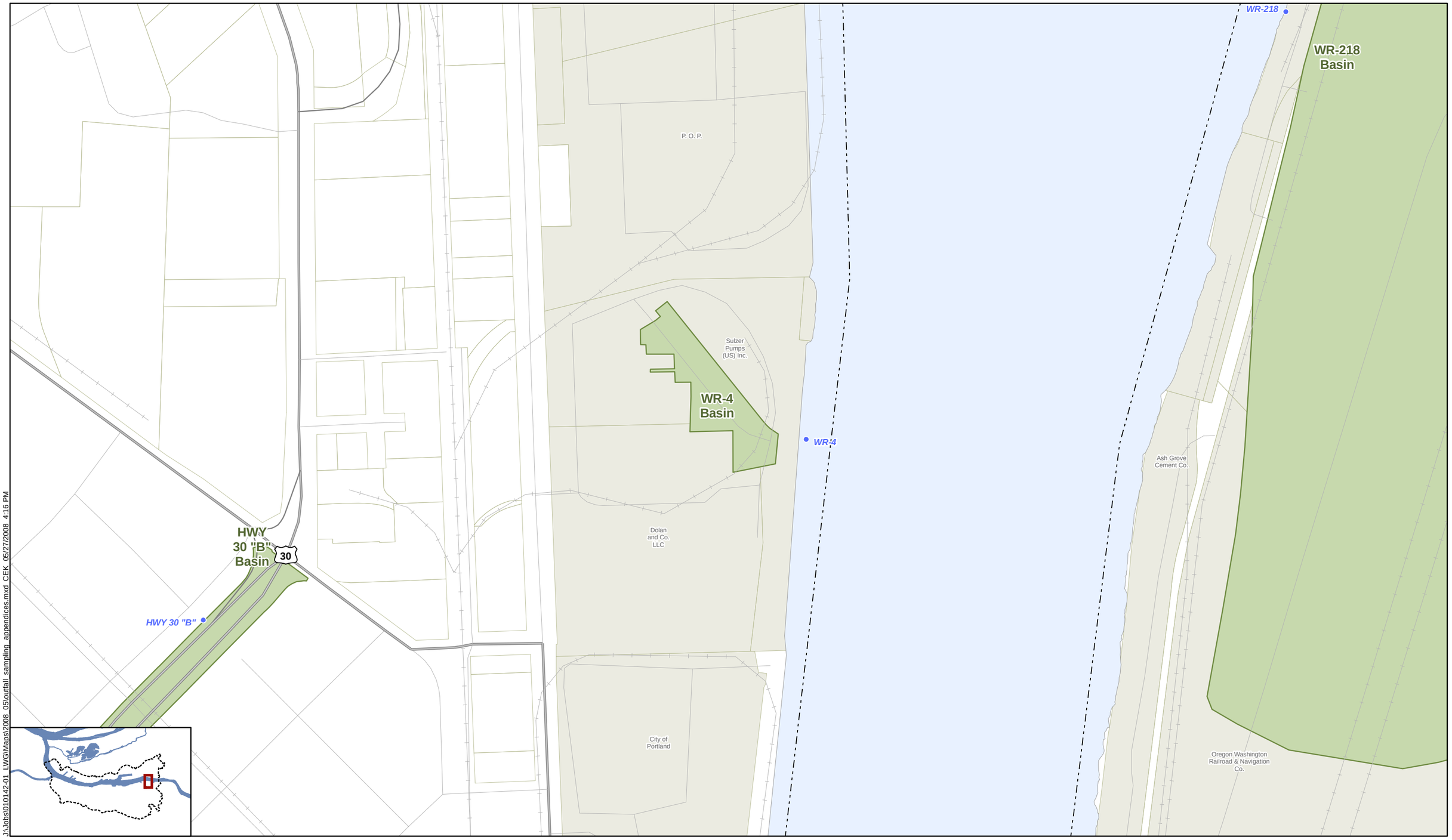
Note: 1. Indicates that for the dates denoted the compositing calculations were based on the total flow in gallons during the time period

2. Indicates that for the dates denoted the compositing calculations were based on the total level in feet (in 5 minute increments) during the time period

Table H-6. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	Date	Depth of Sediment (in)	Observation/Notes
Installation			No sediment trap was installed. No feasible location was identified.

FIGURES



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ANCHOR ENVIRONMENTAL, L.L.C.

0 110 220 330 440 Feet

LWG LOWER WILLAMETTE GROUP

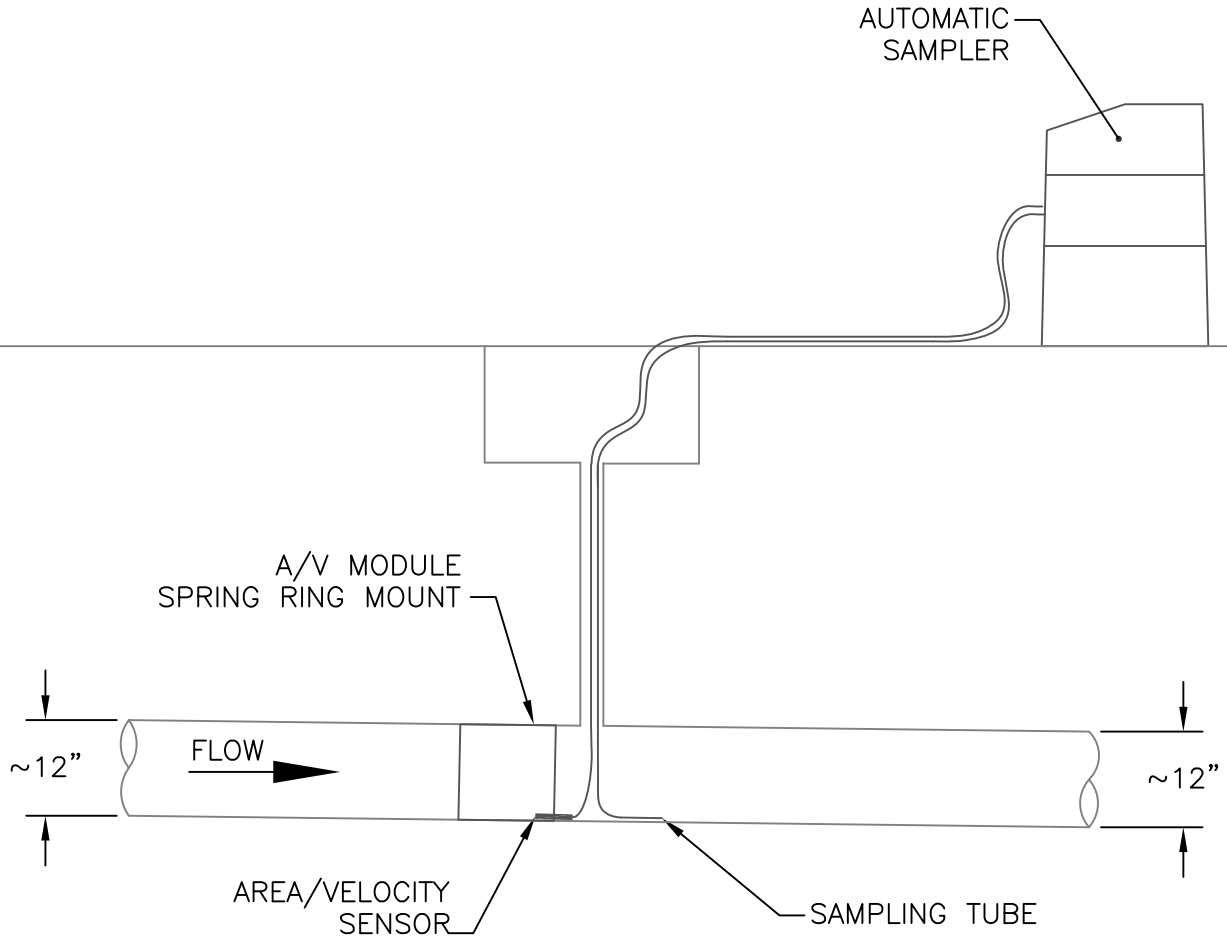
Map Features:
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

NOTE: Coordinates for WR-4 sampling location TBD.

Figure H-1
Drainage Basin and Sampling Location
WR-4
Lower Willamette Group



INSTALLATION SECTION

NOT TO SCALE

Note: During the first round of sampling, 2 sediment trap bottles were installed at WR-4*, whereas during the second round of sampling, sediment trap bottles were not installed at WR-4. WR-4* and WR-4 are different locations and have different site layouts.

Figure H-2

Diagram of Sampling Equipment
WR-4 Sulzer Pump

Overview of Site

Catch Basin

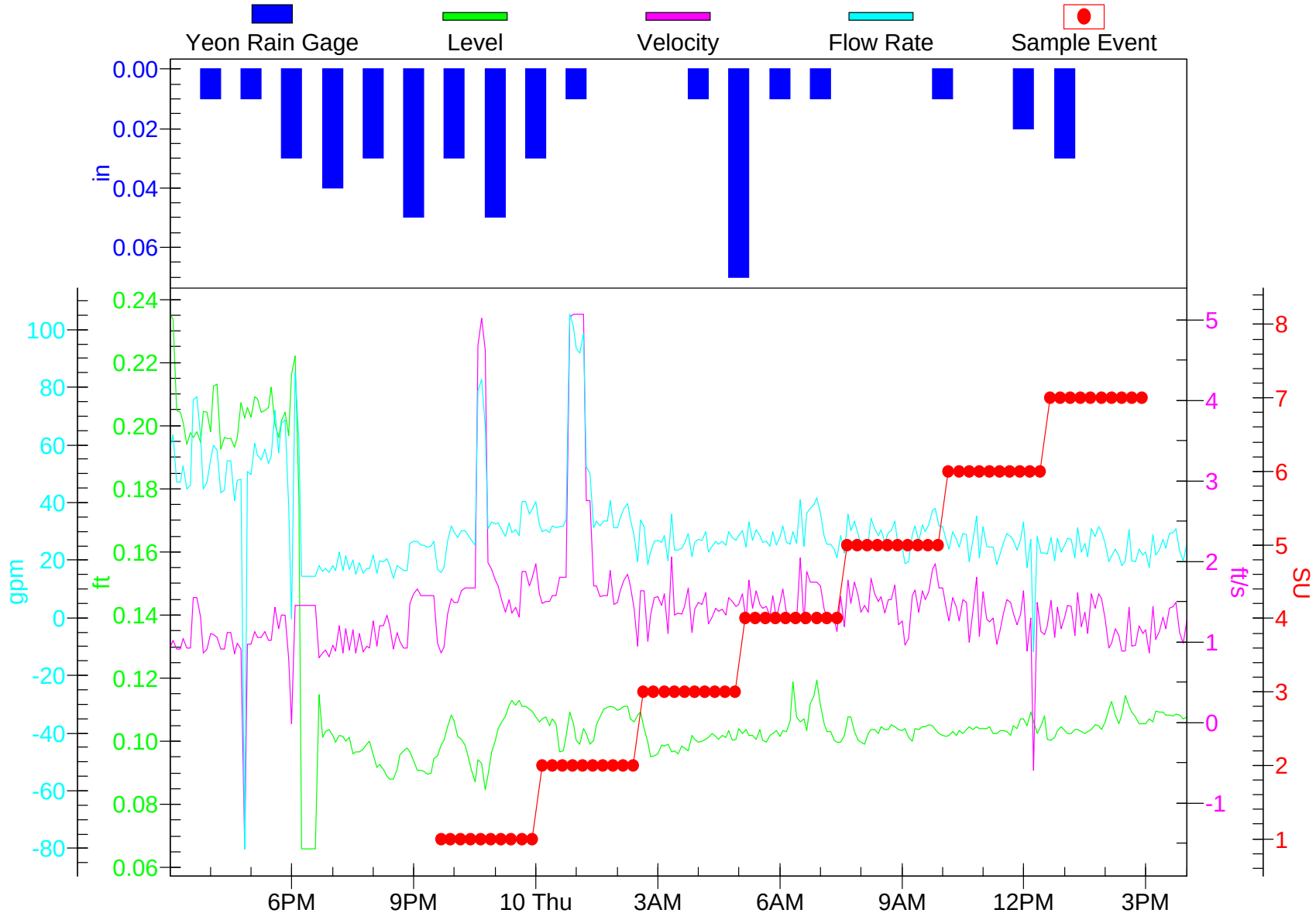
Installation of ISCO

ANCHOR ENVIRONMENTAL, L.L.C.

Figure H-3
Photographs of the Installation
WR-4* Sulzer Pump

Figure H-4 WR-4 Sulzer Pump

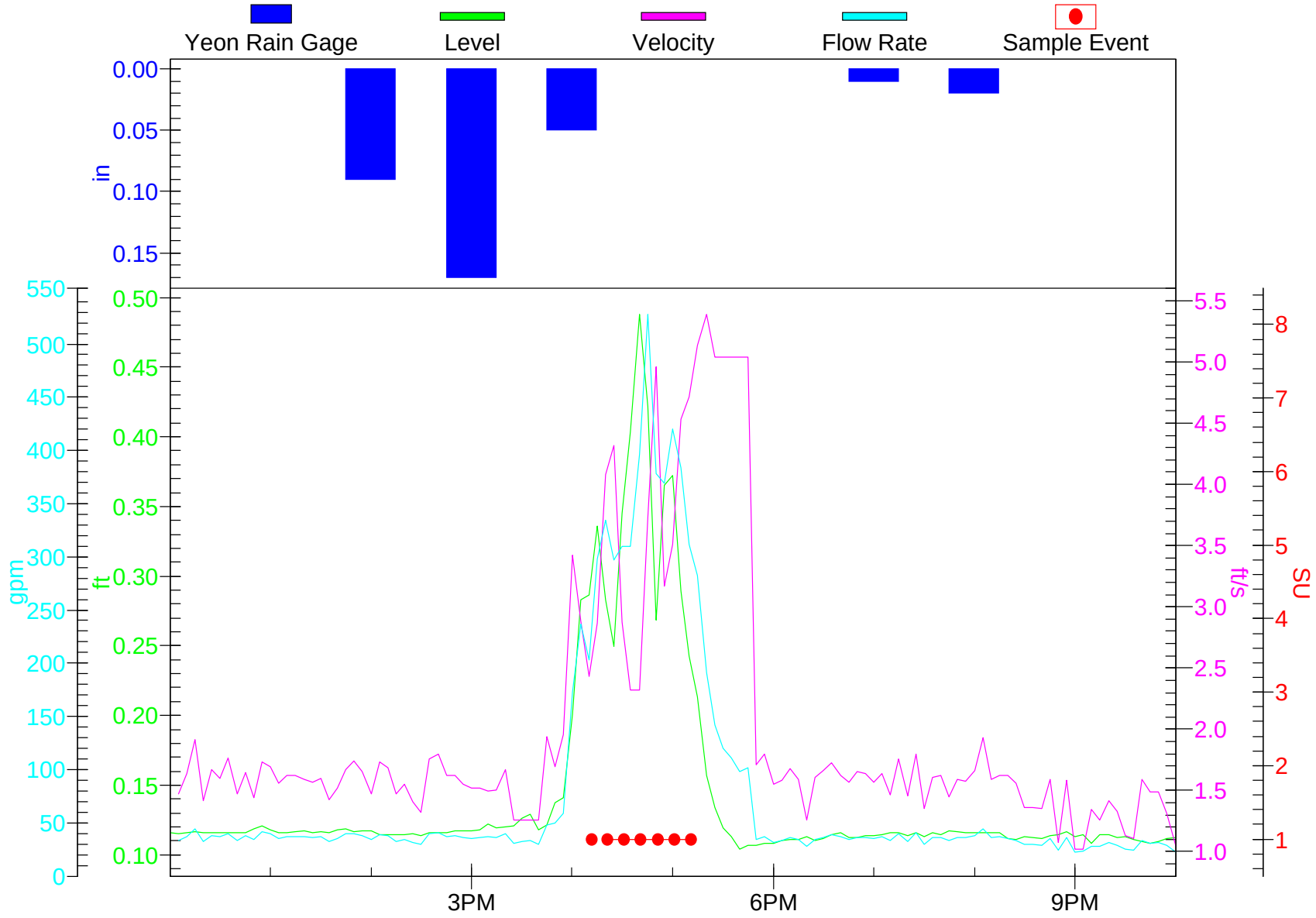
January 11th Sampling Event



9 Wed Jan 2008 1/9/2008 3:00:00 PM - 1/10/2008 4:00:00 PM

Figure H-5 WR-4 Sulzer Pump

January 15th Sampling Event

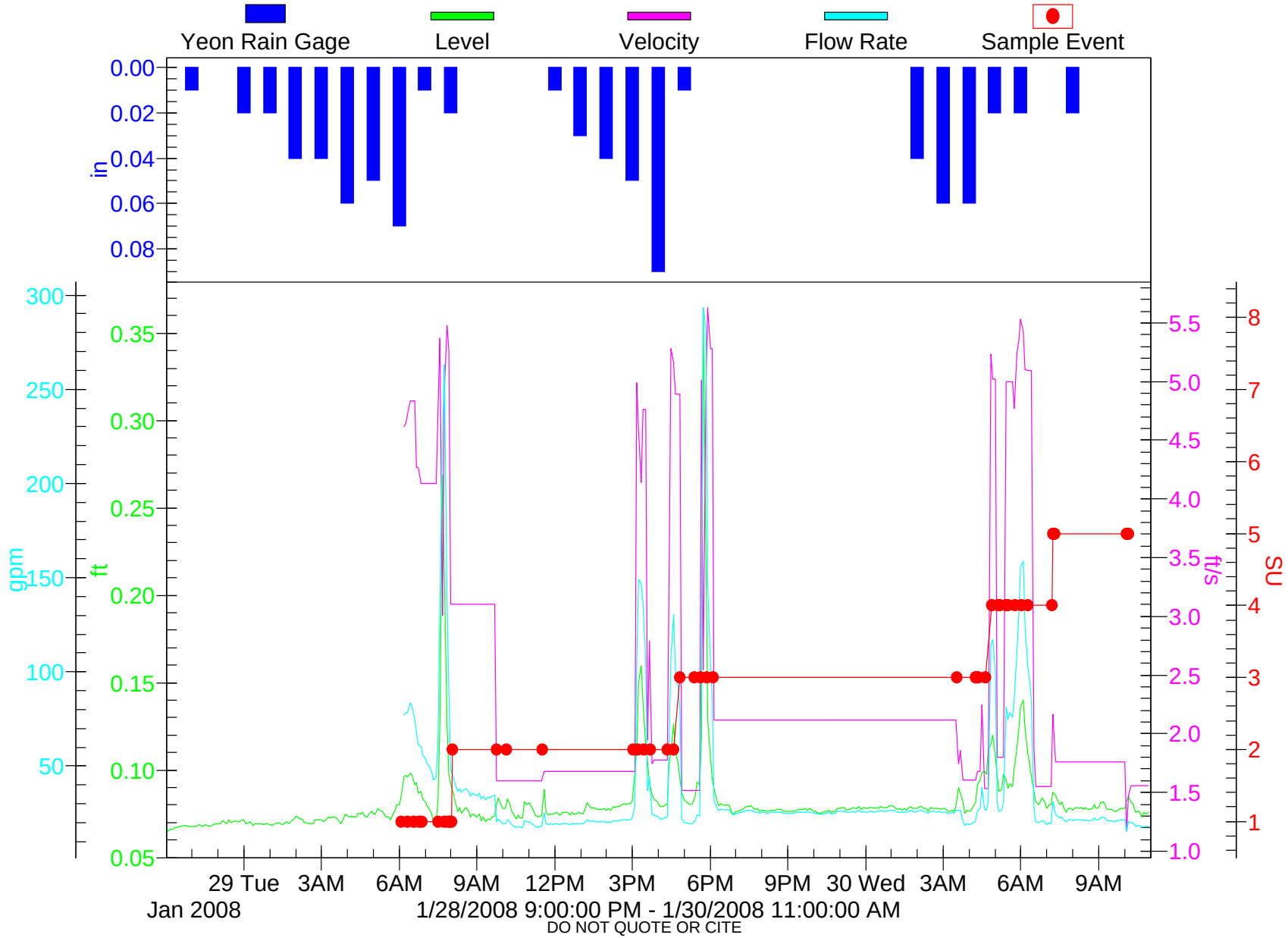


14 MonJan 2008

1/14/2008 12:00:00 PM - 1/14/2008 10:00:00 PM

Figure H-6 WR-4 Sulzer Pump

January 30th Sampling Event



APPENDIX I

WR-145/142
Gunderson
Site-Specific Sampling Report

Appendix I – WR-145/142 Gunderson Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the WR-145/142 outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix I for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the WR-145/142 outfall sampling location, located at the outfall on the bank of the LWR:

- Flow weighted composite sampling (first/second rounds)
- Grab water sampling (first round only)
- Sampling of stormwater suspended sediments using sediment traps (first/second rounds)

This report contains the following information:

- Table I-1 – Key Parameters for Sampling Programming
- Table I-2 – Composite Sampling – Sampling Details for Each Second Round Event
- Table I-3 – Composite Sampling – Estimated Runoff Quantity Calculations
- Table I-4 – Composite Sampling – Summary and Compositing of Second Round Sampling Activities
- Table I-5 – Composite Sampling – Second Round Compositing Calculations
- Table I-6 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure I-1 – Drainage Basin and Sampling Location
- Figure I-2 – Diagram of Sample Equipment Setup
- Figure I-3 – Photographs of Installation
- Figure I-4 – Flowlink Graph (11/16/07)
- Figure I-5 – Flowlink Graph (11/27/07)
- Figure I-6 – Flowlink Graph (11/29/07)
- Figure I-7 – Flowlink Graph (01/09/08)
- Attachment I-1 – Reconnaissance Survey Data Sheet

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

Table I-1. Key Parameters for Sampling Programming.

Parameter	
Site	WR-145/142: Gunderson
Sampler Phone Number	206-450-8535
Outfall Pipe Size	15.75 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	15 ft

Table I-2. Composite Sampling – Sampling Details for Each Second Round Event.

Date of Sample Collection	**Trigger**	**Type of Sample Program**
11/16/2007	0.01	Time-based
11/27/2007	0.01	Time-based
11/29/2007	0.01	Time-based
1/9/2008	0.01	Time-based

Table I-3. Composite Sampling – Estimated Runoff Quantity Calculations.

	Precipitation (in)				
Parameter	**0.2**	**0.35**	**0.5**	**0.75**	**1.50**
Impervious Area (acres)	0.252525	0.252525	0.252525	0.252525	0.252525
Pervious Area (acres)	0	0	0	0	0
Impervious CN	98	98	98	98	98
Pervious CN	80	80	80	80	80
$Length_{sheet}$ (ft)	150	150	150	150	150
$Slope_{sheet}$	0.01	0.01	0.01	0.01	0.01
n_{sheet}	0.011	0.011	0.011	0.011	0.011
T_{sheet} (min)	8.8	8.8	8.8	8.8	8.8
$Length_{channel}$ (min)	25	25	25	25	25
$k_{channel}$	27	27	27	27	27
$Slope_{channel}$	0.005	0.005	0.005	0.005	0.005
$T_{channel}$ (min)	0.2	0.2	0.2	0.2	0.2
Time of Conc. (min)	9.1	9.1	9.1	9.1	9.1
Peak Discharge (cfs)	0.00	0.01	0.02	0.04	0.05
Peak Discharge (gpm)	2	5	9	16	24
Volume (cf)	64	171	291	505	725
Volume (gallons)	478	1,276	2,179	3,775	5,421

Table I-4. Composite Sampling – Summary and Compositing of Second Round Sampling Activities.

Sample Event ID	Date Collected	Retrieval Time	Composite Instructions	Notes
LW3-STW2-CW10-WR142	11/16/2007	1540	A - 601 ml	A-D - 100% full, somewhat turbid, yellowish.
			B - 745 ml	
			C - 633 ml	
			D - 626 ml	
			E - 1820 ml	E-G - 100% full, somewhat turbid, slightly grayish.
			F - 999 ml	
			G - 863 ml	
			H - field blank	H - 0% full.
LW3-STW2-CW20-WR142	11/27/2007	1120	A - 1840 ml	A - 100% full, slightly cloudy, grayish.
			B - 216 ml	B - 40% full, slightly cloudy, grayish.
			C - G -empty	C-H - 0% full.
			H - field blank	
LW3-STW2-CW30-WR142	11/29/2007	1130	A - 1790 ml	A - 100% full, slightly cloudy, grayish.
			B - 68 ml	B - 20% full, slightly cloudy, grayish.
			C, D, E, F, G - empty	C, D, E, F, G, H - 0% full.
			H - field blank	
LW3-STW2-CW40-WR142	1/9/2008	1415	A - 1033 ml	A, B, C, D - 110% full, clear, minimal sediment.
			B - 1900 ml	
			C - 817 ml	
			D - 467 ml	
			E - 417 ml	E - 80% full, clear, minimal sediment.
			F, G -empty	F, G, H - 0% full.
			H - field blank	

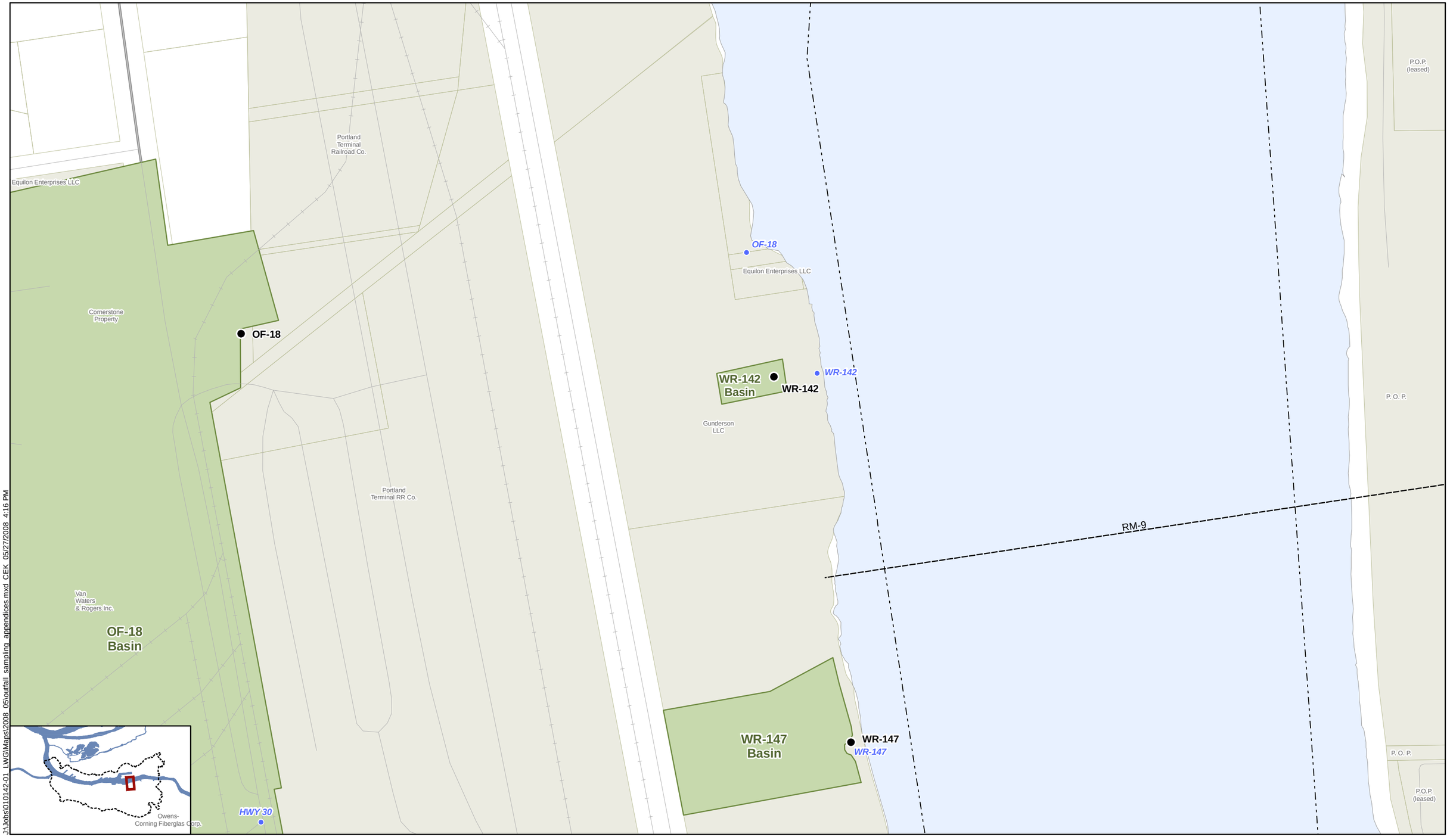
Table I-5. Composite Sampling – Second Round Compositing Calculations.

Date	Bottle	Total Level During Time Period (ft in 5 minute increments)	Volume of Sample in Jar (mL)	Jar Contribution to Sample	Volume from Jar (mL)	Normalized to Largest Bottle Volume (mL)
11/16/2007	A	0.317	1690	0.10	1172	601
	B	0.393	1675	0.12	1452	745
	C	0.334	1810	0.10	1234	633
	D	0.33	1785	0.10	1220	626
	E	0.96	1820	0.29	3548	1820
	F	0.527	1740	0.16	1948	999
	G	0.455	1735	0.14	1682	863
	Total	**3.3**	**12255.0**	**1.0**	**12255.0**	**6287**
11/27/2007	A	0.132	1840	0.77	1984	1840
	B	0.039	730	0.23	586	216
	Total	**0.2**	**2570.0**	**1.0**	**2570.0**	**2056**
1/29/2007	A	0.181	1790	0.84	1793	1790
	B	0.035	350	0.16	347	68
	Total	**0.2**	**2140.0**	**1.0**	**2140.0**	**1858**
1/9/2008	A	0.062	1870	0.22	1978	1033
	B	0.114	1900	0.41	3637	1900
	C	0.049	1840	0.18	1563	817
	D	0.028	1800	0.10	893	467
	E	0.025	1460	0.09	798	417
	Total	**0.278**	**8870.000**	**1.0**	**8870.000**	**4633**

Table I-6. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	Date	Depth of Sediment (in)	Observation/Notes
Installation	11/14/2007		
Interim Inspection 1	12/10/2007	1/8	Dark flocculent sediment.
Interim Inspection 2	1/9/2008	1/8-1/4	Dark flocculent sediment.
Interim Inspection 3	1/29/2008	1/8-1/4	Dark, loose, flocculent material. Collected six bottles and replaced them with six new bottles.
Final Removal	2/11/2008	Trace-1/4	Dark, loose, flocculent material. Collected six bottles.

FIGURES



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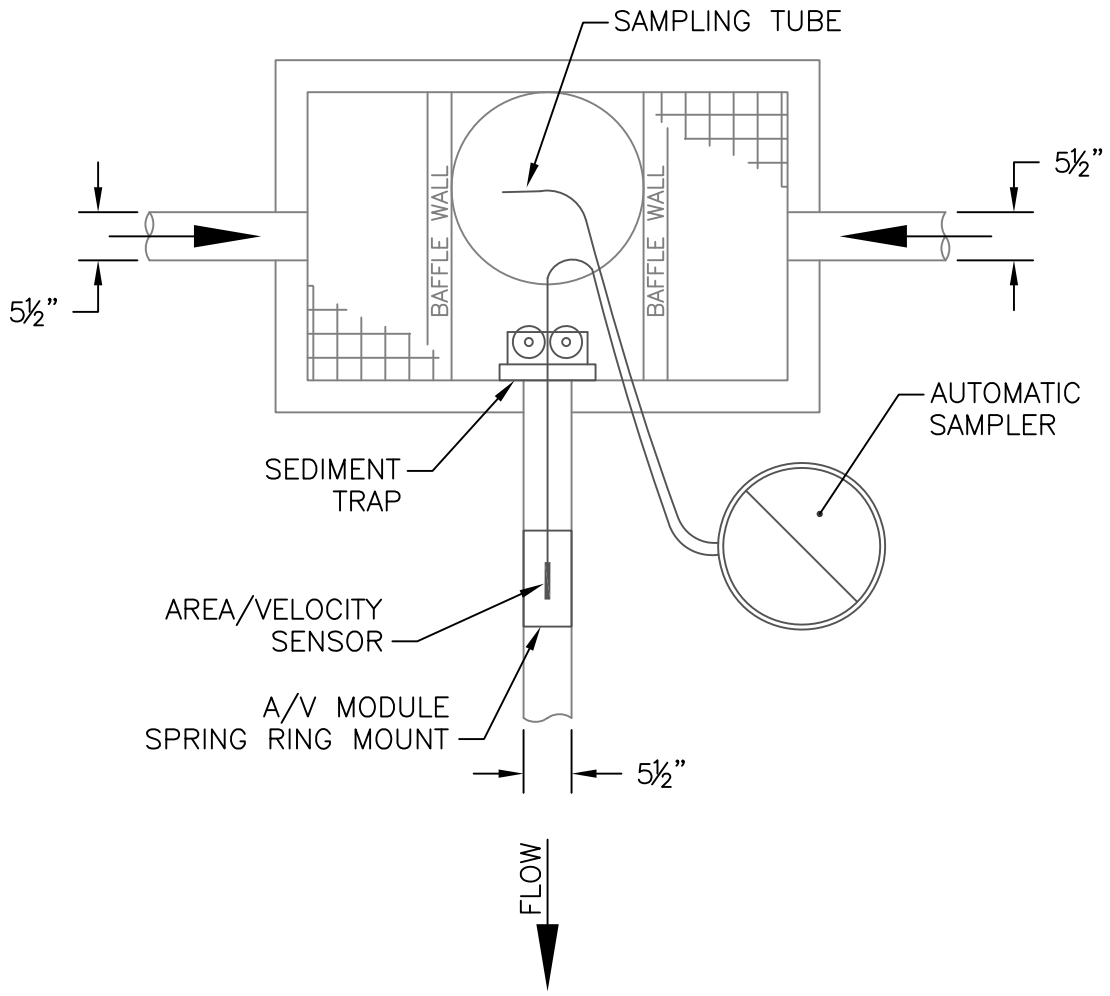
LWG LOWER WILLAMETTE GROUP

0 110 220 330 440 Feet

Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

Figure I-1
Drainage Basin and Sampling Location
WR-142 and WR-145
Lower Willamette Group



INSTALLATION PLAN

NOT TO SCALE

Note: During the first round of sampling, 2 sediment trap bottles were installed at WR-145/142, whereas during the second round of sampling, 6 sediment trap bottles were installed.

Figure I-2

Diagram of Sampling Equipment
WR-145/142 Gunderson

ISCO

Site Setup

Sampled Catch Basin

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Figure I-3
Photographs of the Installation
WR-145/142 Gunderson

Figure I-4 WR-142 Gunderson

November 16th Sampling Event

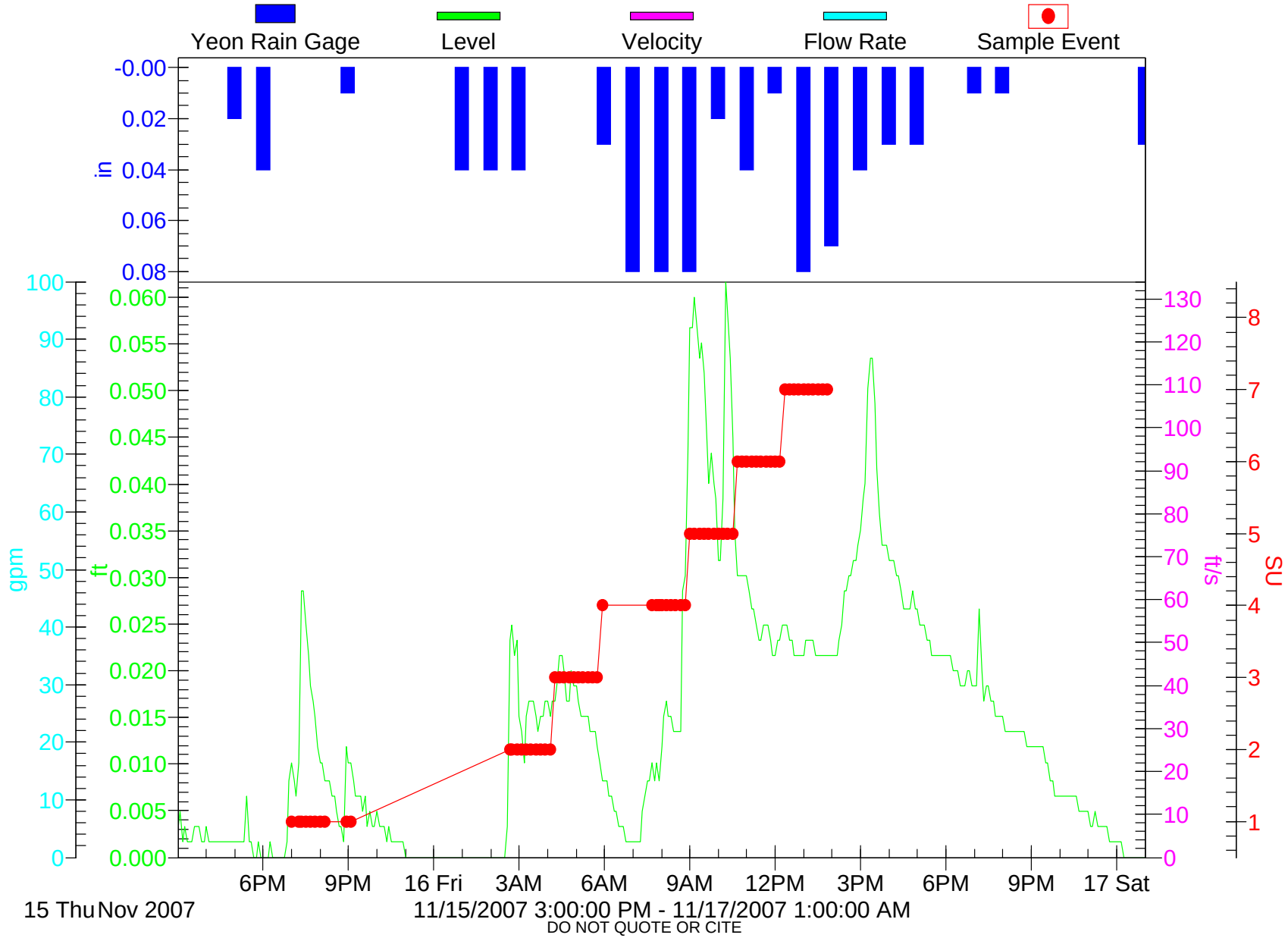


Figure I-5 WR-142 Gunderson

November 27th Sampling Event

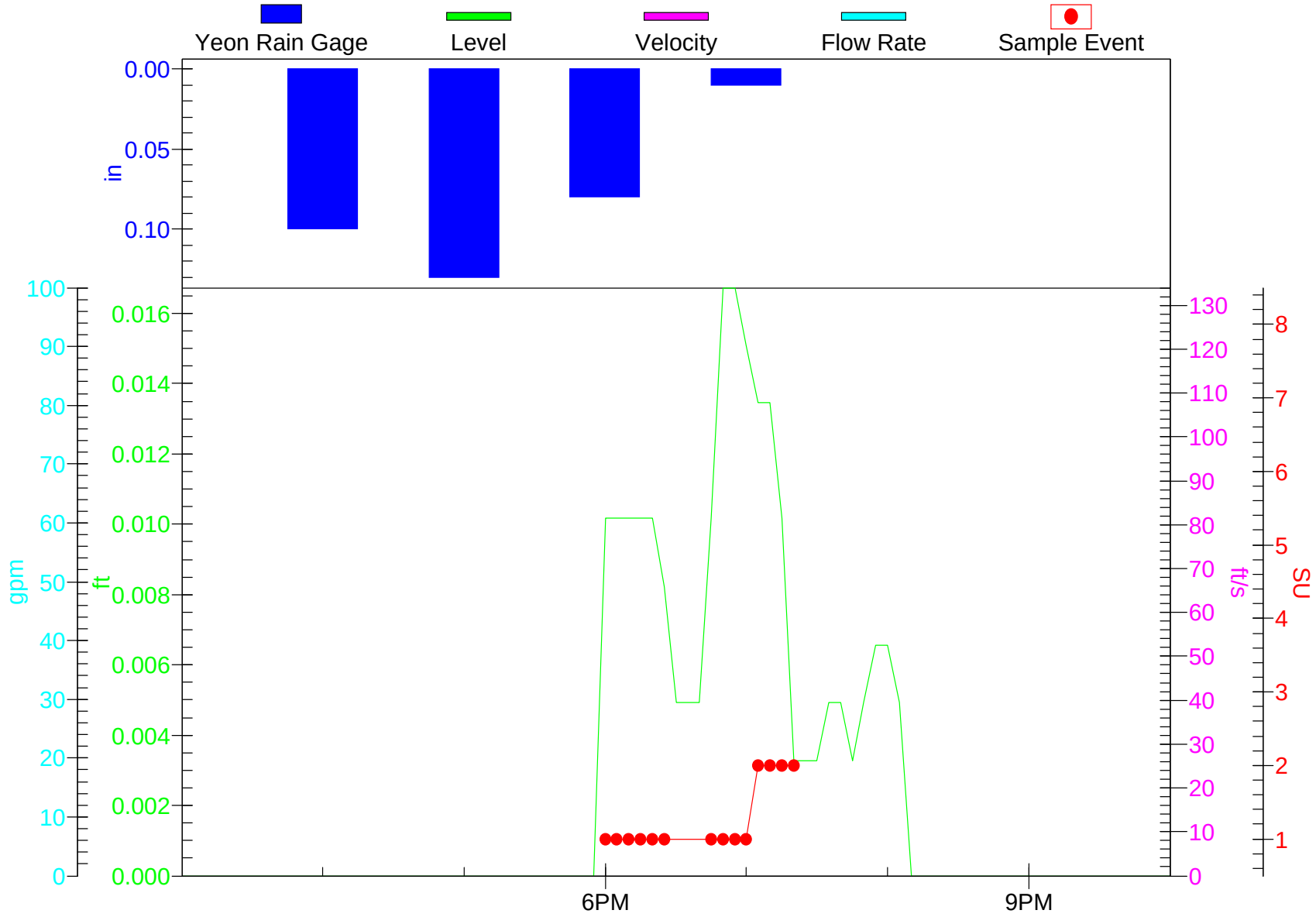


Figure I-6 WR-142 Gunderson

November 29th Sampling Event

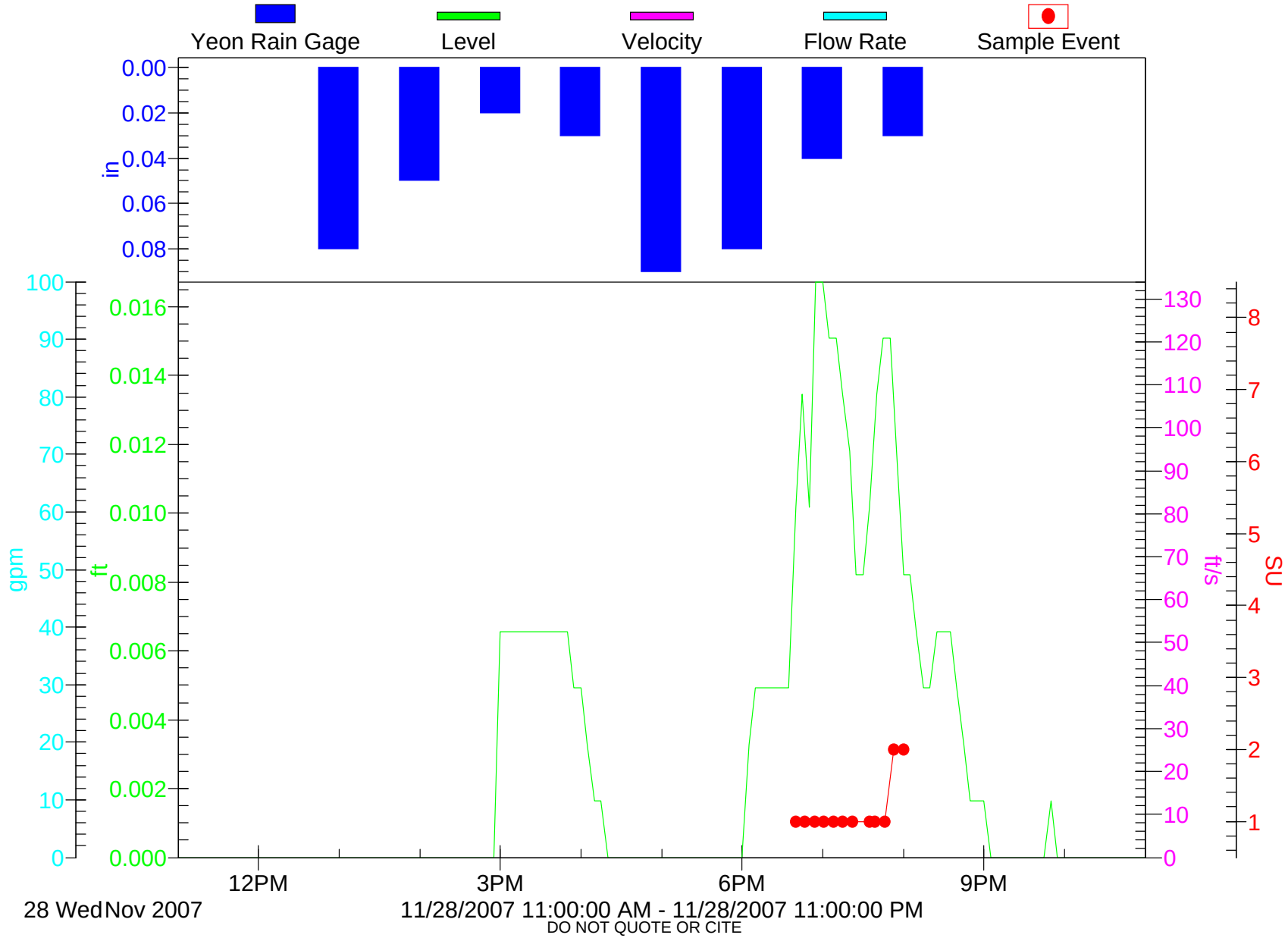
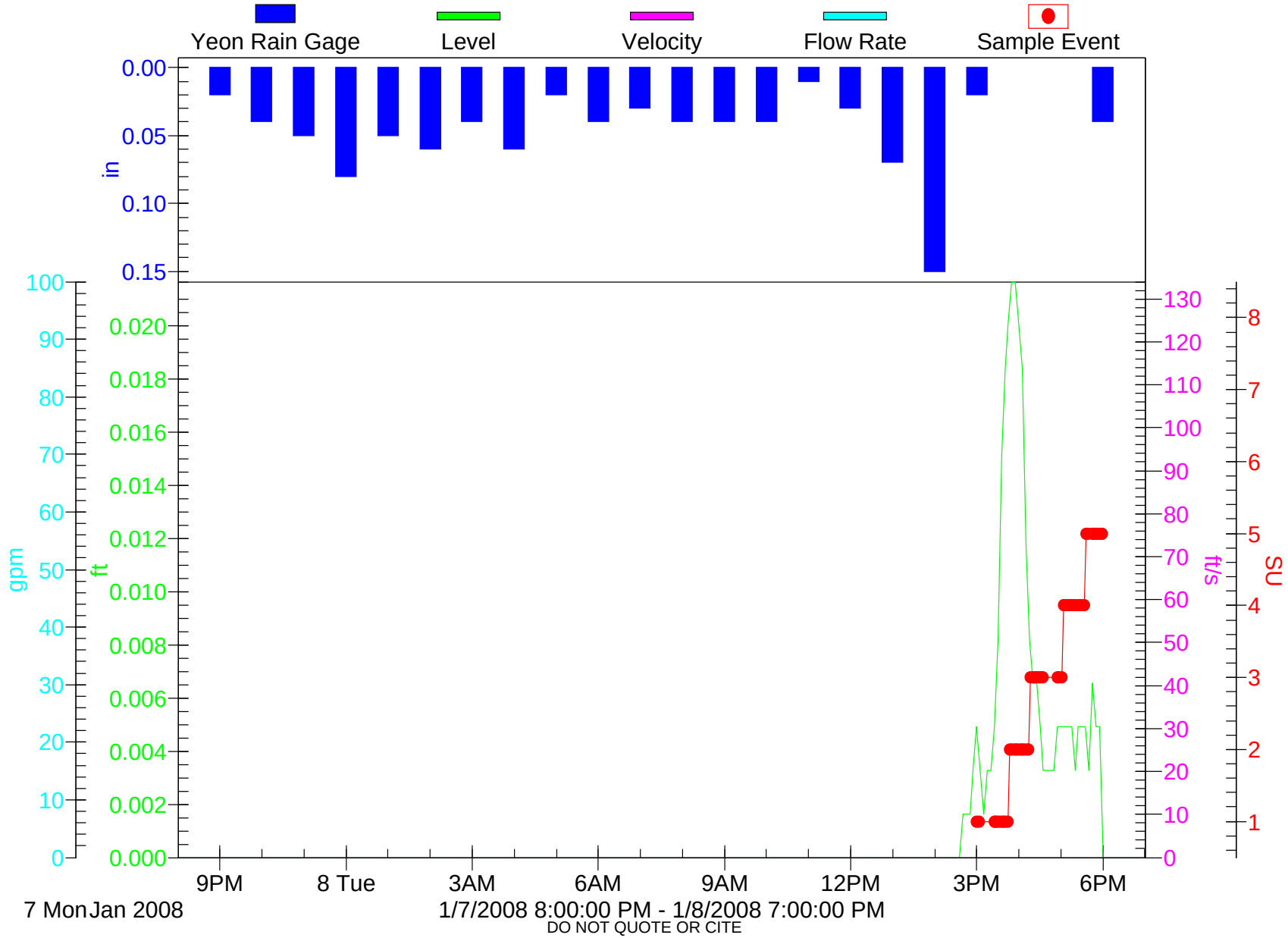


Figure I-7 WR-142 Gunderson

January 9th Sampling Event



ATTACHMENT I-1

Reconnaissance Survey Data Sheet

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Outfall Reference Sheet – Lower Willamette Group

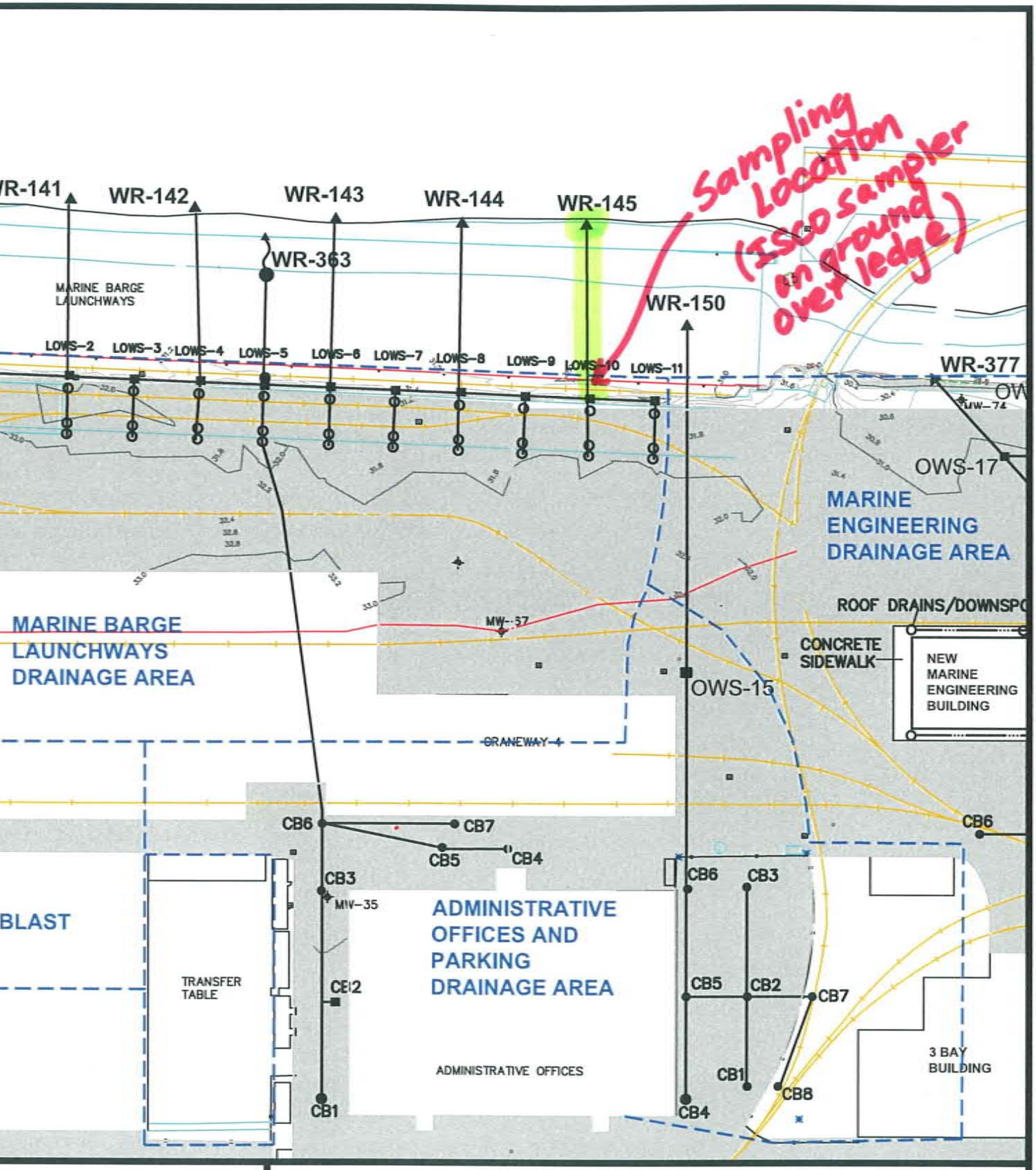
Outfall ID: WR-145/2 Gunderson		
Contact: David King	Office: 503-644-9447	
Team Lead: Amanda Shellenberger		

Site Access

Address:	**4350 NW FRONT AVE, PORTLAND**
Directions:	Bear R **Right** on **NW 20TH AVE** - **go 0.2** mi Turn L **Left** on **NW YORK ST** - **go 0.1** mi Turn R **Right** on **NW 21ST AVE** - **go 0.2** mi Turn L **Left** on **NW FRONT AVE** - **go 1.6** mi Arrive at site on the R **Right** Park at main gate near brick building.
Access Procedure:	
Restrictions:	

Sampling Specifics

Sediment Trap Location:	In MH upstream of outfall
Flow Meter Location:	In outlet pipe of outfall?
ISCO Sampler Location:	Over ledge on river bank



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STORM WATER DRAINAGE BASINS
PAGE 2 OF 3
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PORTLAND, OREGON

PROJECT #S090445

FIGURE 3

APPENDIX J

WR-147
Gunderson (former Schnitzer)
Site-Specific Sampling Report

Appendix J – WR-147 Gunderson (former Schnitzer) Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the WR-147 outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix J for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the WR-147 outfall sampling location, located in a catch basin directly upstream of the outfall on the Gunderson site:

- Flow weighted composite sampling (first round only)
- Sampling of stormwater suspended sediments using sediment traps (first/second rounds)

This report contains the following information:

- Table J-1 – Key Parameters for Sampling Programming
- Table J-2 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure J-1 – Drainage Basin and Sampling Location
- Figure J-2 – Diagram of Sample Equipment Setup
- Figure J-3 – Photographs of Installation
- Attachment J-1 – Reconnaissance Survey Data Sheet

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

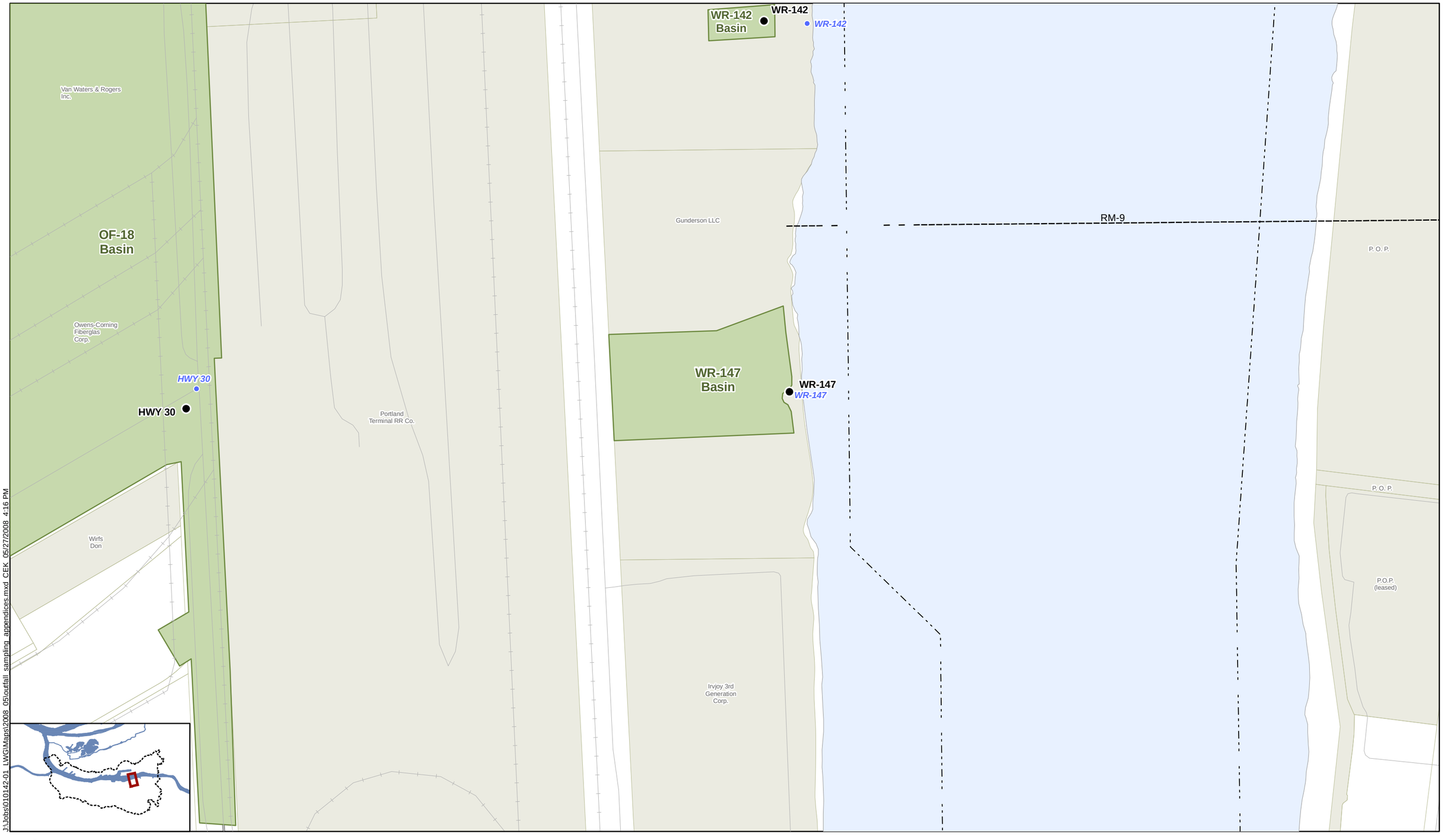
Table J-1. Key Parameters for Sampling Programming.

Parameter	
Site	WR-147: Gunderson (former Schnitzer)
Sampler Phone Number	206-450-0653
Outfall Pipe Size	5.5 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	25 ft

Table J-2. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	**Date**	**Depth of Sediment (in)**	**Observation/Notes**
Installation	11/14/2007		
Interim Inspection 1	12/10/2007	1/8-1/4	Dark flocculent sediment.
Interim Inspection 2	1/9/2008	1/8-1/2	Dark flocculent sediment. Bottles opaque and hard to see through.
Interim Inspection 3	1/29/2008	1/4	Dark, flocculent material. Collected four bottles and replaced them with four new bottles.
Final Removal	2/11/2008	Trace-1/4	Dark, loose flocculent material. Collected four bottles.

FIGURES



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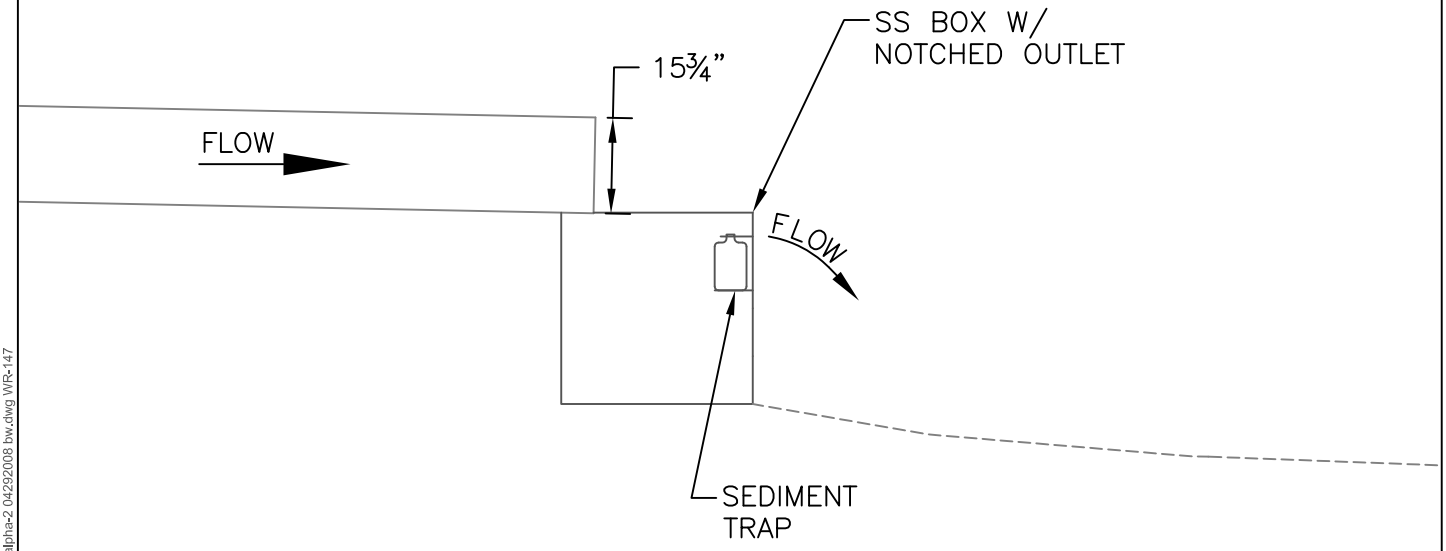
LWG LOWER WILLAMETTE GROUP

0 110 220 330 440 Feet

Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

Figure J-1
Drainage Basin and Sampling Location
WR-147
Lower Willamette Group



INSTALLATION SECTION

NOT TO SCALE

Note: During the first round of sampling, 2 sediment trap bottles were installed at WR-147, whereas during the second round of sampling, 4 sediment trap bottles were installed.

Figure J-2

Diagram of Sampling Equipment
WR-147 Gunderson

Sediment Trap Mounter
Note: This photograph is from the first round installation.

Sampling Location
Note: This photograph is from the first round installation.

Sampling Location

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Figure J-3
Photographs of the Installation
WR-147 Gunderson

ATTACHMENT J-1

Reconnaissance Survey Data Sheet

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Outfall Reference Sheet – Lower Willamette Group

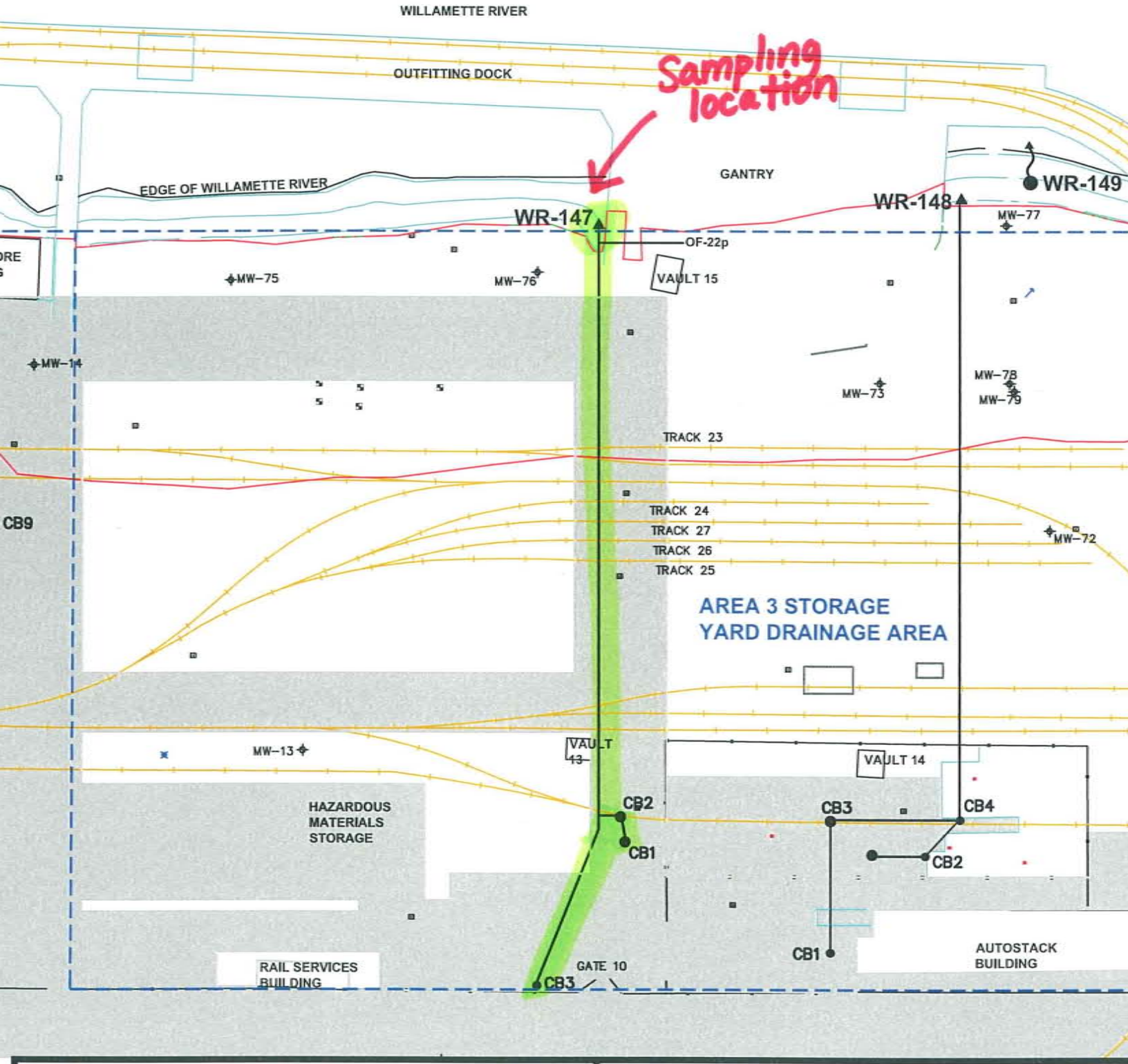
Outfall ID: WR-147 Gunderson		
Contact: David King	Office: 503-644-9447	
Team Lead: Amanda Shellenberger		

Site Access

Address:	**4350 NW FRONT AVE, PORTLAND**
Directions:	Bear (R) **Right** on **NW 20TH AVE** - **go 0.2** mi Turn (L) **Left** on **NW YORK ST** - **go 0.1** mi Turn (R) **Right** on **NW 21ST AVE** - **go 0.2** mi Turn (L) **Left** on **NW FRONT AVE** - **go 1.6** mi Arrive at site on the (R) **Right** Park at main gate near brick building.
Access Procedure:	
Restrictions:	

Sampling Specifics

Sediment Trap Location:	In existing catch basin at outfall
Flow Meter Location:	In 14-inch outfall pipe
ISCO Sampler Location:	On hillside next to outfall



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STORM WATER DRAINAGE BASIN
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PROJECT #S090445

APPENDIX K

Hwy 30
Yeon-Mixed Use
Site-Specific Sampling Report

Appendix K – Yeon-NW35 Site-Specific Sampling Report – Second Round Sampling

Sampling was not conducted at this location during the second round of sampling. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix K for information about sampling conducted during the first round of sampling in February through July of 2007 (first round sampling). Sampling was conducted at the correct Highway 30 location during the second round of sampling. Refer to Appendix X – Hwy 30 A of the Round 3A Upland Stormwater Sampling Field Sampling Report Addendum for information regarding sampling conducted during the second round of sampling in November 2007 through February 2008.

APPENDIX L

OF-49
City
Site-Specific Sampling Report

Appendix L – OF-49 City Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the OF-49 outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix L for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the OF-49 outfall sampling location, located in the City of Portland manhole AAG-669 upstream of the outfall:

- Flow weighted composite sampling (first/second rounds)
- Sampling of stormwater suspended sediments using sediment traps (first/second rounds)

This report contains the following information:

- Table L-1 – Key Parameters for Sampling Programming
- Table L-2 – Composite Sampling – Sampling Details for Each Second Round Event
- Table L-3 – Composite Sampling – Estimated Runoff Quantity Calculations
- Table L-4 – Composite Sampling – Summary and Compositing of Second Round Sampling Activities
- Table L-5 – Composite Sampling – Second Round Compositing Calculations
- Table L-6 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure L-1 – Drainage Basin and Sampling Location
- Figure L-2 – Diagram of Sample Equipment Setup
- Figure L-3 – Photographs of Installation
- Figure L-4 – Flowlink Graph (11/16/07)
- Attachment L-1 – Reconnaissance Survey Data Sheet

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented

by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

Table L-1. Key Parameters for Sampling Programming.

Parameter	
Site	OF-49: City
Sampler Phone Number	206-450-8445
Outfall Pipe Size	18 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	25 ft

Table L-2. Composite Sampling – Sampling Details for Each Second Round Event.

Date of Sample Collection	**Trigger**	**Type of Sample Program**
11/16/2007	0.08 ft	Time-based

Table L-3. Composite Sampling – Estimated Runoff Quantity Calculations.

	Precipitation (in)				
Parameter	**0.2**	**0.35**	**0.5**	**0.75**	**1.50**
Impervious Area (acres)	13.329	13.329	13.329	13.329	13.329
Pervious Area (acres)	31.101	31.101	31.101	31.101	31.101
Impervious CN	91.5	91.5	91.5	91.5	91.5
Pervious CN	50	50	50	50	50
$Length_{sheet}$ (ft)	300	300	300	300	300
$Slope_{sheet}$	0.01	0.01	0.01	0.01	0.01
n_{sheet}	0.011	0.011	0.011	0.011	0.011
T_{sheet} (min)	15.4	15.4	15.4	15.4	15.4
$Length_{channel}$ (min)	100	100	100	100	100
$k_{channel}$	27	27	27	27	27
$Slope_{channel}$	0.005	0.005	0.005	0.005	0.005
$T_{channel}$ (min)	0.9	0.9	0.9	0.9	0.9
Time of Conc. (min)	16.3	16.3	16.3	16.3	16.3
Peak Discharge (cfs)	0.00	0.03	0.08	0.40	0.91
Peak Discharge (gpm)	1	14	34	179	409
Volume (cf)	10	1,192	3,839	10,308	18,390
Volume (gallons)	77	8,916	28,718	77,107	137,560

Table L-4. Composite Sampling – Summary and Compositing of Second Round Sampling Activities.

Sample Event ID	Date Collected	Retrieval Time	Composite Instructions	Notes
LW3-STW2-CW10-OF49	11/16/2007	1630	A - 1381 ml	A-G - 110% full, cloudy, slightly turbid (B - 100% full).
			B - 1740 ml	
			C - 1174 ml	
			D - 763 ml	
			E - 779 ml	
			F - 1345 ml	
			G - 1559 ml	
			H - field blank	H - 0% full.

Table L-5. Composite Sampling – Second Round Compositing Calculations.

Date	Bottle	Total Level During Time Period (ft in 5 minute increments)	Volume of Sample in Jar (mL)	Jar Contribution to Sample	Volume from Jar (mL)	Normalized to Largest Bottle Volume (mL)
11/16/2007	A	2.354	1840	0.16	2049	1381
	B	2.966	1740	0.20	2582	1740
	C	2.001	1840	0.13	1742	1174
	D	1.301	1880	0.09	1132	763
	E	1.328	1910	0.09	1156	779
	F	2.293	1900	0.15	1996	1345
	G	2.657	1860	0.18	2313	1559
	Total	**14.9**	**12970.0**	**1.0**	**12970.0**	**8741**

Table L-6. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	Date	Depth of Sediment (in)	Observation/Notes
Installation	11/12/2007		
Interim Inspection 1	12/11/2007	Trace	Not enough material to classify.
Interim Inspection 2	1/10/2008	Trace-1/4	Loose flocculent sediment.
Interim Inspection 3	1/28/2008	Trace-1/2	Loose, flocculent material. Collected four bottles and replaced with four new ones.
Final Removal	2/11/2008	Trace-1/4	Dark, flocculent material. Collected all four bottles.

FIGURES

Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

0 140 280 420 560 Feet

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

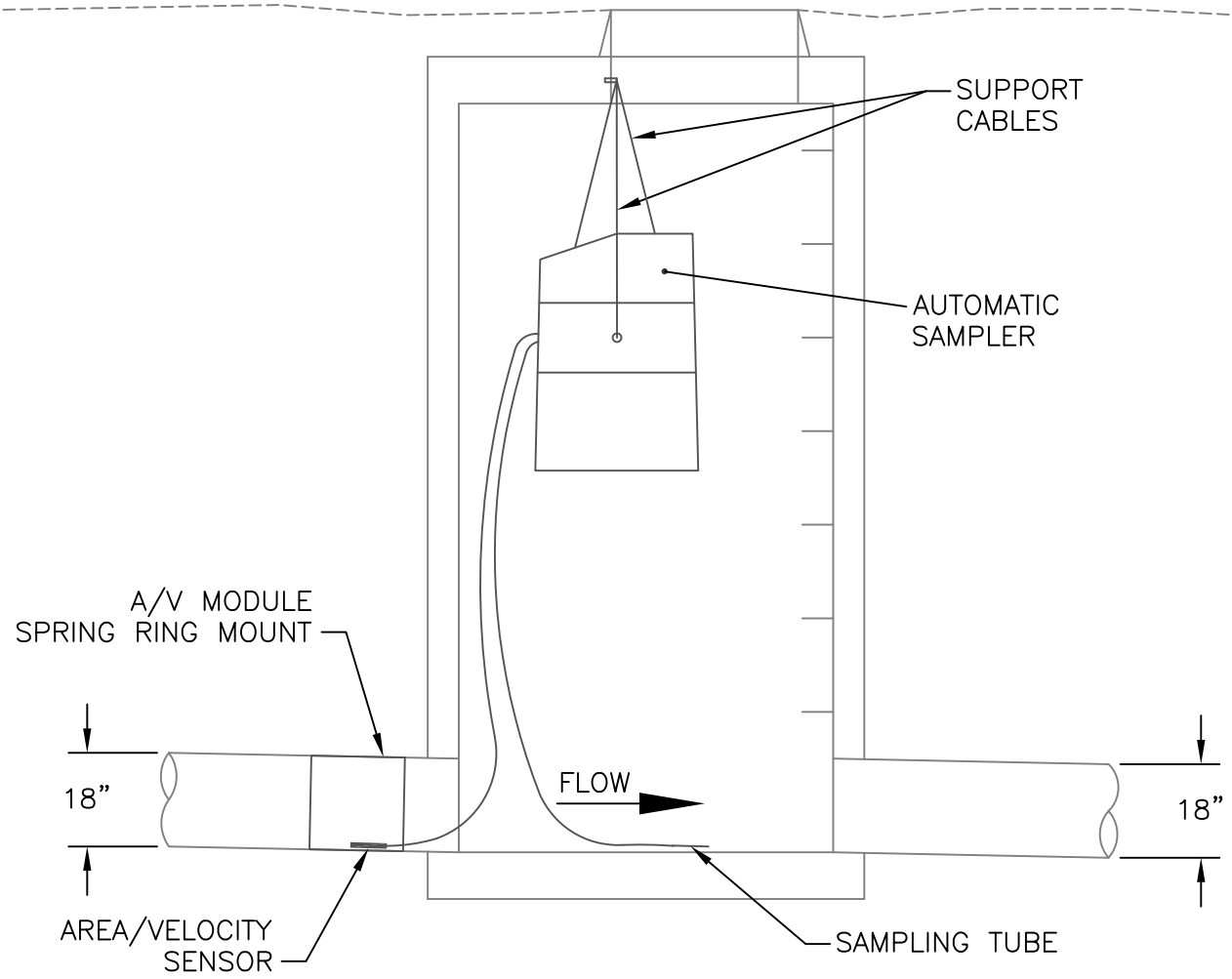
NOTES:

DO NOT QUOTE OR CITE
This document is currently under review by U.S. EPA and its federal, state and tribal partners and is subject to change in whole or in part

ANCHOR ENVIRONMENTAL L.L.C.

LWG LOWER WILLAMETTE GROUP

Figure L-1
Drainage Basin and Sampling Location
OF-49 City
Lower Willamette Group



INSTALLATION SECTION

NOT TO SCALE

Note: Sediment traps for OF-49 were installed in an adjacent manhole downstream. During the first round of sampling, 2 sediment trap bottles were installed, whereas during the second round of sampling, 4 sediment trap bottles were installed.

Figure L-2

Diagram of Sampling Equipment
OF-49 City of Portland

Sampling Manhole

Sediment Traps with Weir

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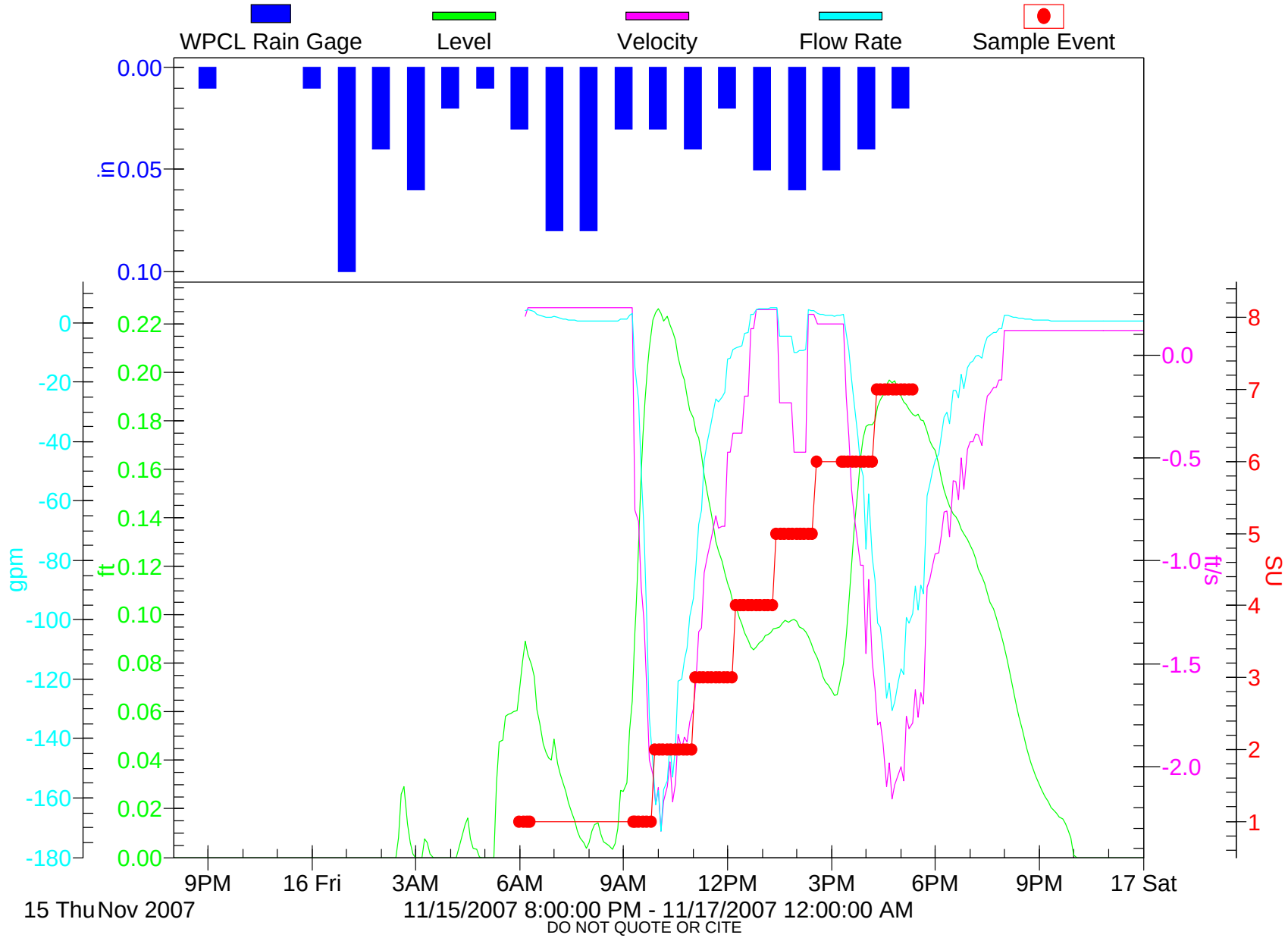
Figure L-3
Photographs of the Installation
OF-49 City

Figure L-4 OF-49 City

November 16th Sampling Event



ATTACHMENT L-1

Reconnaissance Survey Data Sheet

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Outfall Reference Sheet – Lower Willamette Group

Outfall ID: OF-49 City of Portland		
Contact: Linda Sheffler	Cell: 503-823-2296	Office: 503-539-2287
Team Lead: Shawn Hinz		

Site Access

Address:	See Map
Directions:	
Access Procedure:	Need access agreement with City of Portland
Restrictions:	Confined Space

Sampling Specifics

Sediment Trap Location:	In MH AAG-634
Flow Meter Location:	In 15-inch outlet pipe
ISCO Sampler Location:	In MH AAG-669


Basin 49 Site Map
AAG6
ANE713
AAG678
ISCO Sampler Location
AAG633
Sediment Trap Location
AAG634

APPENDIX N

OF-22C
City
Site-Specific Sampling Report

Appendix N – OF-22C City Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the OF-22C outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix N for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the OF-22C outfall sampling location, located upstream of the outfall in City of Portland manhole AAJ 602:

- Flow weighted composite sampling (first/second rounds)
- Sampling of stormwater suspended sediments using sediment traps (first round only)

This report contains the following information:

- Table N-1 – Key Parameters for Sampling Programming
- Table N-2 – Composite Sampling – Sampling Details for Each Second Round Event
- Table N-3 – Composite Sampling – Estimated Runoff Quantity Calculations
- Table N-4 – Composite Sampling – Summary and Compositing of Second Round Sampling Activities
- Table N-5 – Composite Sampling – Second Round Compositing Calculations
- Figure N-1 – Drainage Basin and Sampling Location
- Figure N-2 – Diagram of Sample Equipment Setup
- Figure N-3 – Photographs of Installation
- Figure N-4 – Flowlink Graph (01/09/08)
- Attachment N-1 – Reconnaissance Survey Data Sheet

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

Table N-1. Key Parameters for Sampling Programming.

Parameter	
Site	OF-22C: City
Sampler Phone Number	206-450-5525
Outfall Pipe Size	42 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	25 ft

Table N-2. Composite Sampling – Sampling Details for Each Second Round Event.

Date of Sample Collection	**Trigger**	**Type of Sample Program**
1/9/2008	0.06 ft	Time-based

Table N-3. Composite Sampling – Estimated Runoff Quantity Calculations.

	Precipitation (in)				
Parameter	**0.2**	**0.35**	**0.5**	**0.75**	**1.50**
Impervious Area (acres)	96.9	96.9	96.9	96.9	96.9
Pervious Area (acres)	872.1	872.1	872.1	872.1	872.1
Impervious CN	98	98	98	98	98
Pervious CN	70	70	70	70	70
$Length_{sheet}$ (ft)	300	300	300	300	300
$Slope_{sheet}$	0.01	0.01	0.01	0.01	0.01
n_{sheet}	0.011	0.011	0.011	0.011	0.011
T_{sheet} (min)	15.4	15.4	15.4	15.4	15.4
$Length_{channel}$ (min)	100	100	100	100	100
$k_{channel}$	27	27	27	27	27
$Slope_{channel}$	0.005	0.005	0.005	0.005	0.005
$T_{channel}$ (min)	0.9	0.9	0.9	0.9	0.9
Time of Conc. (min)	16.3	16.3	16.3	16.3	16.3
Peak Discharge (cfs)	1.14	3.85	6.98	12.45	17.99
Peak Discharge (gpm)	513	1729	3131	5589	8076
Volume (cf)	24,522	65,481	111,771	193,634	292,625
Volume (gallons)	183,421	489,798	836,050	1,448,385	2,188,834

Table N-4. Composite Sampling – Summary and Compositing of Second Round Sampling Activities.

Sample Event ID	Date Collected	Retrieval Time	Composite Instructions	Notes
No sample	11/16/2007	None	None	No samples collected.
No sample	11/272007	1605	None	A - 0% full. B - 15% full, clear. C - 80% full, clear. D - 115% full, clear. E - 95% full, clear. F - 80% full, clear. G - 50% full, clear. H - 0% full.
No sample	11/292007	None	None	No samples collected.
LW3-STW2-CW10-OF22C	1/9/2008	1300	A - 773 ml	A - 100% full.
			B - 768 ml	B - 50% full, grayish with slight sediment*
			C - 778 ml	C - 100% full, grayish with slight sediment.
			D - 808 ml	D, E, F - 100% full, grayish, with less suspended material.
			E - 1129 ml	
			F - 1720 ml	
			G - 1136 ml	G - 100% full, grayish, more sediment.
			H - field blank	H - 0% full.

* This appears to be an erroneous field observation. Since bottle volumes are measured with as soon as they return to the field lab, the bottle volumes are considered a more accurate representation of amount of sample.

Table N-5. Composite Sampling – Second Round Compositing Calculations.

Date	Bottle	Total Flow in Time Period (gal)	Volume of Sample in Jar (mL)	Jar Contribution to Sample	Volume from Jar (mL)	Normalized to Largest Bottle Volume (mL)
1/9/2008	A	7187.6	1680	0.11	1285	773
	B	7145.4	1690	0.11	1277	768
	C	7238.7	1670	0.11	1294	778
	D	7513.3	1680	0.11	1343	808
	E	10497.7	1700	0.16	1876	1129
	F	15994	1720	0.24	2858	1720
	G	10561.3	1680	0.16	1887	1136
	Total	**66138.0**	**11820.0**	**1.0**	**11820.0**	**7113**

FIGURES

ANCHOR ENVIRONMENTAL L.L.C.

LWG LOWER WILLAMETTE GROUP

0 340 680 1,020 1,360 Feet

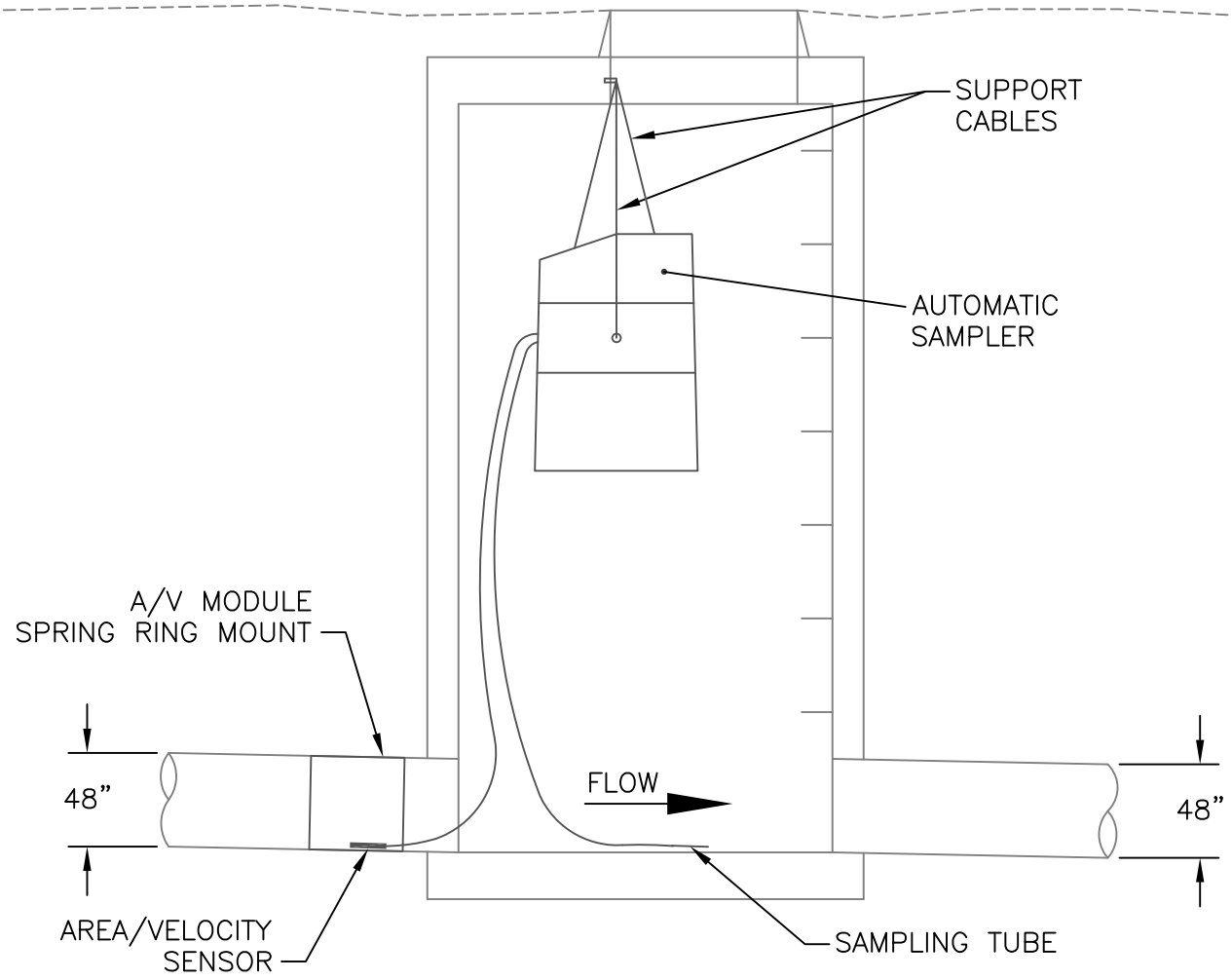
Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

NOTES:

DO NOT QUOTE OR CITE
This document is currently under review by U.S. EPA and its federal, state and tribal partners and is subject to change in whole or in part

Figure N-1
Drainage Basin and Sampling Location
OF-22C City
Lower Willamette Group



INSTALLATION SECTION

NOT TO SCALE

Note: During the first round of sampling, 2 sediment trap bottles were installed at OF-22C, whereas during the second round of sampling, sediment trap bottles were not installed.

Apr 29, 2008 12:14pm bhayworth C:\Documents and Settings\bhayworth\Desktop\LWG Round 2 Sampling Figure alpha-2 04292008 bw.dwg OF-22C

Figure N-2

Diagram of Sampling Equipment
OF-22C City of Portland

Flow Channel
Note: This photograph is from the first round installation.

Sampling Manhole Location
Note: This photograph is from the first round installation.

ISCO
Note: This photograph is from the first round installation.

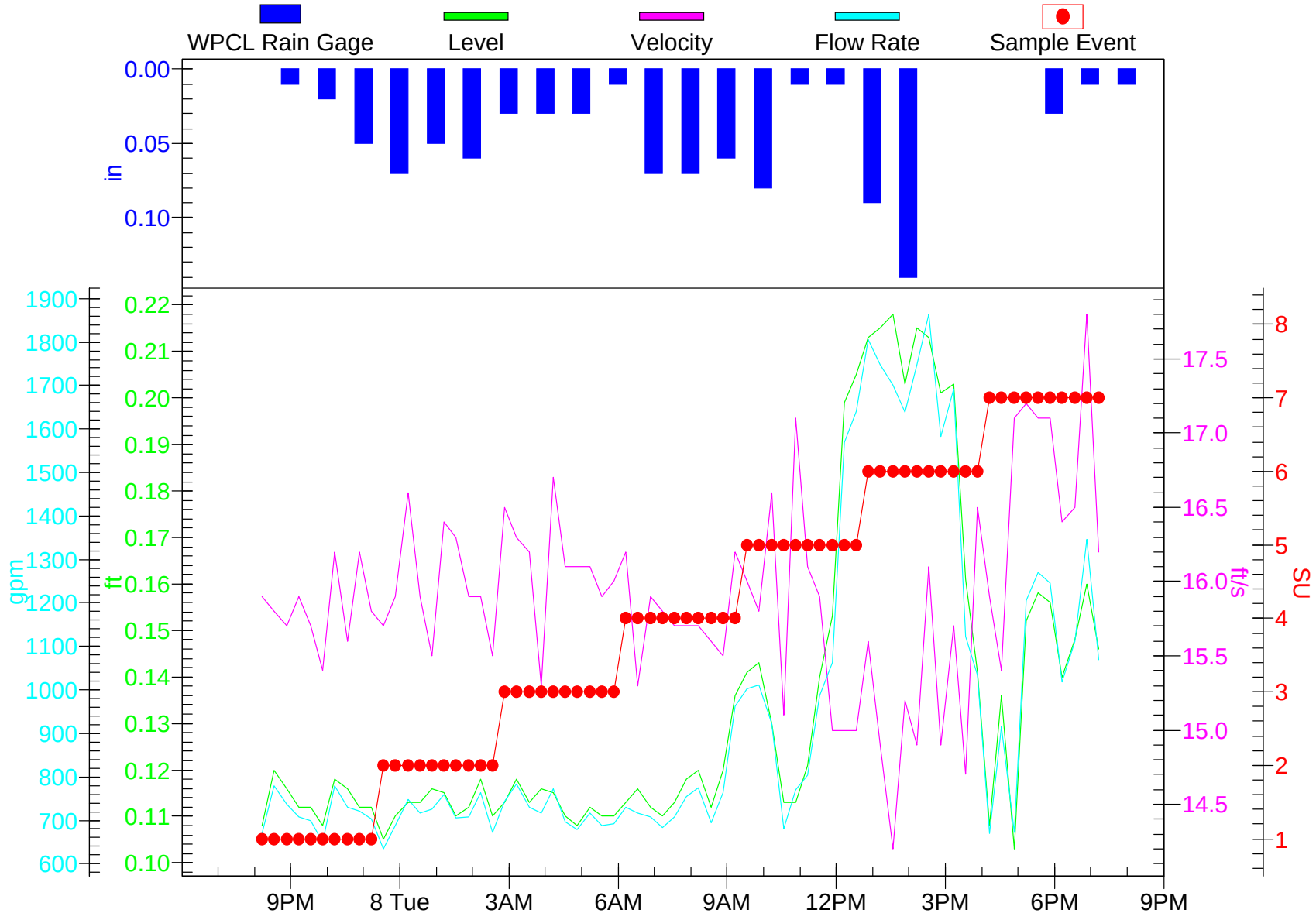
Flow Meter
Note: This photograph is from the first round installation.

ANCHOR ENVIRONMENTAL, L.L.C.

Figure N-3
Photographs of the Installation
OF-22C City

Figure N-4 OF-22C City

January 9th Sampling Event



7 Mon Jan 2008

1/7/2008 6:00:00 PM - 1/8/2008 9:00:00 PM

ATTACHMENT N-1

Reconnaissance Survey Data Sheet

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Outfall Reference Sheet – Lower Willamette Group

Outfall ID: OF-22C City of Portland		
Contact: Linda Sheffler	Cell: 503-823-2297	Office: 503-539-2287
Team Lead: Shawn Hinz		

Site Access

Address:	See Map
Directions:	
Access Procedure:	Need access agreement with City of Portland
Restrictions:	Confined Space Police Evidence Yard—Can only be accessed M-Th 7am-10am without special arrangements. Need background check. City can assist with access.

Sampling Specifics

Sediment Trap Location:	In MH AAJ-602
Flow Meter Location:	In 48-inch outlet pipe (upstream to avoid turbulence)
ISCO Sampler Location:	In MH AAJ-602


Basin 22C Site Map
Sampler Location
NW ST HELENS RD
6330-6346
7027
AAJ603
AAJ604
AMZ969
AMZ968

APPENDIX O

OF-22B
City
Site-Specific Sampling Report

Appendix O – OF-22B City Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the OF-22B outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix O for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the OF-22B outfall sampling location, located upstream of the outfall in City of Portland manhole AAJ 650:

- Flow weighted composite sampling (first/second rounds)
- Grab water sampling (first round only)
- Sampling of stormwater suspended sediments using sediment traps (first/second rounds)

This report contains the following information:

- Table O-1 – Key Parameters for Sampling Programming
- Table O-2 – Composite Sampling – Sampling Details for Each Second Round Event
- Table O-3 – Composite Sampling – Estimated Runoff Quantity Calculations
- Table O-4 – Composite Sampling – Summary and Compositing of Second Round Sampling Activities
- Table O-5 – Composite Sampling – Second Round Compositing Calculations
- Table O-6 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure O-1 – Drainage Basin and Sampling Location
- Figure O-2 – Diagram of Sample Equipment Setup
- Figure O-3 – Photographs of Installation
- Figure O-4 – Flowlink Graph (11/16/07)
- Figure O-5 – Flowlink Graph (11/27/07)
- Attachment O-1 – Reconnaissance Survey Data Sheet

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

Table O-1. Key Parameters for Sampling Programming.

Parameter	
Site	OF-22B: City
Sampler Phone Number	206-450-8436
Outfall Pipe Size	60 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	25 ft

Table O-2. Composite Sampling – Sampling Details for Each Second Round Event.

Date of Sample Collection	**Trigger**	**Type of Sample Program**
11/16/2007	100 gpm	Time-based
11/27/2007	150 gpm	Flow-based

Table O-3. Composite Sampling – Estimated Runoff Quantity Calculations.

	Precipitation (in)				
Parameter	**0.2**	**0.35**	**0.5**	**0.75**	**1.50**
Impervious Area (acres)	30.38	30.38	30.38	30.38	30.38
Pervious Area (acres)	0	0	0	0	0
Impervious CN	98	98	98	98	98
Pervious CN	70	70	70	70	70
$Length_{sheet}$ (ft)	300	300	300	300	300
$Slope_{sheet}$	0.01	0.01	0.01	0.01	0.01
n_{sheet}	0.011	0.011	0.011	0.011	0.011
T_{sheet} (min)	15.4	15.4	15.4	15.4	15.4
$Length_{channel}$ (min)	100	100	100	100	100
$k_{channel}$	27	27	27	27	27
$Slope_{channel}$	0.005	0.005	0.005	0.005	0.005
$T_{channel}$ (min)	0.9	0.9	0.9	0.9	0.9
Time of Conc. (min)	16.3	16.3	16.3	16.3	16.3
Peak Discharge (cfs)	0.36	1.21	2.19	3.90	5.64
Peak Discharge (gpm)	161	542	982	1752	2532
Volume (cf)	7,688	20,530	35,042	60,708	87,189
Volume (gallons)	57,506	153,561	262,118	454,096	652,170

Table O-4. Composite Sampling – Summary and Compositing of Second Round Sampling Activities.

Sample Event ID	Date Collected	Retrieval Time	Composite Instructions	Notes
LW3-STW2-CW10-OF22B	11/16/2007	1445	A - 1157 ml	A-E - 100% full, fine sediment, brown.
			B - 461 ml	
			C - 1820 ml	
			D - 784 ml	
			E - 762 ml	
			F, G, H - empty	H used as blank.
LW3-STW2-CW20-OF22B	11/27/2007	1300	All A, B, C, D, E. Discard F because it includes a portion of the next storm	A, E - 105% full, clear with trace sediment in bottom. B, C, D - 105% full, cloudier with more sediment than A. F - 105% full, clearer. G - 10% full, clear.
			H – empty	H - 0% full.

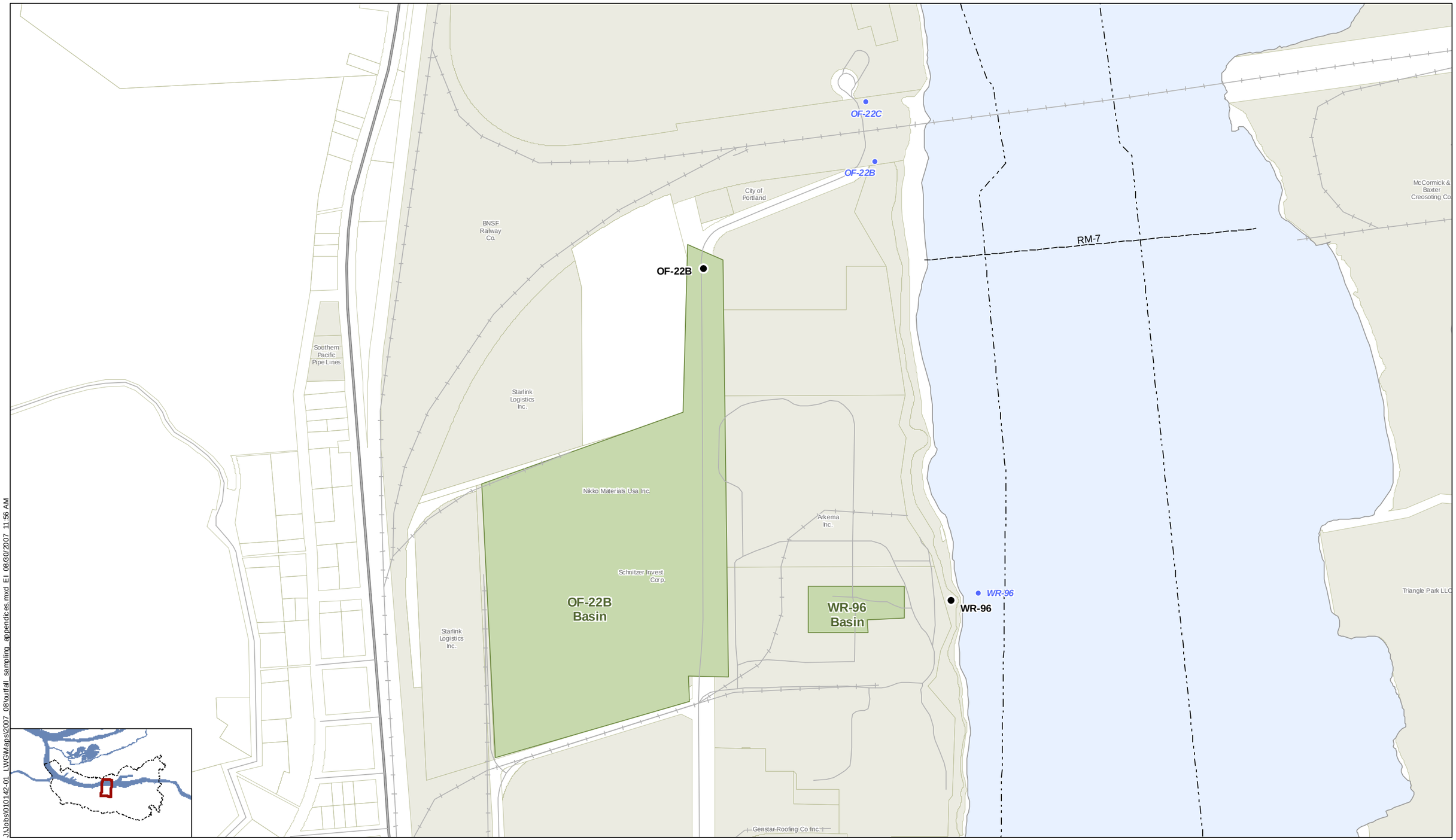
Table O-5. Composite Sampling – Second Round Compositing Calculations.

Date	Bottle	Total Flow in Time Period (gal)	Volume of Sample in Jar (mL)	Jar Contribution to Sample	Volume from Jar (mL)	Normalized to Largest Bottle Volume (mL)
11/16/2007	A	17289	1790	0.23	2123	1157
	B	6890	1845	0.09	846	461
	C	27200	1820	0.37	3340	1820
	D	11718	1860	0.16	1439	784
	E	11388	1830	0.15	1398	762
	Total	**74485**	**9145**	**1**	**9145**	**4984**

Table O-6. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	Date	Depth of Sediment (in)	Observation/Notes
Installation	11/15/2007		
Interim Inspection 1	12/11/2007	1/8”	Dark, flocculent material
Interim Inspection 2	1/3/2008	1/4-1/2”	Loose flocculent sediment, bottles opaque and hard to see through. Terra Hydr modified weir to raise bottles 2.5". Bottle tops level with lip of weir.
Interim Inspection 3	1/29/2008	Unknown	Bottles were too opaque to determine sediment volume. Dark, stringy material was found on the outside of bottles. Everything had a strong sulfuric smell. Collected four bottles and replaced them with four new ones.
Final Removal	2/12/2008	1/8-1/4	Dark, stringy, flocculent sediment. Bottles were slightly opaque. Strong sulfur smell in bottles as well as coming out of the manhole. Collected four bottles.

FIGURES



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ANCHOR ENVIRONMENTAL L.L.C.

LWG LOWER WILLAMETTE GROUP

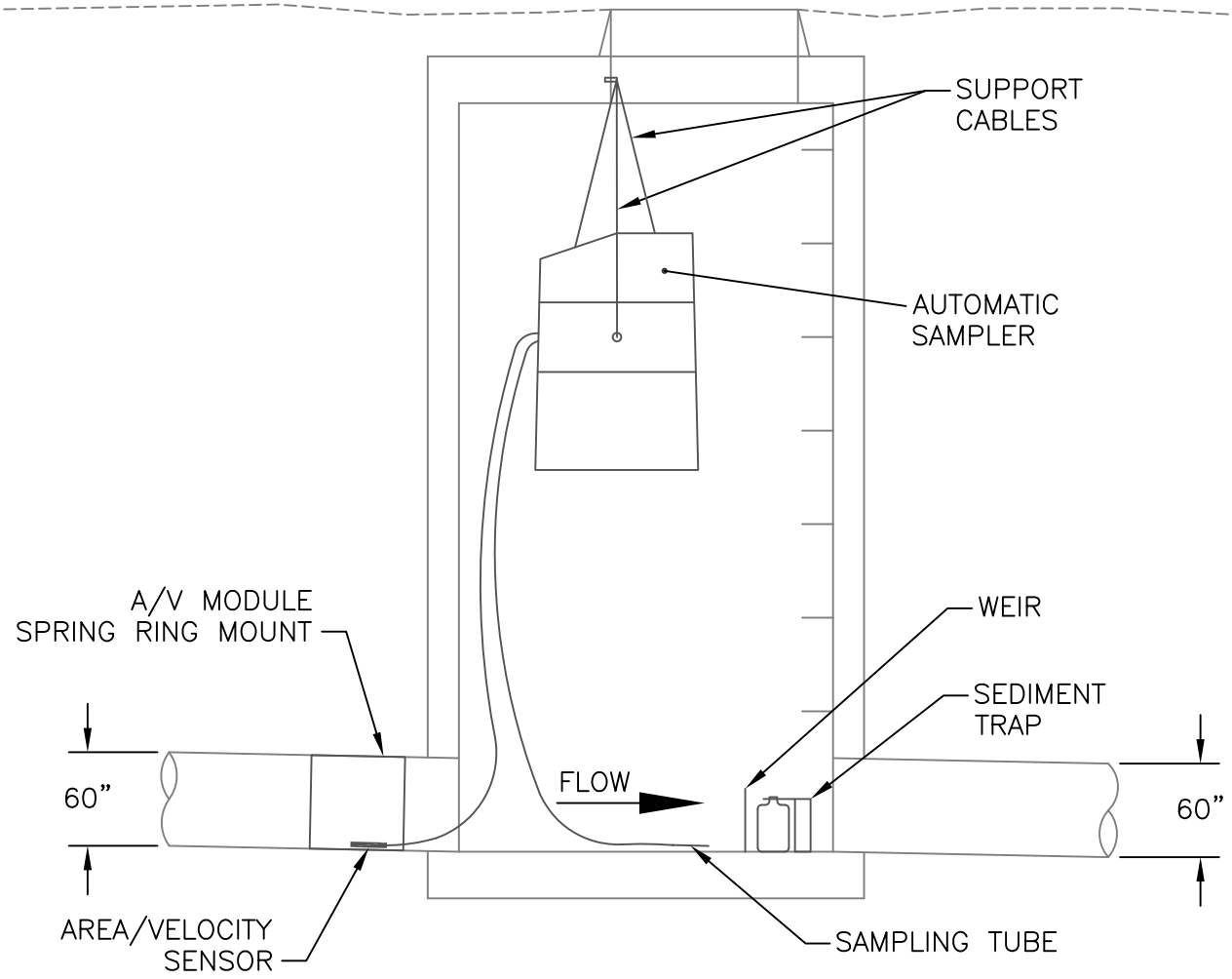
0 140 280 420 560 Feet

Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

NOTES:

Figure O-1
Drainage Basin and Sampling Location
OF-22B City
Lower Willamette Group



INSTALLATION SECTION

NOT TO SCALE

Note: During the first round of sampling, 2 sediment trap bottles were installed at OF-22B, whereas during the second round of sampling, 4 sediment trap bottles were installed.

Figure O-2

Diagram of Sampling Equipment
OF-22B City of Portland

Flow Meter

Weir

Sediment Traps with Weir

ANCHOR ENVIRONMENTAL, L.L.C.

Figure O-3
Photographs of the Installation
OF-22B City

Figure O-4 OF-22B City

November 16th Sampling Event

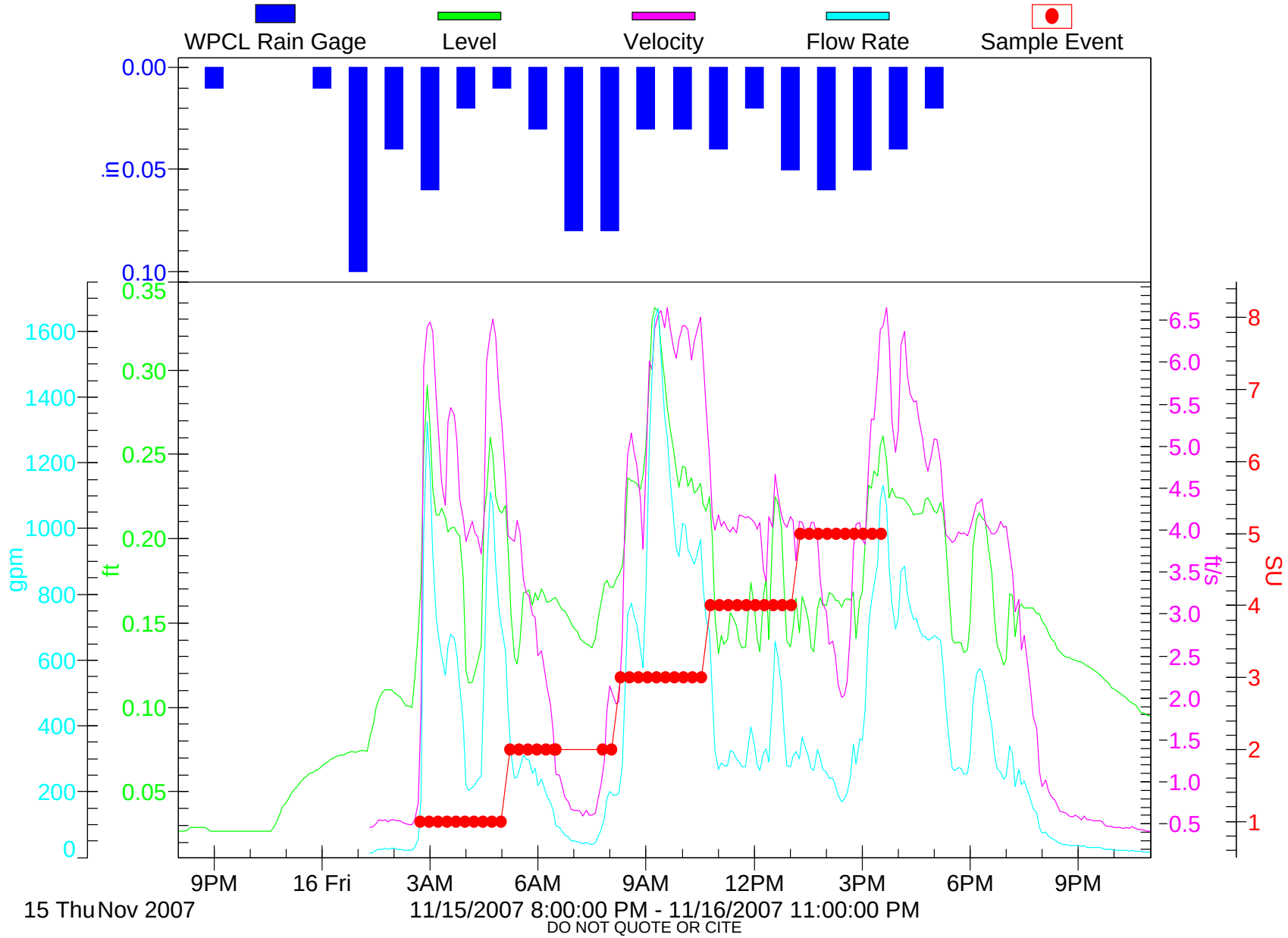
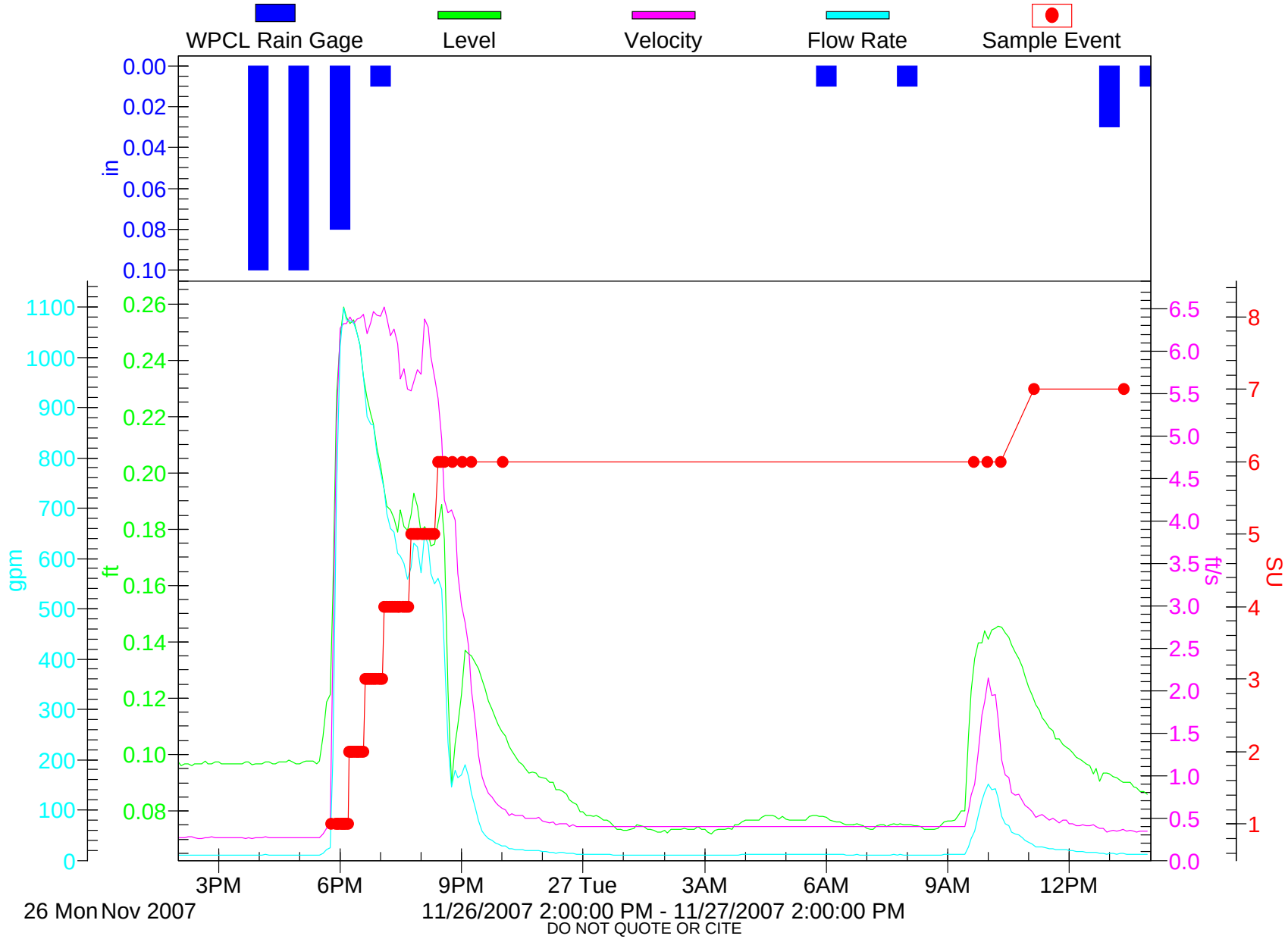


Figure O-5 OF-22B City

November 27th Sampling Event



ATTACHMENT O-1

Reconnaissance Survey Data Sheet

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Outfall Reference Sheet – Lower Willamette Group

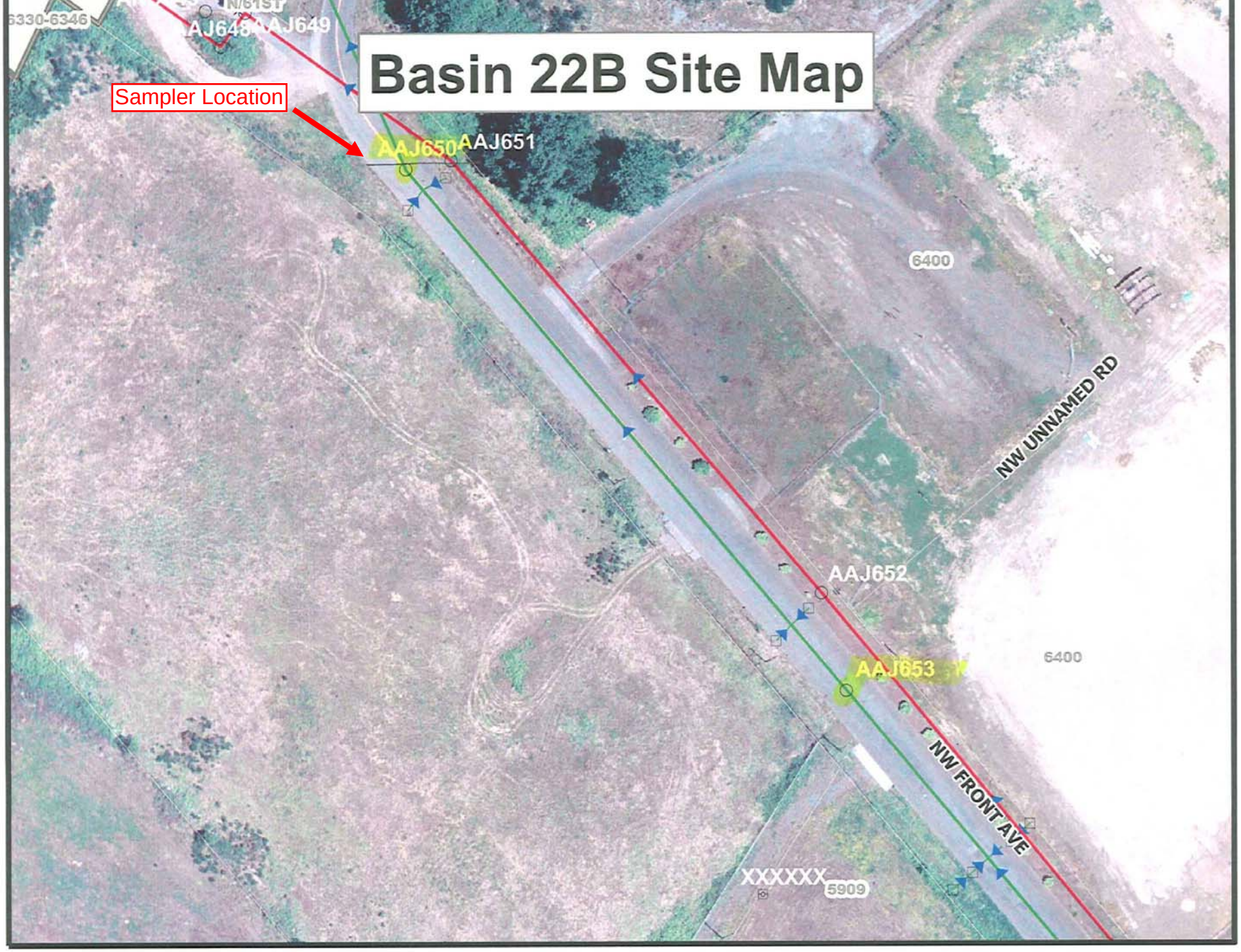
Outfall ID: OF-22B City of Portland		
Contact: Linda Sheffler	Office: 503-823-2296	Cell: 503-539-2287
Team Lead: Shawn Hinz		

Site Access

Address:	See Map
Directions:	
Access Procedure:	Need access agreement with City of Portland
Restrictions:	Confined Space

Sampling Specifics

Sediment Trap Location:	In MH AAJ-650
Flow Meter Location:	In 60-inch outlet pipe
ISCO Sampler Location:	In MH AAJ-650


Basin 22B Site Map
Sampler Location
AAJ650
AAJ651
AAJ652
AAJ653
6400
6400
NW UNNAMED RD
NW FRONT AVE
XXXXXX
5909

APPENDIX T

WR-218
Albina - UPRR
Site-Specific Sampling Report

Appendix T – WR-218 Albina - UPRR Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the WR-218 outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix T for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the WR-218 outfall sampling location, located in a manhole upstream of the outfall on the UPRR site:

- Flow weighted composite sampling (first/second rounds)
- Sampling of stormwater suspended sediments using sediment traps (first/second rounds)

This report contains the following information:

- Table T-1 – Key Parameters for Sampling Programming
- Table T-2 – Composite Sampling – Sampling Details for Each Second Round Event
- Table T-3 – Composite Sampling – Estimated Runoff Quantity Calculations
- Table T-4 – Composite Sampling – Summary and Compositing of Second Round Sampling Activities
- Table T-5 – Composite Sampling – Second Round Compositing Calculations
- Table T-6 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure T-1 – Drainage Basin and Sampling Location
- Figure T-2 – Diagram of Sample Equipment Setup
- Figure T-3 – Photographs of Installation
- Figure T-4 – Flowlink Graph (11/27/07)
- Figure T-5 – Flowlink Graph (11/29/07)
- Attachment T-1 – Reconnaissance Survey Data Sheet

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented

by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

Table T-1. Key Parameters for Sampling Programming.

Parameter	
Site	WR-218: Albina – UPRR
Sampler Phone Number	206-450-8447
Outfall Pipe Size	30 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	25 ft

Table T-2. Composite Sampling – Sampling Details for Each Second Round Event.

Date of Sample Collection	**Trigger**	**Type of Sample Program**
11/27/2007	1.4 ft	Time-based
11/29/2007	1.4 ft	Time-based

Table T-3. Composite Sampling – Estimated Runoff Quantity Calculations.

	Precipitation (in)				
Parameter	**0.2**	**0.35**	**0.5**	**0.75**	**1.50**
Impervious Area (acres)	75.9	75.9	75.9	75.9	75.9
Pervious Area (acres)	0	0	0	0	0
Impervious CN	98	98	98	98	98
Pervious CN	80	80	80	80	80
$Length_{sheet}$ (ft)	300	300	300	300	300
$Slope_{sheet}$	0.01	0.01	0.01	0.01	0.01
n_{sheet}	0.011	0.011	0.011	0.011	0.011
T_{sheet} (min)	15.4	15.4	15.4	15.4	15.4
$Length_{channel}$ (min)	100	100	100	100	100
$k_{channel}$	27	27	27	27	27
$Slope_{channel}$	0.005	0.005	0.005	0.005	0.005
$T_{channel}$ (min)	0.9	0.9	0.9	0.9	0.9
Time of Conc. (min)	16.3	16.3	16.3	16.3	16.3
Peak Discharge (cfs)	0.90	3.02	5.46	9.75	14.09
Peak Discharge (gpm)	402	1354	2452	4378	6326
Volume (cf)	19,207	51,290	87,548	151,670	217,828
Volume (gallons)	143,670	383,650	654,862	1,134,493	1,629,353

Table T-4. Composite Sampling – Summary and Compositing of Second Round Sampling Activities.

Sample Event ID	Date Collected	Retrieval Time	Composite Instructions	Notes
No sample	11/16/2007	None	None	No samples collected.
LW3-STW2-CW10-WR218	11/27/2007	1415	A - 1458 ml	A - 100% full, cloudy, yellowish, flocculent sediment.
			B - 1660 ml	B - 100% full, slightly cloudy, trace sediment.
			C - 418 ml	C - 100% full, cloudy, trace sediment.
			D - discard	D - 20% full, clear.
			E-G - empty	E, F, G, H - 0% full.
			H - field blank	
LW3-STW2-CW20-WR218	11/29/2007	1045	A - 1055 ml	A, B - 100% full, cloudy, grayish, some sediment.
			B - 815 ml	
			C - 1289 ml	C, D - 100%, less cloudy, grayish, some sediment.
			D - 1640 ml	
			E - 1026 ml	E, F, G - 100% full, less cloudy, yellowish, some sediment.
			F - 569 ml	
			G - 288 ml	
			H - field blank	H - 0% full.

Table T-5. Composite Sampling – Second Round Compositing Calculations.

Date	Bottle	Total Level During Time Period (ft in 5 minute increments)	Volume of Sample in Jar (mL)	Jar Contribution to Sample	Volume from Jar (mL)	Normalized to Largest Bottle Volume (mL)
11/27/2007	A	6.635	1680	0.41	2061	1458
	B	7.555	1660	0.47	2347	1660
	C	1.904	1660	0.12	592	418
	Total	**16.1**	**5000.0**	**1.0**	**5000.0**	**3536**
11/29/2007	A	4.587	1680	0.16	1827	1055
	B	3.545	1660	0.12	1412	815
	C	5.604	1630	0.19	2231	1289
	D	7.13	1640	0.25	2839	1640
	E	4.462	1640	0.15	1777	1026
	F	2.475	1640	0.09	986	569
	G	1.253	1680	0.04	499	288
	Total	**29.056**	**11570.0**	**1.0**	**11570.0**	**6684**

Table T-6. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	Date	Depth of Sediment (in)	Observation/Notes
Installation	11/21/2008		
Interim Inspection 1	12/11/2007	1/8-3/4	Very loose flocculent sediment.
Interim Inspection 2	1/10/2008	Trace-1/2	Loose flocculent rust colored sediment.
Interim Inspection 3	1/30/2008	3/4-1	Loose flocculent rusty material. Collected four bottles and replaced them with four new ones.
Final Removal	2/12/2008	1/8	Loose, rusty flocculent material. Collected four bottles.

FIGURES

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ANCHOR ENVIRONMENTAL L.L.C.

LWG LOWER WILLAMETTE GROUP

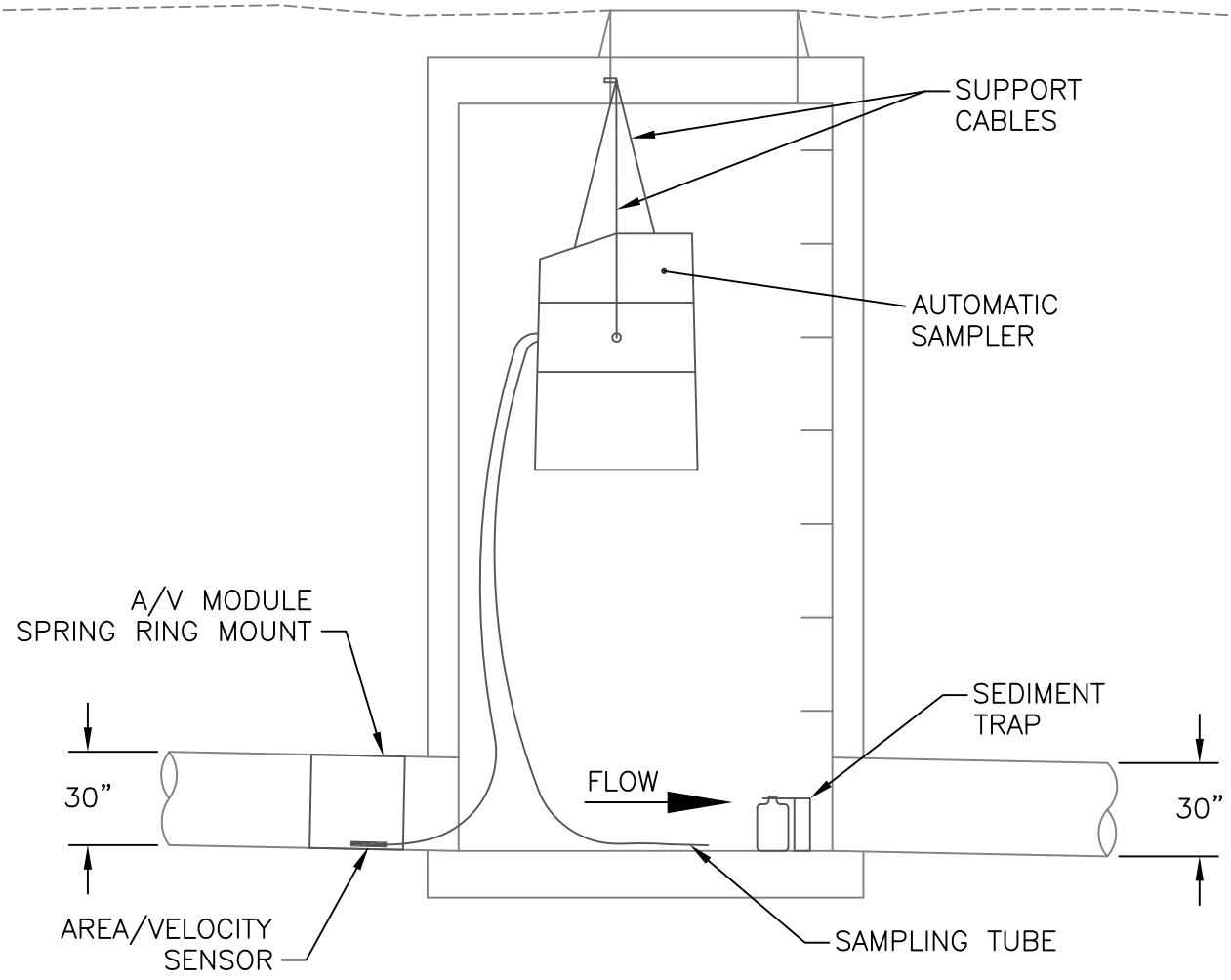
0 150 300 450 600 Feet

Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

NOTES:

Figure T-1
Drainage Basin and Sampling Location
WR-218 UPR Albina
Lower Willamette Group



INSTALLATION SECTION

NOT TO SCALE

Note: During the first round of sampling, 2 sediment trap bottles were installed at WR–218, whereas during the second round of sampling, 4 sediment trap bottles were installed.

Figure T-2

Diagram of Sampling Equipment
WR-218 UPRR Albina

Sampling Manhole Location
Note: This photograph is from the first round installation.

Flow Channel

ANCHOR ENVIRONMENTAL, L.L.C.

Figure T-3
Photographs of the Installation
WR-218 UPRR Albina

Figure T-4 WR-218 UPRR Albina

November 27th Sampling Event

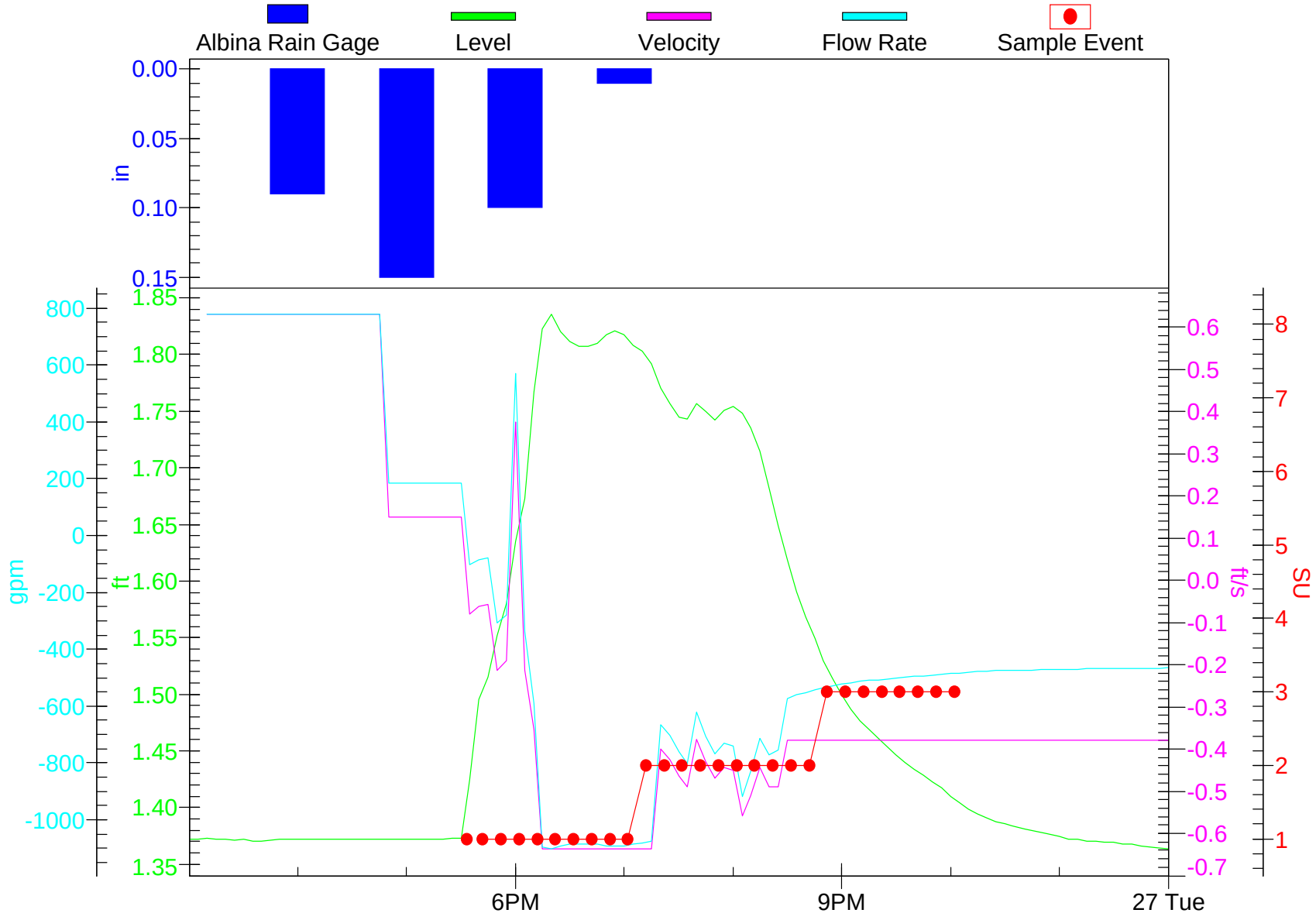
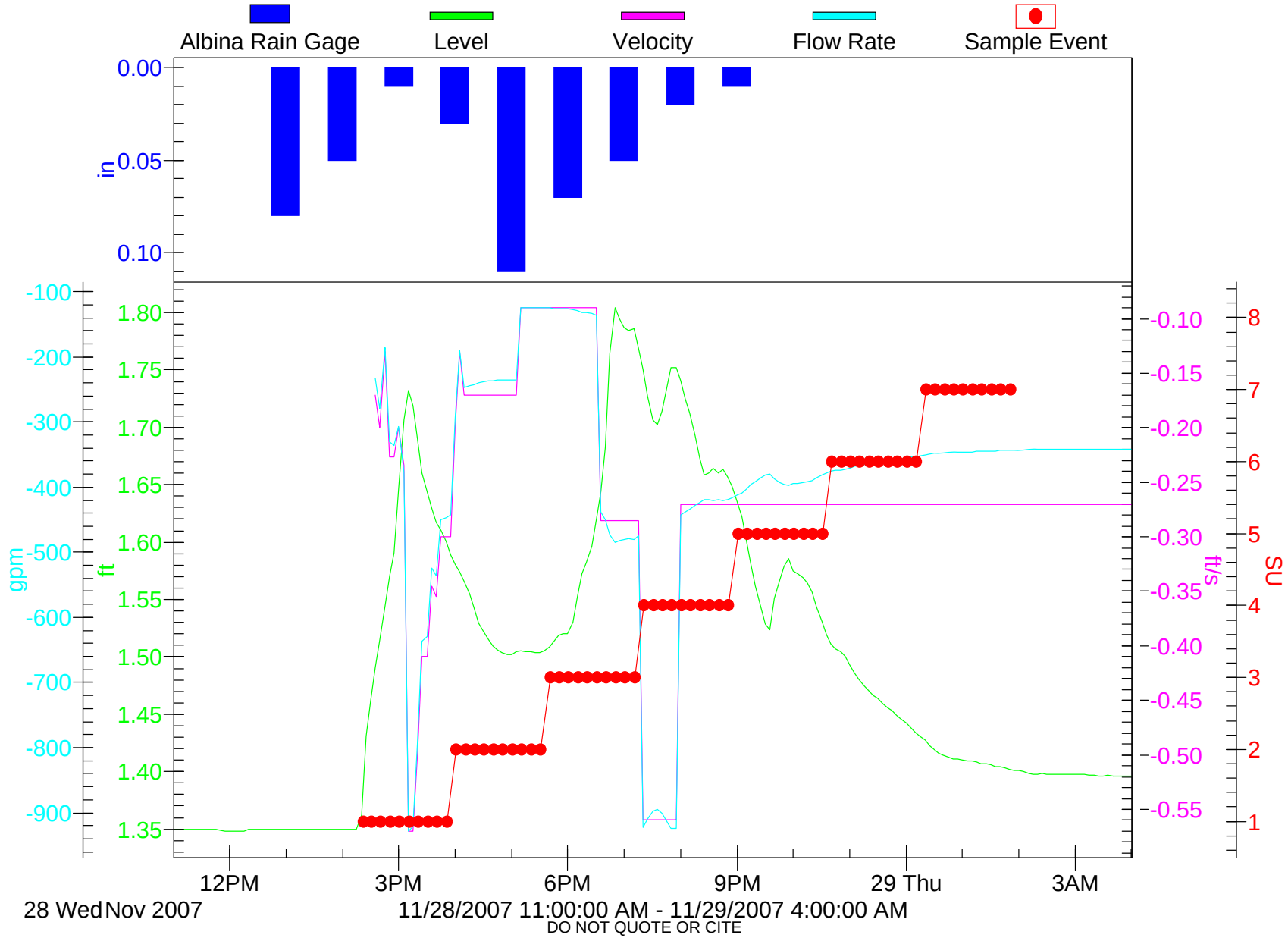


Figure T-5 WR-218 UPRR Albina

November 29th Sampling Event



ATTACHMENT T-1

Reconnaissance Survey Data Sheet

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

Outfall Reference Sheet – Lower Willamette Group

Outfall ID: WR-218 Union Pacific Railroad		
Contact: Mark Leece	Office: 503-736-4242	Cell: 503-225-3806
Team Lead: Shawn Hinz		

Site Access

Address:	**1525 N RIVER ST, PORTLAND**
Directions:	Turn **Left** on **NW 17TH AVE** - **go 0.1** mi Turn **Right** on **NW FRONT AVE** - **go 1.2** mi Bear **Right** onto **STEEL BRG** toward **OR-99W NORTH** - **go 0.4** mi Continue on **NE OREGON ST** - **go 0.1** mi Turn **Left** on **INTERSTATE AVE** - **go 0.8** mi Turn **Left** on **N TILLAMOOK ST** - **go 0.1** mi Bear **Right** on **N RIVER ST** - **go 0.3** mi Arrive at site, on the **Right**
Access Procedure:	Park next to machine shop and wait for Mark Leece.
Restrictions:	Confined Space. Need e-Rail Safe certification to do work on the site. MH is between two sets of railroad tracks. MH has constant running water because of groundwater infiltration.

Sampling Specifics

Sediment Trap Location:	In MH upstream of outfall
Flow Meter Location:	In inlet pipe of MH upstream of outfall
ISCO Sampler Location:	In MH upstream of outfall

LEGEND

- Property Boundary
- Pavement Areas
- Stormwater Outfall
- 30" Storm Drain
- 18" Storm Drain
- 12" Storm Drain

100' 200'

SCALE: 1" = 100'

Drawing Reference: CAD drawing developed from digital conversion of Union Pacific Railroad C.E. Drawing No. 82641, Portland (Albina Yard) and St. Johns Junction, July 10, 1974. Survey based on a David Evans and Associates, Inc. field survey conducted in March 2002 and March 2004. Basis of elevation is City of Portland Benchmark No. 2933, located at the NE corner in curb, 3 foot east at N. Randolph Avenue and N. River Street with an elevation of 31.96 feet.

ificRailroad\334988\CAD\Submittal to LWG\UPRR-Storm Lines - LWG April 2006.dwg

APPENDIX V

OF-18
City
Site-Specific Sampling Report

Appendix V – OF-18 City Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the OF-18 outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix V for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the OF-18 outfall sampling location, located upstream of the outfall in City of Portland manhole AMZ-088:

- Flow weighted composite sampling (first round only)
- Grab water sampling (first round only)
- Sampling of stormwater suspended sediments using sediment traps (first/second rounds)

This report contains the following information:

- Table V-1 – Key Parameters for Sampling Programming
- Table V-2 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure V-1 – Drainage Basin and Sampling Location
- Figure V-2 – Diagram of Sample Equipment Setup
- Figure V-3 – Photographs of Installation
- Attachment V-1 – Reconnaissance Survey Data Sheet

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

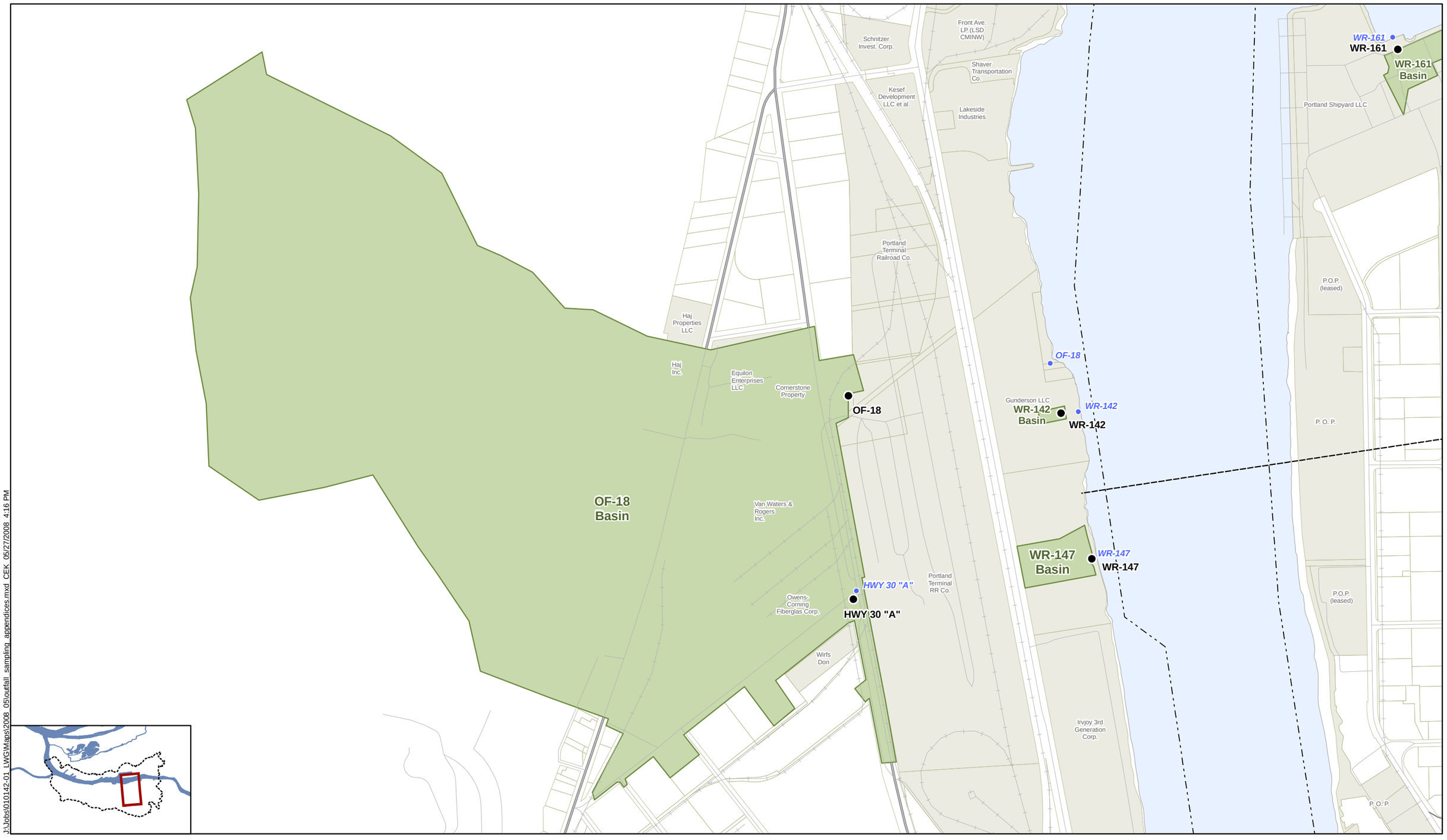
Table V-1. Key Parameters for Sampling Programming.

Parameter	
Site	OF-18: City
Sampler Phone Number	206-450-8536
Outfall Pipe Size	54 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	25 ft

Table V-2. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	**Date**	**Depth of Sediment (in)**	**Observation/Notes**
Installation	11/12/2007		
Interim Inspection 1	12/10/2007	1/2-7/8 full	Consolidated, stratified layers of sandy sediment, organic material, and loose flocculent sediment BOTTLES ARCHIVED IN FIELD LAB.
Interim Inspection 2	1/10/2008	3/4-1½	Sandy sediment with some organic material. Top layer consisted of loose flocculent sediment. Removed all bottles to be archived, replaced with two tall and two short bottles.
Interim Inspection 3	1/28/2008	1/4-1/2	Dark, flocculent material. Collected four bottles and replaced them with two short bottles and two tall bottles.
Final Removal	2/11/2008	1/4-3/4	Loose, dark, flocculent material. Collected four bottles.

FIGURES



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ANCHOR ENVIRONMENTAL, L.L.C.

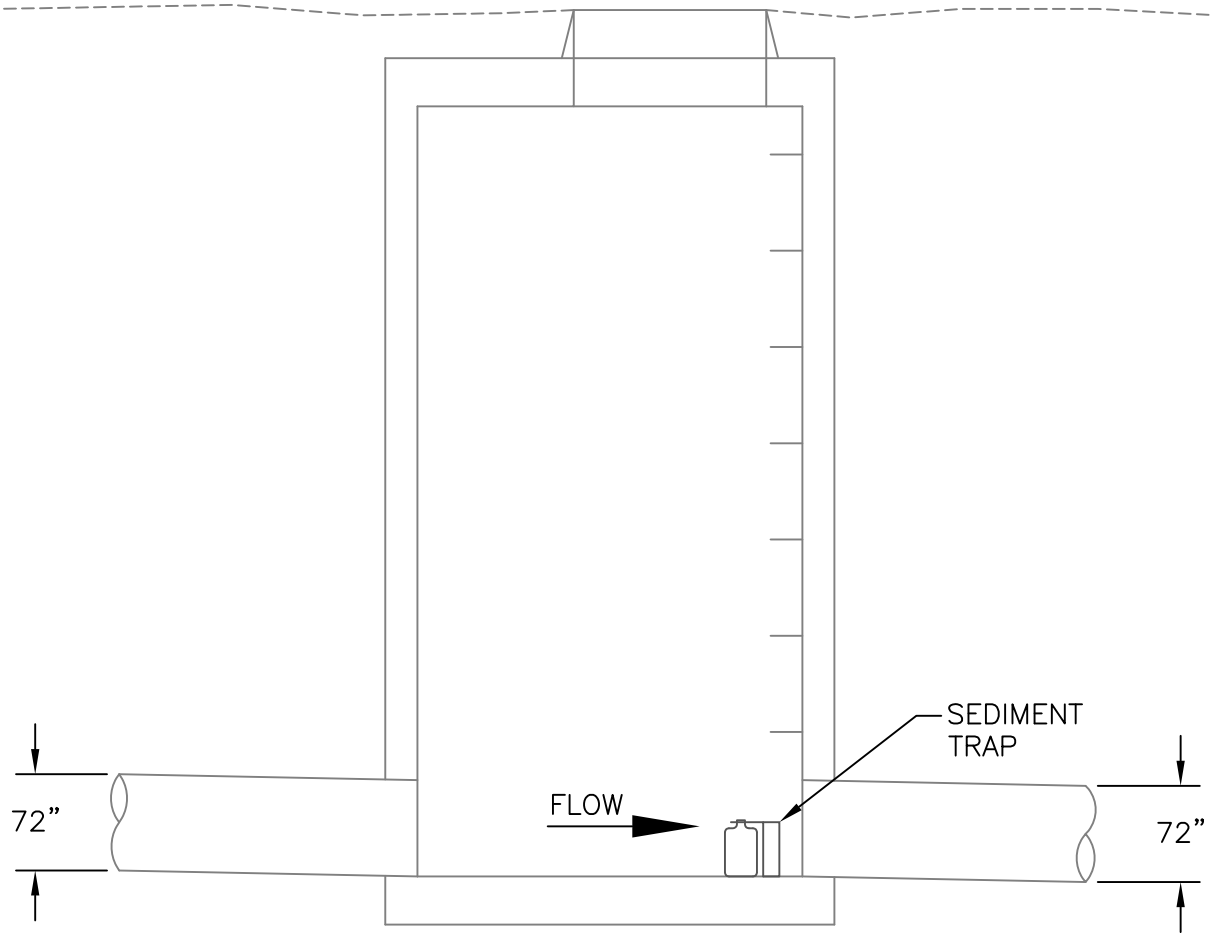
LWG LOWER WILLAMETTE GROUP

0 275 550 825 1,100 Feet

Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

Figure V-1
Drainage Basin and Sampling Location
OF-18
Lower Willamette Group



INSTALLATION SECTION

NOT TO SCALE

Note: During the first round of sampling, 2 sediment trap bottles were installed at OF-18, whereas during the second round of sampling, 4 sediment trap bottles were installed.

Figure V-2

Diagram of Sampling Equipment
OF-18 City of Portland

Sampling Manhole
Note: This photograph is from the first round installation.

Submerged Sampling Tube and Sediment Traps

Figure V-3
Photographs of the Installation
OF-18 City

ATTACHMENT V-1

Reconnaissance Survey Data Sheet

Anchor Environmental, L.L.C.
1423 3rd Avenue, Suite 300
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131

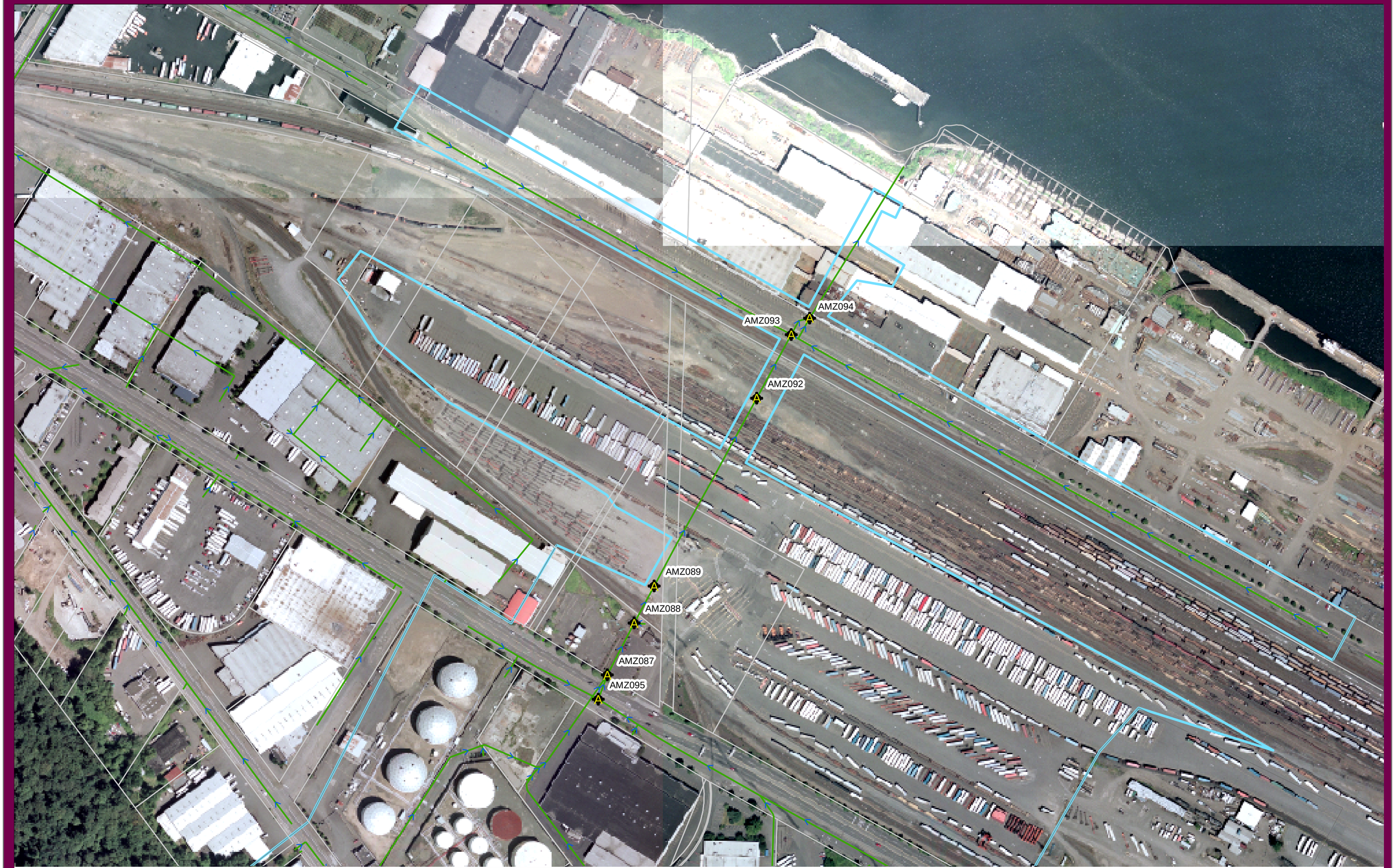
Outfall ID: OF-18 City of Portland		
Contact: Linda Scheffler	Cell: 503-823-2296	Office: 503-539-2287
Team Lead: Shawn Hinz		

Site Access

Address:	NW Yeon Street in BNSF parking lot
Directions:	
Access Procedure:	Need access agreement with City of Portland
Restrictions:	Confined Space

Sampling Specifics

Sediment Trap Location:	City MH AMZ-088
Flow Meter Location:	City MH AMZ-088
ISCO Sampler Location:	City MH AMZ-088


AMZ094
AMZ093
AMZ092
AMZ089
AMZ088
AMZ087
AMZ095

APPENDIX X

Hwy 30 A
Highway 30 A
Site-Specific Sampling Report

Appendix X – Highway 30 A Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the Hwy 30 A outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. Refer to Round 3A Upland Stormwater Sampling Field Sampling Report Appendix K for information about additional sampling conducted during the first round of sampling in February through July of 2007 (first round sampling).

The following sampling activities were conducted at the Hwy 30 A outfall sampling location, located in a manhole at Highway 30 at 35th Street NW:

- Flow weighted composite sampling (second round only)
- Sampling of stormwater suspended sediments using sediment traps (second round only)

This report contains the following information:

- Table X-1 – Key Parameters for Sampling Programming
- Table X-2 – Composite Sampling – Sampling Details for Each Second Round Event
- Table X-3 – Composite Sampling – Estimated Runoff Quantity Calculations
- Table X-4 – Composite Sampling – Summary and Compositing of Second Round Sampling Activities
- Table X-5 – Composite Sampling – Second Round Compositing Calculations
- Table X-6 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure X-1 – Drainage Basin and Sampling Location
- Figure X-2 – Diagram of Sample Equipment Setup
- Figure X-3 – Photographs of Installation
- Figure X-4 – Flowlink Graph (11/16/07)
- Figure X-5 – Flowlink Graph (11/27/07)
- Figure X-6 – Flowlink Graph (01/28/08)
- Figure X-7 – Flowlink Graph (01/30/08)

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

Table X-1. Key Parameters for Sampling Programming.

Parameter	
Site	Hwy 30 A: Highway 30 A
Sampler Phone Number	206-450-8438
Outfall Pipe Size	26 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	18 ft

Table X-2. Composite Sampling – Sampling Details for Each Second Round Event.

Date of Sample Collection	**Trigger**	**Type of Sample Program**
11/16/2007	0.1 ft	Time-based
11/27/2007	0.1 ft	Time-based
1/28/2008	0.1 ft	Time-based
1/30/2008	0.1 ft	Time-based

Table X-3. Composite Sampling – Estimated Runoff Quantity Calculations.

	Precipitation (in)				
Parameter	**0.2**	**0.35**	**0.5**	**0.75**	**1.50**
Impervious Area (acres)	14	14	14	14	14
Pervious Area (acres)	0	0	0	0	0
Impervious CN	98	98	98	98	98
Pervious CN	76	76	76	76	76
$Length_{sheet}$ (ft)	100	100	100	100	100
$Slope_{sheet}$	0.01	0.01	0.01	0.01	0.01
n_{sheet}	0.011	0.011	0.011	0.011	0.011
T_{sheet} (min)	6.4	6.4	6.4	6.4	6.4
$Length_{channel}$ (min)	100	100	100	100	100
$k_{channel}$	27	27	27	27	27
$Slope_{channel}$	0.005	0.005	0.005	0.005	0.005
$T_{channel}$ (min)	0.9	0.9	0.9	0.9	0.9
Time of Conc. (min)	7.3	7.3	7.3	7.3	7.3
Peak Discharge (cfs)	0.20	0.65	1.17	2.07	2.97
Peak Discharge (gpm)	90	293	524	927	1334
Volume (cf)	3,543	9,461	16,149	27,976	40,179
Volume (gallons)	26,500	70,765	120,791	209,261	300,539

Table X-4. Composite Sampling – Summary and Compositing of Second Round Sampling Activities.

Sample Event ID*	Date Collected	Retrieval Time	Composite Instructions	Notes
LW3-STW2-CW10-H30	11/16/2007	1445	A - 960 ml	A - 50% full, turbid, sediment, yellow/brown.
			B - 0 ml**	B, C - 0% full.
			C - 0 ml**	
			D - 1362 ml	D - 90% full, turbid, sediment, yellow/brown.
			E - 810 ml	E - 40% full, turbid, light yellow/brown.
			F - 1287 ml	F, G - 100% full, turbid, sediment, yellow/brown.
			G – 1325 ml	
LW3-STW2-CW20-H30	11/27/2007	1150	A - 1520 ml	A - 90% full, cloudy, gray, trace sediment.
			B - 1194 ml	B - 95% full, clear, trace sediment.
			C - 260 ml	C - 10% full, clear, no sediment.
			D-H - empty	D-H - 0% full.
No sample	11/29/2007	None	None	No samples collected.
LW3-STW2-CW30-H30	1/28/2008	945	A - 1003 ml	A, B - 100% full, slightly cloudy, some sediment.
			B - 1131 ml	
			C - 1200 ml	C, D, E - 100% full, more cloudy, less sediment.
			D - 1292 ml	
			E - 1500 ml	
			F - 1209 ml	F - 100% full, clear, less sediment.
			G - 720 ml	G - 40% full, clear.
			H - field blank	H - 0 % full.
LW3-STW2-CW40-H30	1/30/2008	1050	A - blank	A, B - 0% full.
			B - blank	
			C - 759 ml	C - 50% full, gray, cloudy, some sediment.
			D - 1294 ml	D, E - 100% full, gray, cloudy, some sediment.
			E - 1660 ml	
			F - 958 ml	F - 50% full, gray, cloudy, some sediment.
			G - blank	G - 0% full.
			H - discard	H - 10% full, gray, cloudy.

* Sample ID's will be changed to reflect the name change to Hwy30A at a later date.
** The stormwater technical team, with EPA agreed that the sample taken on November 16th could be used as a sample, even though sample representing about 4% of the flow from the middle of the storm was not collected.

Table X-5. Composite Sampling – Second Round Compositing Calculations.

Date	Bottle	Total Flow in Time Period (gal)[1]; Total Level During Time Period (ft in 5 minute increments)[2]	Volume of Sample in Jar (mL)	Jar Contribution to Sample	Volume from Jar (mL)	Normalized to Largest Bottle Volume (mL)
11/16/2007[1]	A	2024.48	960	0.16	1069	960
	B	285.8		0.02	151	136[3]
	C	294.08		0.02	155	139[3]
	D	2871.65	1500	0.23	1516	1362
	E	1707.49	880	0.13	901	810
	F	2713.9	1680	0.21	1433	1287
	G	2793.81	1680	0.22	1475	1325
	Total	**12691.2**	**6700.0**	**1.0**	**6700.0**	**6018**
11/27/2007[1]	A	2109.23	1520	0.51	1748	1520
	B	1657.05	1650	0.40	1373	1194
	C	372.22	260	0.09	308	268
	Total	**4138.5**	**3430.0**	**1.0**	**3430.0**	**2982**
1/28/2007[2]	A	5.506	1750	0.12	1375	1003
	B	6.207	1700	0.14	1550	1131
	C	6.584	1700	0.15	1644	1200
	D	7.089	1730	0.16	1770	1292
	E	8.231	1710	0.19	2055	1500
	F	6.634	1725	0.15	1656	1209
	G	3.952	720	0.09	987	720
	Total	**44.2**	**11035.0**	**1.0**	**11035.0**	**8053.2**
1/30/2007[2]	A	0				
	B	0				
	C	4.801	850	0.16	843	759
	D	8.184	1670	0.28	1438	1294
	E	10.498	1660	0.36	1844	1660
	F	6.059	1010	0.21	1064	958
	G	0	0			
	Total	**29.5**	**5190.0**	**1.0**	**5190.0**	**4671.3**

Note: 1. Indicates that for the dates denoted the compositing calculations were based on the total flow in gallons during the time period

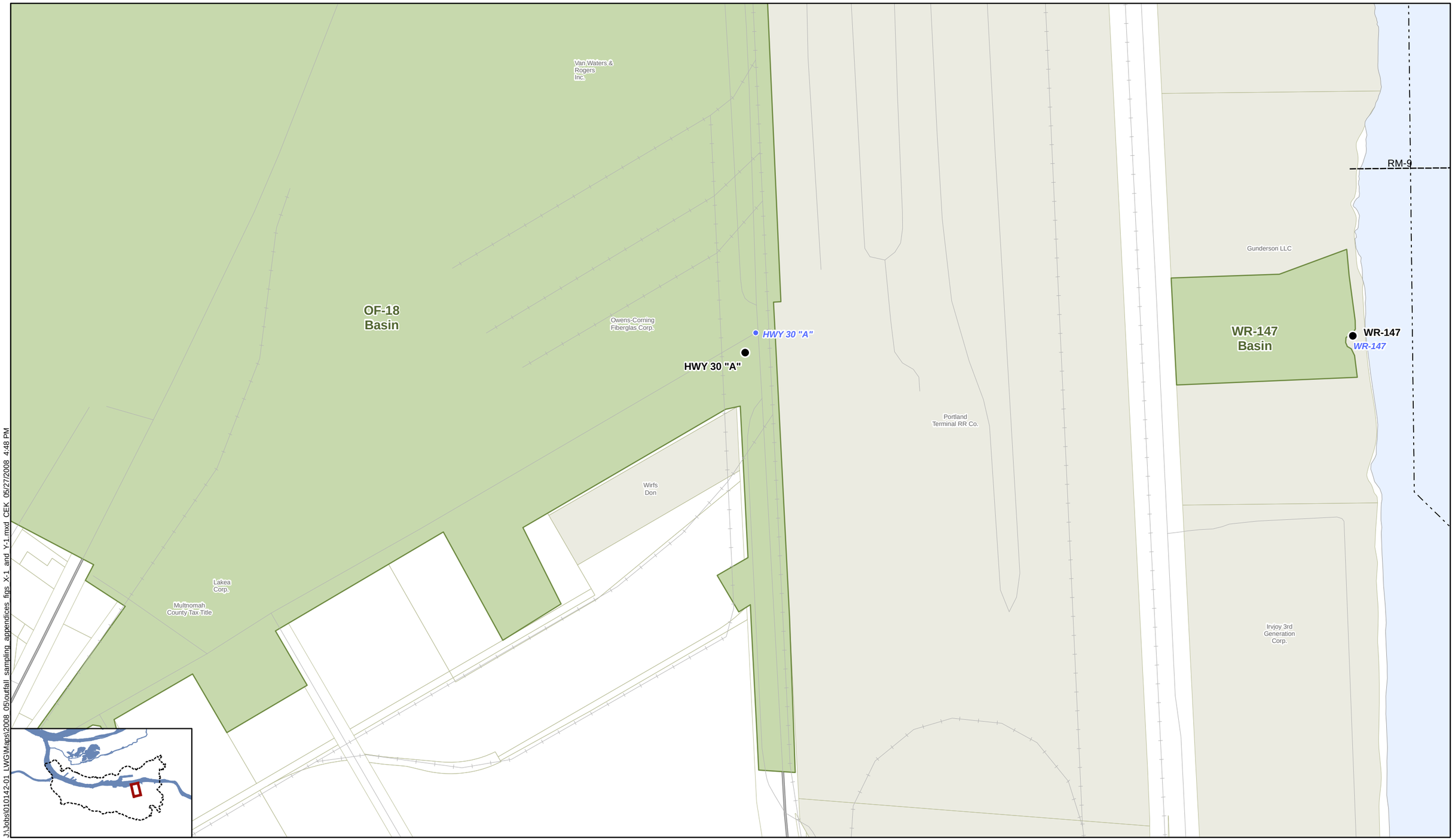
2. Indicates that for the dates denoted the compositing calculations were based on the total level in feet (in 5 minute increments) during the time period

3. Volume listed in column "Normalized to Largest Bottle Volume" is a by product of flow based compositing calculation and no sample was actually collected in this jar.

Table X-6. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	Date	Depth of Sediment (in)	Observation/Notes
Installation	11/12/2007		
Interim Inspection 1	12/10/2007	0	Bottles have not been over-topped by water.
Interim Inspection 2	1/9/2008	0-Trace	Replaced bottles with new shorter bottles. Only the angled tall bottles had any sediment.
Interim Inspection 3	1/28/2008	Trace	Trace amounts of dark flocculent sediment.
Final Removal	2/11/2008	Trace-1/4	Dark, loose, flocculent material. Collected four bottles.

FIGURES



ANCHOR ENVIRONMENTAL, L.L.C.

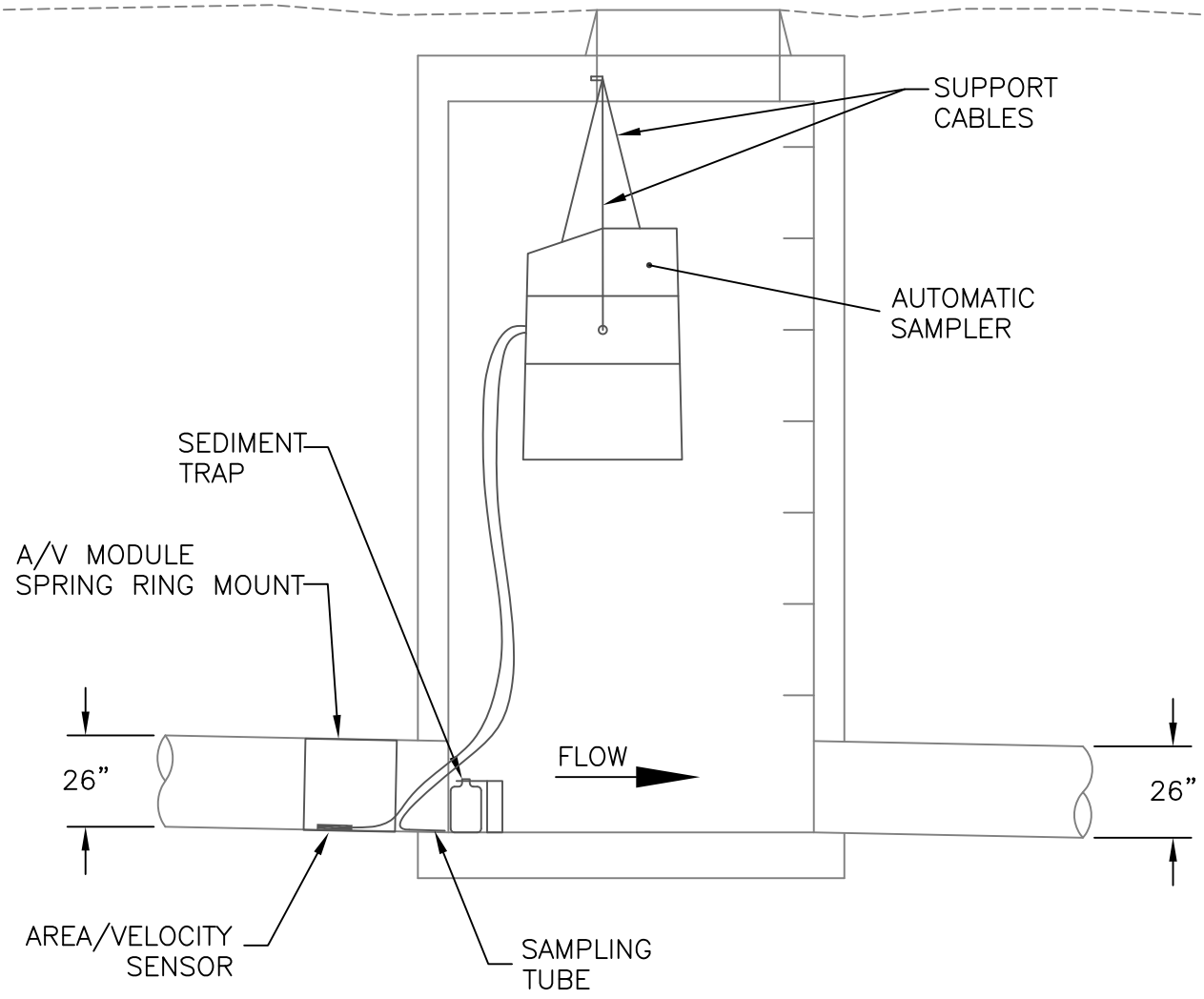
LWG LOWER WILLAMETTE GROUP

0 130 260 390 520 Feet

Map Features:
- Stormwater Sampling Location
- Sediment Trap Location
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

Figure X-1
Drainage Basin and Sampling Location
Hwy 30 "A"
Lower Willamette Group



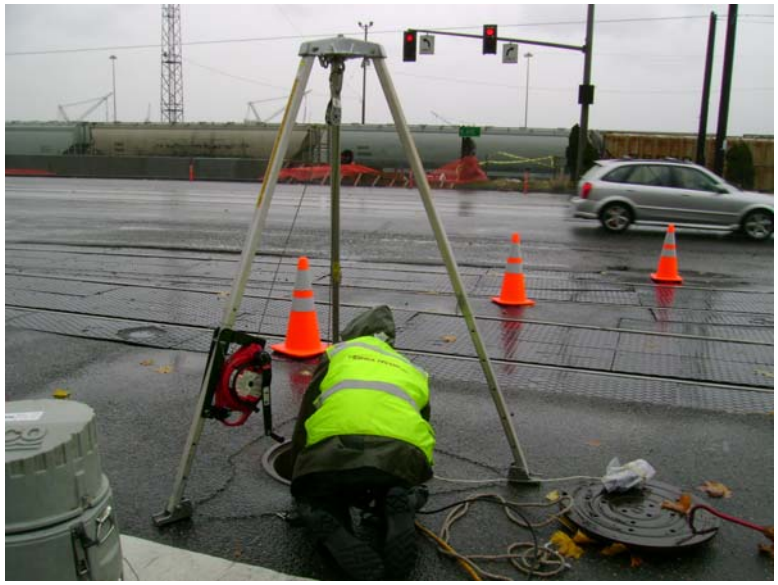
INSTALLATION SECTION

NOT TO SCALE

Note: During the first round of sampling, 2 sediment trap bottles were installed at Hwy 30 A downstream of the manhole, whereas during the second round of sampling, 4 sediment trap bottles were installed upstream of the manhole vault.

Figure X-2

Diagram of Sampling Equipment
Highway 30 A



Location of Manhole

Sampling Manhole

Sediment Traps and Sampling Tube

ANCHOR ENVIRONMENTAL, L.L.C.

Figure X-3
Photographs of the Installation
Highway 30 A

Figure X-4 Highway 30 A

November 16th Sampling Event

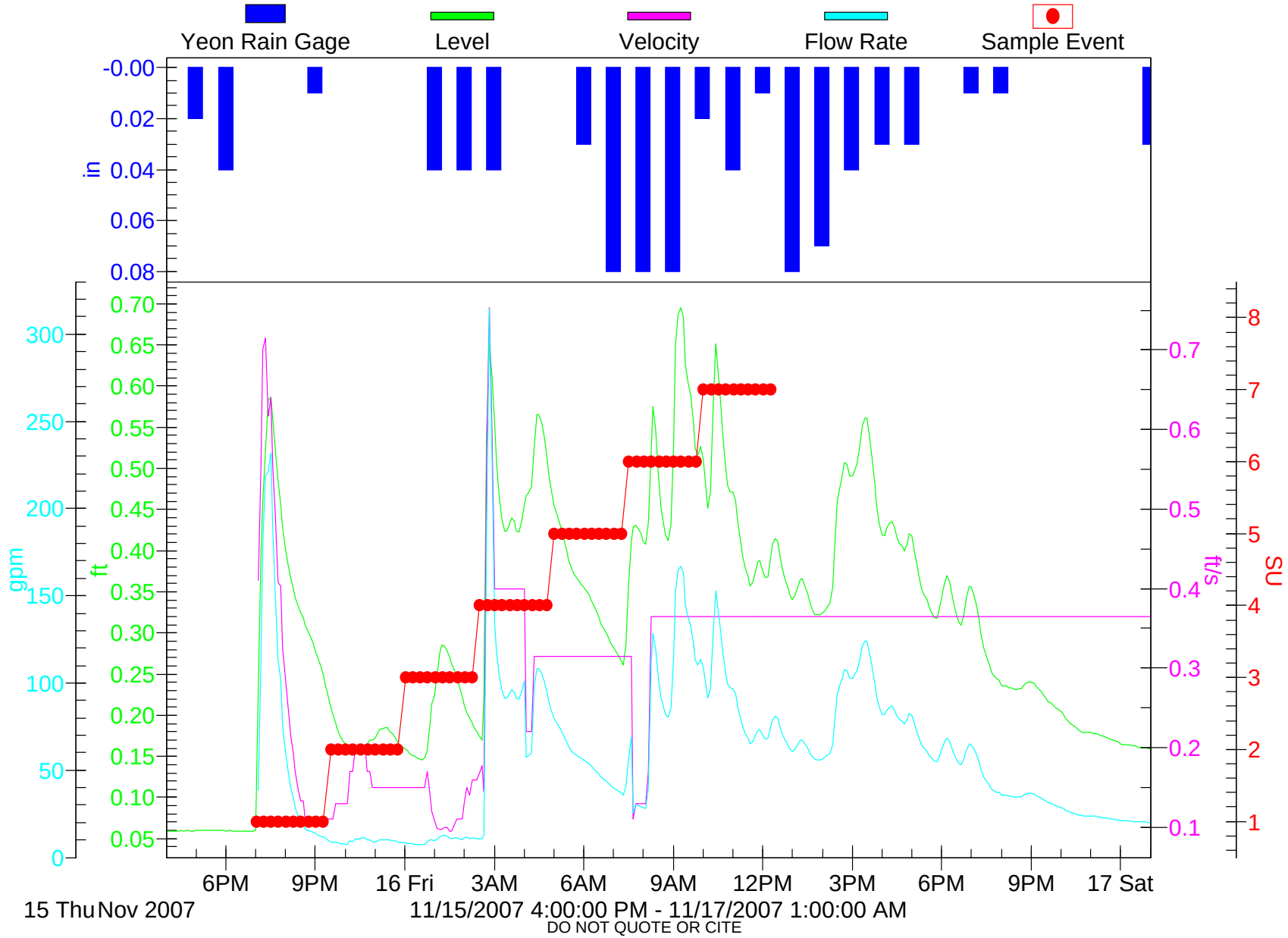
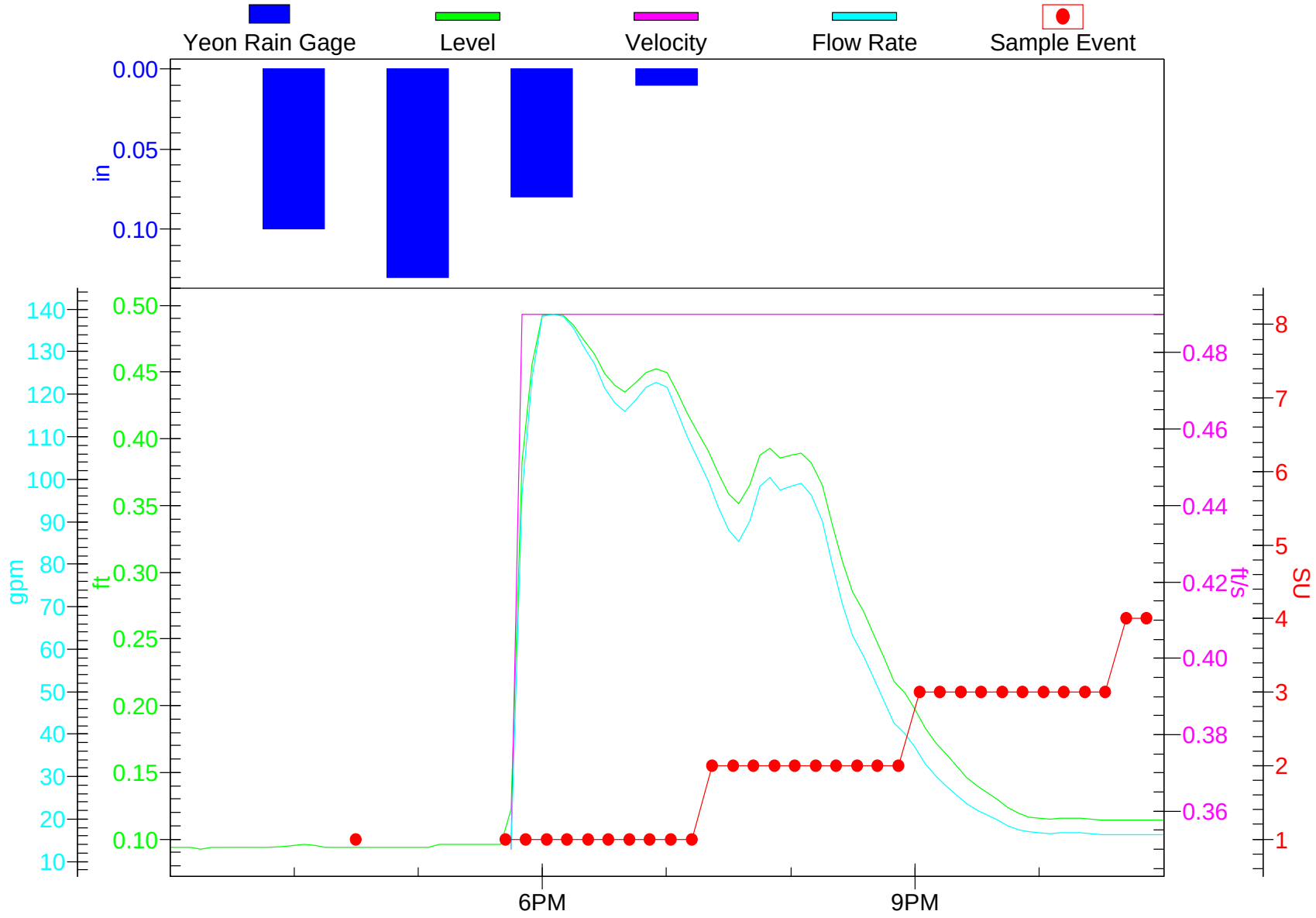


Figure X-5 Highway 30 A

November 27th Sampling Event



26 MonNov 2007

11/26/2007 3:00:00 PM - 11/26/2007 11:00:00 PM

Figure X-6 Highway 30 A

January 28th Sampling Event

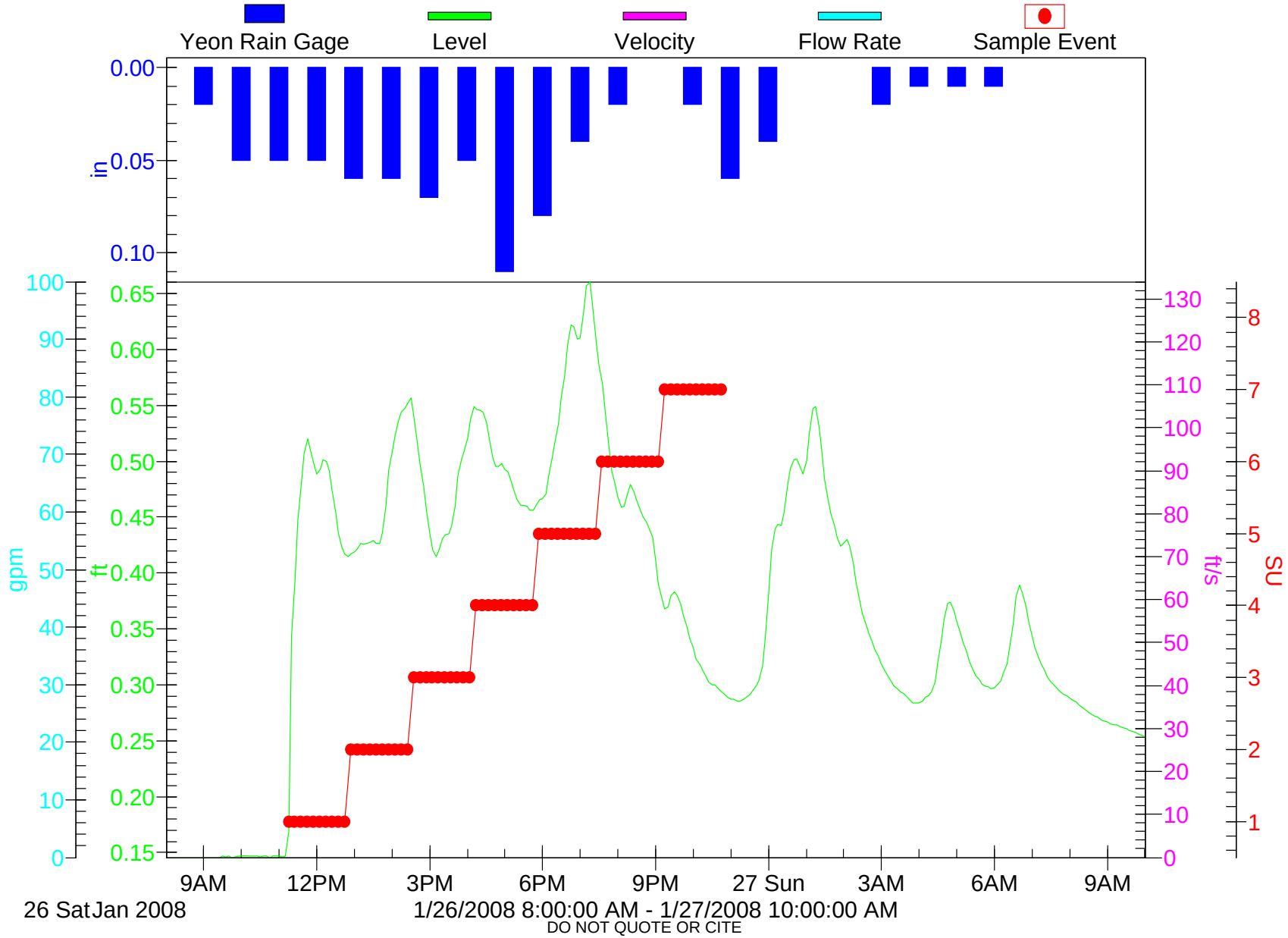
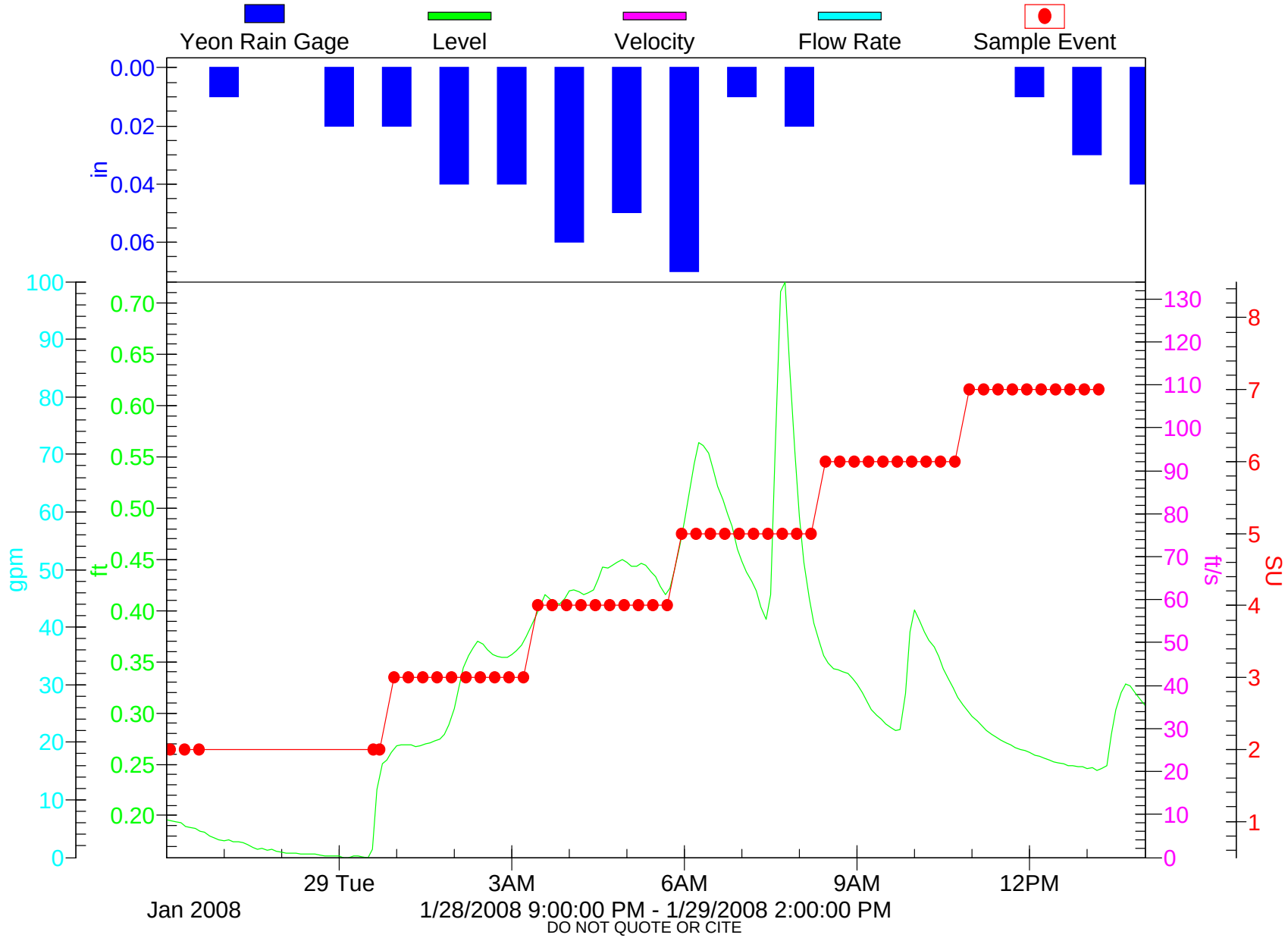


Figure X-7 Highway 30 A

January 30th Sampling Event



APPENDIX Y

Hwy 30 B
Highway 30 B
Site-Specific Sampling Report

Appendix Y – Highway 30 B Site-Specific Sampling Report – Second Round Sampling

This site specific sampling report describes the specific details for implementation of the FSP Addendum for the Hwy 30 B outfall sampling location conducted in November 2007 through February 2008 (second round sampling). This report is based on field reconnaissance surveys and decisions made in the coordination with the Stormwater Technical Team. The following sampling activities were conducted at the Hwy 30 B outfall sampling location, located in a manhole at Highway 30 at Reed Street:

- Flow weighted composite sampling (second round only)
- Sampling of stormwater suspended sediments using sediment traps (second round only)

This report contains the following information:

- Table Y-1 – Key Parameters for Sampling Programming
- Table Y-2 – Composite Sampling – Sampling Details for Each Second Round Event
- Table Y-3 – Composite Sampling – Estimated Runoff Quantity Calculations
- Table Y-4 – Composite Sampling – Summary and Compositing of Second Round Sampling Activities
- Table Y-5 – Composite Sampling – Second Round Compositing Calculations
- Table Y-6 – Sediment Trap Sampling – Summary of Second Round Sampling Activities
- Figure Y-1 – Drainage Basin and Sampling Location
- Figure Y-2 – Diagram of Sample Equipment Setup
- Figure Y-3 – Photographs of Installation
- Figure Y-4 – Flowlink Graph (11/27/07)
- Figure Y-5 – Flowlink Graph (01/11/08)
- Figure Y-6 – Flowlink Graph (01/15/08)
- Figure Y-7 – Flowlink Graph (01/28/08)
- Figure Y-8 – Flowlink Graph (01/30/08)

Flowlink graphs show the rainfall, runoff data, and sample information for each storm. Runoff data includes level, velocity, and flow when available. For sample information, a red dot represents each time one aliquot of sample was taken. The bottles are represented

by sample number. For example, the first 10 aliquots are taken in bottle 1, and then the graphs jumps up to represent filling bottle 2.

Table Y-1. Key Parameters for Sampling Programming.

Parameter	
Site	Hwy 30 B: Highway 30 B
Sampler Phone Number	206-450-8531
Outfall Pipe Size	30 in
Number of Bottles	8
Size of Bottles	1.8 L
Length of Pickup Tube	25 ft

Table Y-2. Composite Sampling – Sampling Details for Each Second Round Event.

Date of Sample Collection	**Trigger**	**Type of Sample Program**
11/27/2007	0.25 ft	Time-based
1/11/2008	0.25 ft	Time-based
1/15/2008	0.25 ft	Time-based
1/28/2008	0.25 ft	Time-based
1/30/2008	0.23 ft	Time-based

Table Y-3. Composite Sampling – Estimated Runoff Quantity Calculations.

Basin delineation was not available at the time of sampler deployment so now runoff quantities were estimated.

Table Y-4. Composite Sampling – Summary and Compositing of Second Round Sampling Activities.

Sample Event ID	Date Collected	Retrieval Time	Composite Instructions	Notes
No sample	11/16/2007	None	None	No samples collected.
LW3-STW2-CW10-H30B	11/27/2007	1515	A - 1900 ml	A - 110% full, cloudy, slight sediment.
			B - 1593 ml	B - 110% full, cloudy, trace sediment.
			C - 368 ml	C - 110% full, cloudy, no sediment.
			D - discard	D - 70% full, slightly cloudy, no sediment.
			E, F, G - empty	E, F, G, H - 0% full
			H - field blank	
No sample	11/29/2007	None	None	No samples collected.
LW3-STW2-CW20-H30B	1/11/2008	930	A - 1890 ml	A, B, C, D - 110% full, slightly gray, trace sediment.
			B - 1890 ml	
			C - 1900 ml	
			D - 1920 ml	
			E - 1920 ml	E - 110% full, clear, 1/16th inch sediment.
			F - 1920 ml	F - 110% full, turbid, trace sediment.
			G - 1880 ml	G - 110% full, trace sediment
			H - discard	H - 10% full, clear.
LW3-STW2-CW30-H30B	1/15/2008	1355	A - 1940 ml	A - 110% full, gray, opaque, some sediment.
			B - 1190 ml	B, C, D - 110% full, gray, cloudy, trace sediment.
			C - 435 ml	
			D - 445 ml	
			E - 37 ml	E - 25% full, cloudy tan.
			F, G, H - empty	F, G, H - 0% full.
LW3-STW2-CW40-H30B	1/28/2008	1120	A - 1278 ml	A, B, C, D, E, F - 110% full, gray, cloudy, some sediment.
			B - 1441 ml	
			C - 1579 ml	
			D - 1744 ml	
			E - 1823 ml	
			F - 1915 ml	
			G - 1123 ml	G - 110% full, lighter gray.
			H - field blank	H - 0% full.

Sample Event ID	Date Collected	Retrieval Time	Composite Instructions	Notes
LW3-STW2-CW50-H30B	1/30/2008	1135	A - blank	A - 110% full, fairly clear.
			B - 705 ml	B - 110%, gray, cloudy, trace sediment.
			C - 1398 ml	C, D - 110% full, more turbid than B, trace sediment.
			D - 1870 ml	
			E - 860 ml	E, F - 110%, gray, cloudy, trace sediment.
			F - 288 ml	
			G - discard	G - 110% full, like B, slightly oily sheen.
			H - discard	H - 5% full, clear.

Table Y-5. Composite Sampling – Second Round Compositing Calculations.

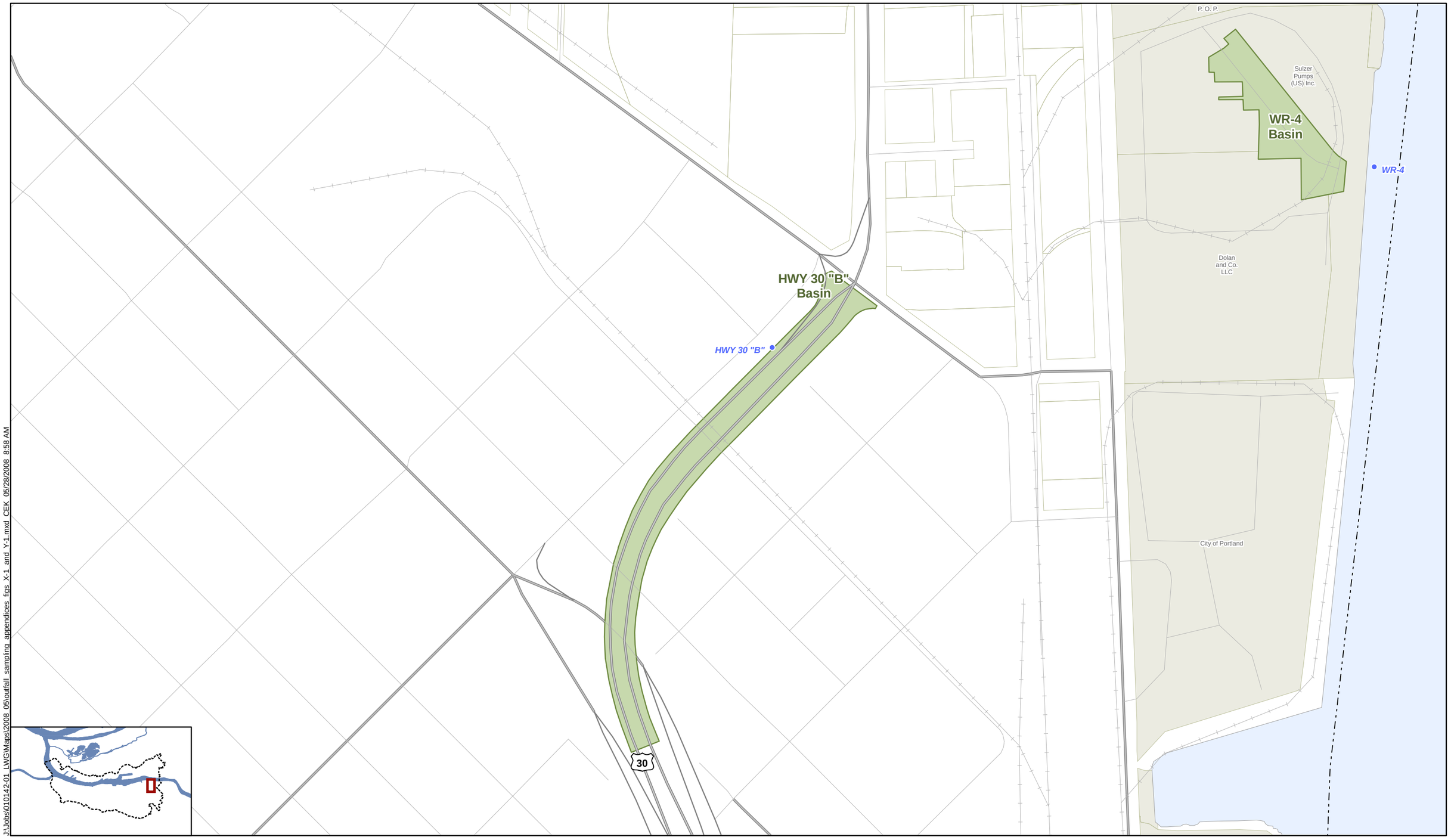
Date	Bottle	Total Level During Time Period (ft in 5 minute increments)	Volume of Sample in Jar (mL)	Jar Contribution to Sample	Volume from Jar (mL)	Normalized to Largest Bottle Volume (mL)
11/27/2007	A	7.191	1900	0.49	2797	1900
	B	6.03	1895	0.41	2346	1593
	C	1.394	1890	0.10	542	368
	Total	**14.6**	**5685.0**	**1.0**	**5685.0**	**3862**
1/11/2008	A	3.381	1890	0.16	2093	1213
	B	4.963	1890	0.23	3073	1780
	C	5.298	1900	0.25	3280	1900
	D	2.558	1920	0.12	1584	917
	E	2.394	1920	0.11	1482	859
	F	2.421	1920	0.11	1499	868
	G	0.499	1880	0.02	309	179
	Total	**21.5**	**13320.0**	**1.0**	**13320.0**	**7715.5**
1/15/2008	A	6.185	1940	0.48	3893	1940
	B	3.793	1920	0.29	2387	1190
	C	1.386	1910	0.11	872	435
	D	1.42	1870	0.11	894	445
	E	0.117	480	0.01	74	37
	Total	**12.9**	**8120.0**	**1.0**	**8120.0**	**4046.6**
1/28/2008	A	4.015	1920	0.12	1574	1278
	B	4.526	1925	0.13	1774	1441
	C	4.96	1930	0.14	1944	1579
	D	5.48	1910	0.16	2148	1744
	E	5.726	1900	0.17	2244	1823

Date	Bottle	Total Level During Time Period (ft in 5 minute increments)	Volume of Sample in Jar (mL)	Jar Contribution to Sample	Volume from Jar (mL)	Normalized to Largest Bottle Volume (mL)
	F	6.016	1915	0.18	2358	1915
	G	3.529	1925	0.10	1383	1123
	Total	**34.3**	**13425.0**	**1.0**	**13425.0**	**10903.0**
1/30/2008	A	DISCARD	1860		0	0
	B	2.494	1850	0.14	1280	705
	C	4.947	1865	0.27	2539	1398
	D	6.617	1870	0.37	3396	1870
	E	3.042	1865	0.17	1561	860
	F	1.02	1850	0.06	524	288
	G	DISCARD	1830		0	0
	H	DISCARD	60		0	0
	Total	**18.1**	**9300.0**	**1.0**	**9300.0**	**5120.8**

Table Y-6. Sediment Trap Sampling – Summary of Second Round Sampling Activities.

Action	Date	Depth of Sediment (in)	Observation/Notes
Installation	11/14/2007		
Interim Inspection 1	12/10/2007	Trace	Trace amounts of loose sediment
Interim Inspection 2	1/11/2008	Trace-1/4	Loose dark flocculent material. Replaced all bottles with short bottles.
Interim Inspection 3	1/28/2008	Trace	Trace amounts of dark flocculent sediment.
Final Removal	2/13/2008	1/4-1/2	Dark flocculent sediment. Collected four bottles.

FIGURES



J:\Jobs\010142-01_LWG\Maps\2008_05\outfall_sampling_appendices_figs_X-1_and_Y-1.mxd CEK 05/28/2008 8:58 AM

ANCHOR ENVIRONMENTAL, L.L.C.

LWG LOWER WILLAMETTE GROUP

0 130 260 390 520 Feet

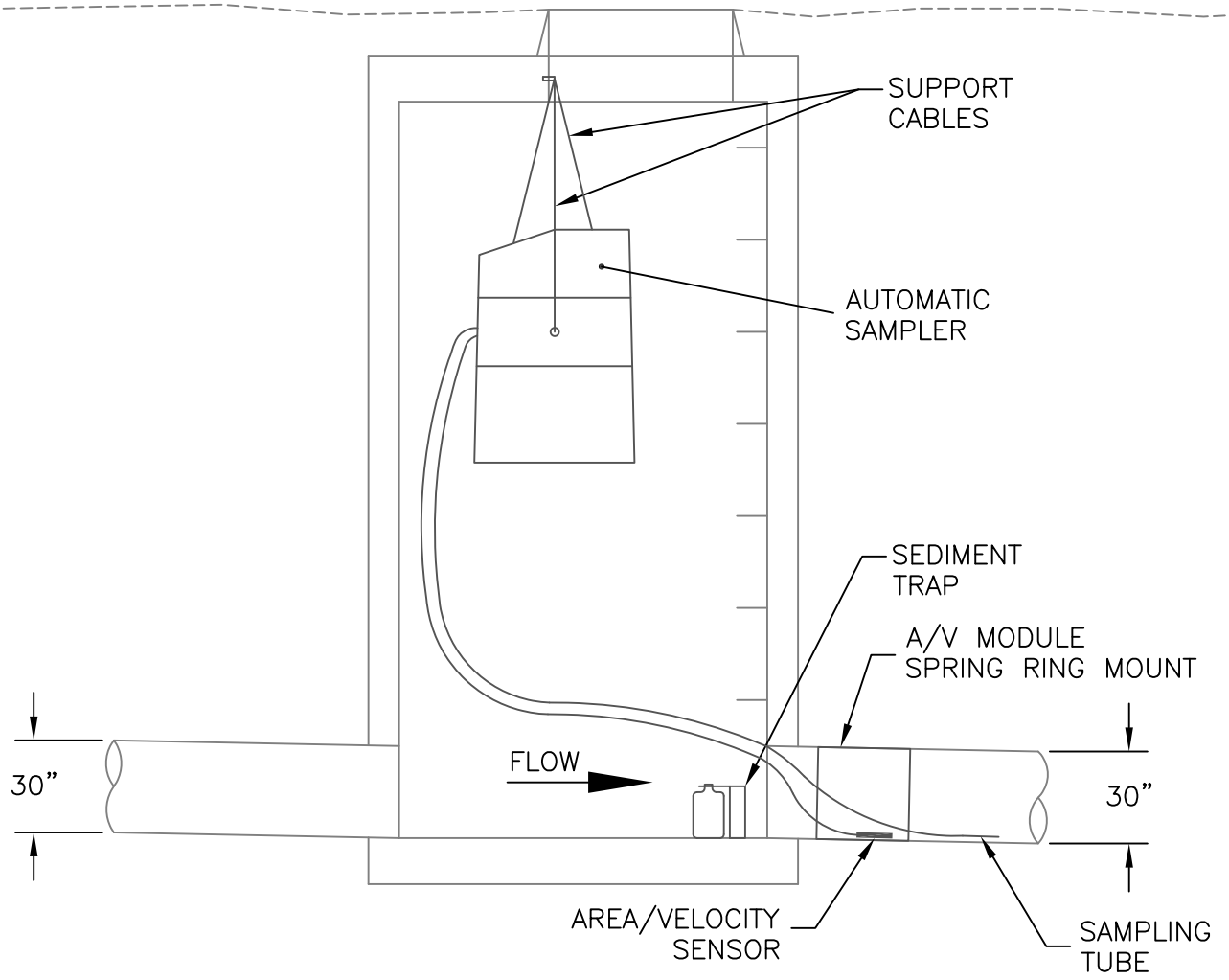
Map Features:
- Outfall Location
- Approximate Basin Upstream From Sample
- Approx. Drainage Boundary
- Navigation Channel
- Waterfront Taxlots
- Waterfront Ownership
- River miles

FEATURE SOURCES:
Land Use/Zoning, Streams, Water Bodies: Metro RLIS.
Channel & River miles: US Army Corps of Engineers.

DO NOT QUOTE OR CITE
This document is currently under review by US EPA and its federal, state, and tribal partners, and is subject to change in whole or in part.

NOTE: Coordinates for WR-4 sampling location TBD.

Figure Y-1
Drainage Basin and Sampling Location
Hwy 30 "B"
Lower Willamette Group



INSTALLATION SECTION

NOT TO SCALE

Note: During the second round of sampling, 4 sediment trap bottles were installed at Hwy 30 B.

Figure Y-2

Diagram of Sampling Equipment
Highway 30 B

Location of Manhole

Sampling Manhole

Sediment Traps

Stormwater Conveyance Line and Sampling Tube

ANCHOR ENVIRONMENTAL, L.L.C.

Figure Y-3
Photographs of the Installation
Highway 30 B

Figure Y-4 Highway 30 B

November 27th Sampling Event

Figure Y-5 Highway 30 B

January 11th Sampling Event

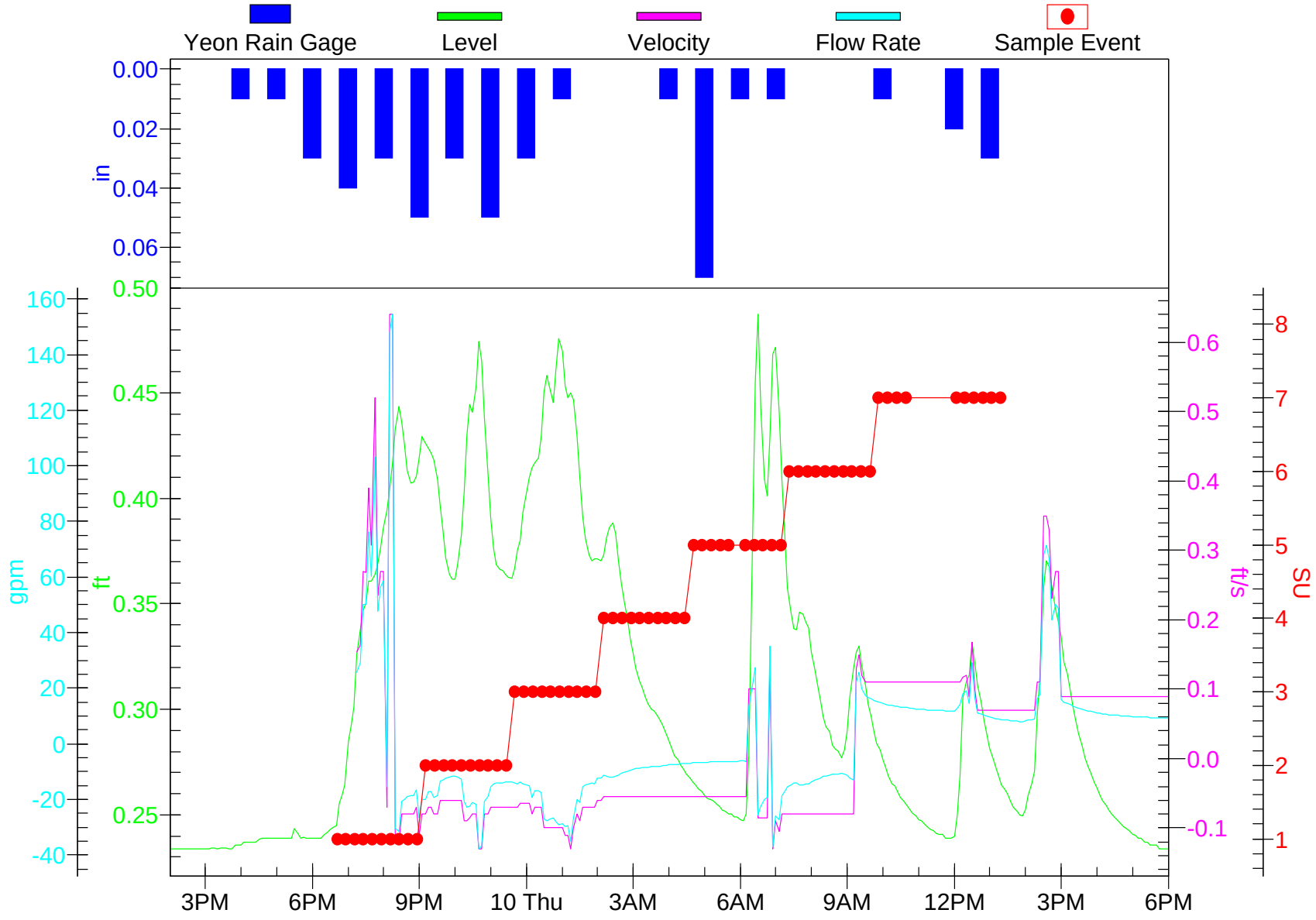
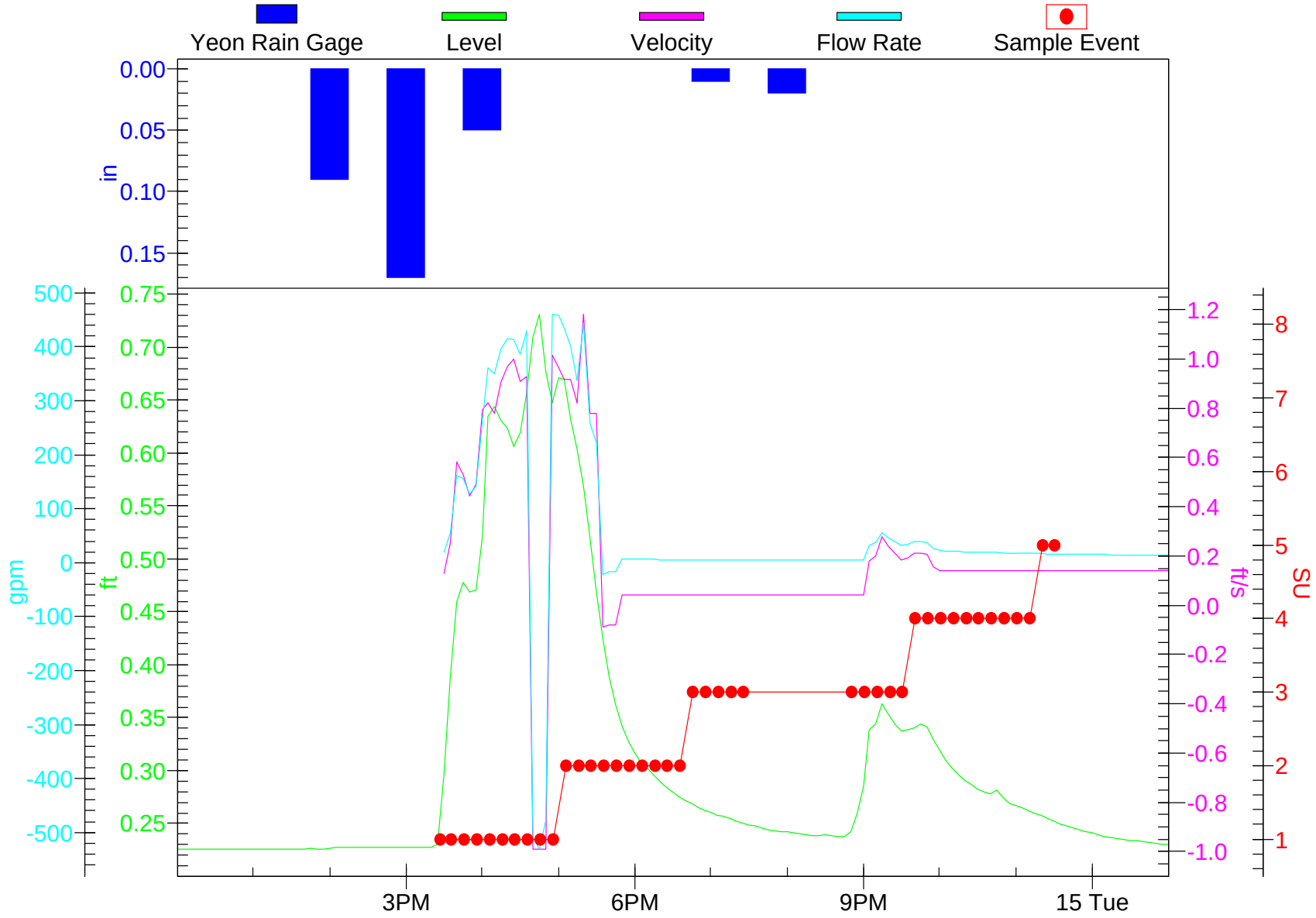


Figure Y-6 Highway 30 B

January 15th Sampling Event



14 MonJan 2008

1/14/2008 12:00:00 PM - 1/15/2008 1:00:00 AM

Figure Y-7 Highway 30 B

January 28th Sampling Event

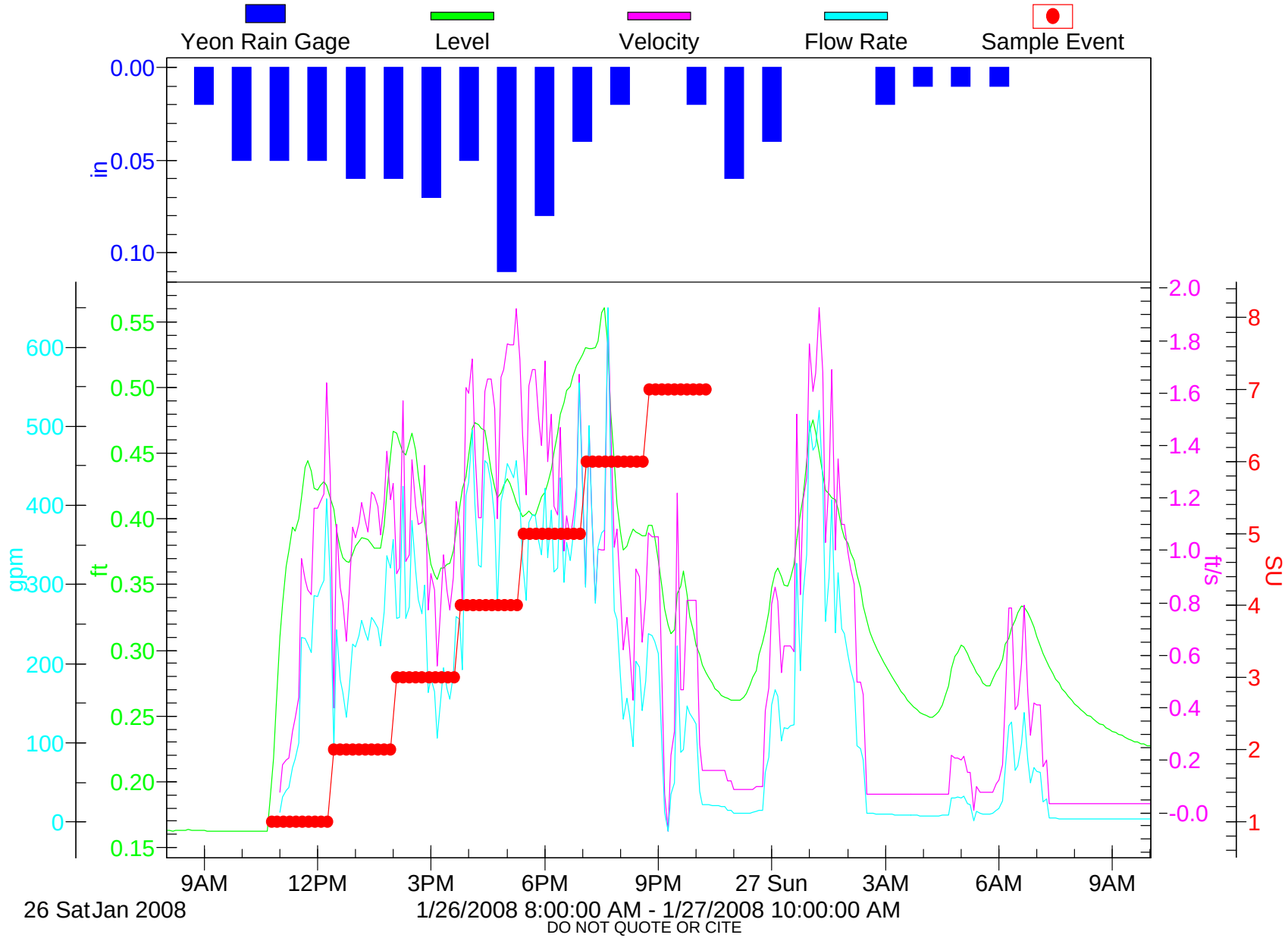
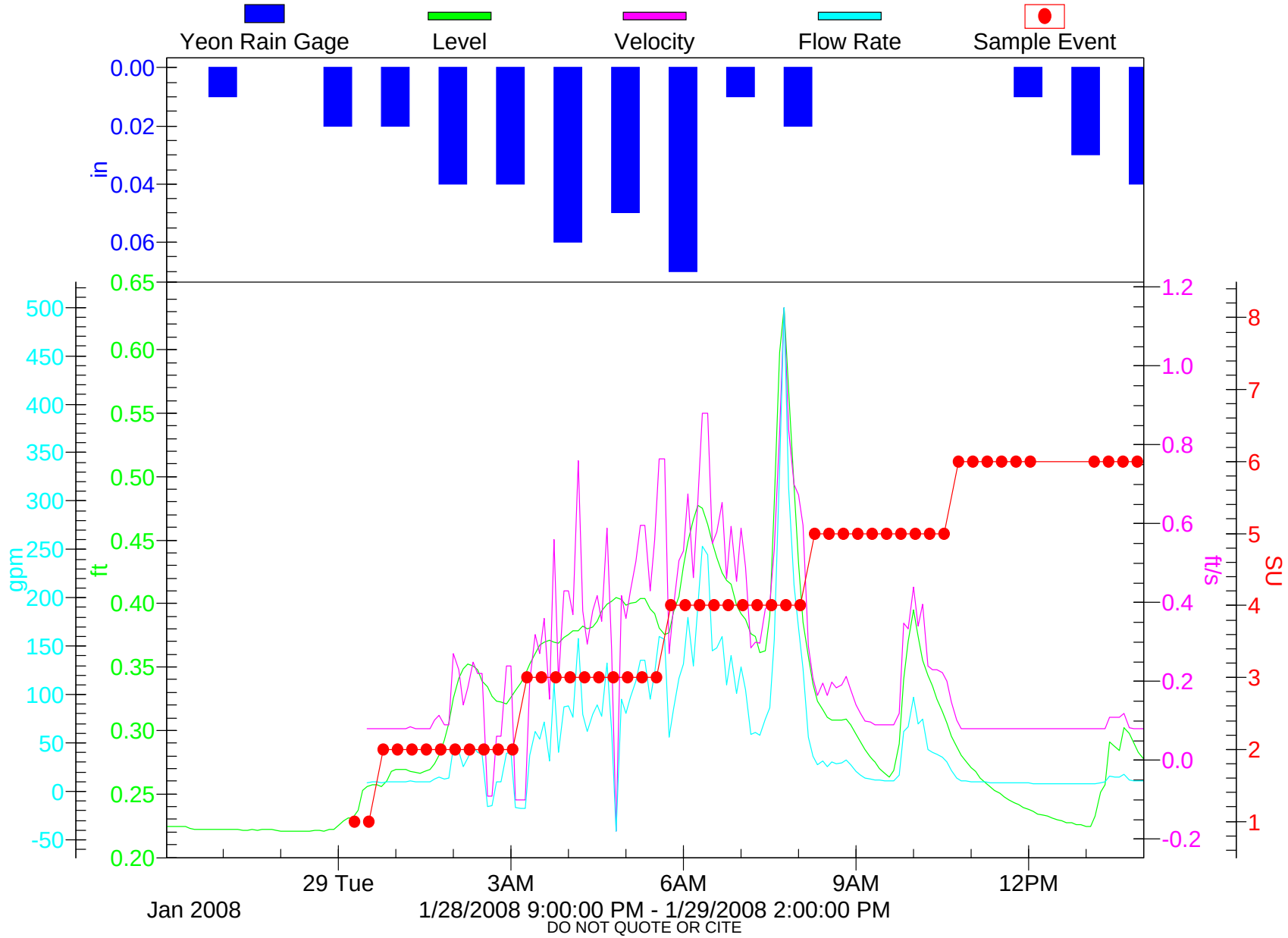


Figure Y-8 Highway 30 B

January 30th Sampling Event



APPENDIX Z

Field Chain of Custody/Compositing Forms

Field Chain of Custody Record
Page 1 of 1
Team: Hamblet/Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	LWG STW
Sample Date:	30 Jan 08
Collection Time:	1200
Site:	Sulzer Pump
Outfall #:	~~WR-4~~ Sulzer
ISCO SN #:	
Extended Program #?: ____	
Data Download Complete?:_____	

Composite Instructions:

Sulzer

	Meas(ml)	Sampled(ml)
A	1945	834
B	1950	1233
C	1950	1950
D	1930	928
E	650	315
F	empty	blank
G		
H	✓	

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
~~WR-4~~ A Sulzer	N	110	clear with trace sed
WR-4 B		110	same as A
WR-4 C		110	same as A
WR-4 D		110	same as A less sed
WR-4 E		30	clear
WR-4 F		0	—
WR-4 G		0	—
WR-4 H* Sulzer	N	✓	—

Relinquished : (signature)	Received by :	Lab Contact:	Special Instructions/Notes
Printed Name : Dennis Hamblet	Printed Name : Monon Tanner	Abbie Spielman Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 30 Jan 08 1300	Date/Time : 1/30/08 1340	Phone: 503-227-8873	

*WR-4 H can represent a Field Blank

Field Chain of Custody Record

Page 1 of 1

Team: Hamilton / Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	30 Jan 08
Collection Time:	1050
Site:	**Hwy 30**
Outfall #:	Hwy 30
Telephone #:	**206-450-8438**
Extended Program #?: ____	
Data Download Complete?: ____	

Composite Instructions:

measured(ml) / sampled(ml)

A-empty / A > blank
B-empty / B > blank
C-850ml / C-759
D-1670ml / D-1294
E-1660ml / E-1660
F-1010ml / F-958
G-empty / G-blank
H-190ml / H-discard

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
Hwy 30 A	N	0	—
Hwy 30 B		0	—
Hwy 30 C		50	grey cloudy some sed
Hwy 30 D		100	" " "
Hwy 30 E		100	" " "
Hwy 30 F		50	" " "
Hwy 30 G		0	
Hwy 30 H*	N	10	grey cloudy

Relinquished (signature)	Received by:	Lab Contact:	Special Instructions/Notes
Printed Name: Dennis Hamilton	Printed Name: Manon Tanner	Abbie Spielman	
Company: Anchor	Company: Integral	Lab: Integral Field Lab	
Date/Time: 30 Jan 08 1300	Date/Time: 1/30/08 1330	Address: 1991 NW Upshur St. Portland, OR	
		Phone: 503-227-8873	

*Hwy 30 H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hanzlick/Peyton

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	30 Jan 08
Collection Time:	1135
Site:	**Hwy 30**
Outfall #:	Hwy 30 "B"
Telephone #:	**206-450-8531**
Extended Program #?: ___	
Data Download Complete?: ___	

Composite Instructions:

	Measured (ml)	Sampled
A	~~empty~~ 1860	blank
B	~~empty~~ 1850	~~blank~~ 705
C	1865	~~754~~ 1398
D	1870	~~1294~~ 1870
E	1865	860
F	1850	~~458~~ 288
G	~~empty~~ 1830	~~blank~~ Discard
H	1860	Discard

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
Hwy 30 "B" A	N	110	fairly clear
Hwy 30 "B" B			gray cloudy with trace sed
Hwy 30 "B" C			more turbid than B, trace sed
Hwy 30 "B" D			" " " " "
Hwy 30 "B" E			like B
Hwy 30 "B" F			like B
Hwy 30 "B" G		110	like B slight oily sheen
Hwy 30 "B" H*	N	5%	clear

Relinquished: (signature)	Received by:	Lab Contact:	Special Instructions/Notes
Dennis Hanzlick	Mason Tanner	Abbie Spielman	
Printed Name: Dennis Hanzlick	Printed Name: Mason Tanner	Lab: Integral Field Lab	
Company: Anchor	Company: Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time: 30 Jan 08 1300	Date/Time: 1/30/08 1435	Phone: 503-227-8873	

*Hwy 30 "B" H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hanzlick / Gregg

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	28 Jan 08
Collection Time:	0945
Site:	**Hwy 30**
Outfall #:	Hwy 30
Telephone #:	**206-450-8438**
Extended Program #?: ____	
Data Download Complete?:_____	

Composite Instructions:

A - ~~1003ml~~ 1750ml — 1003ml
B - H* 1700ml — 1131ml
C — 1730ml — 1200ml
D — 1710ml — 1292ml
E — 1725ml — 1500ml
F — 1725ml — 1209ml
G — 720ml — 720ml
H — empty — field blank

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
Hwy 30 A	N	100	Slightly Cloudy Some SED
Hwy 30 B		100	11
Hwy 30 C		100	More Cloudy, less SED
Hwy 30 D		100	SAME, Less SED
Hwy 30 E		100	SAME AS D
Hwy 30 F		100	CLEAR less SED
Hwy 30 G		40%	CLEAR
Hwy 30 H*		0	

Relinquished : (signature)	Received by :	Lab Contact:	Special Instructions/Notes
Dennis Hanzlick	Manon Tanner	Abbie Spielman	
Printed Name : Dennis Hanzlick	Printed Name : Manon Tanner	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 28 Jan 08 12:15	Date/Time : 1/28/08 1315	Phone: 503-227-8873	

*Hwy 30 H can represent a Field Blank

Field Chain of Custody Record

Page 1 of 1

Team: Hanglick / Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	28 Jan 08
Collection Time:	1120 am
Site:	**Hwy 30**
Outfall #:	Hwy 30 "B"
Telephone #:	**206-450-8531**
Extended Program #?: ____	
Data Download Complete?: ____	

Composite Instructions:

	Measured (ml)	Sampled (ml)
A	1920	1278
B	1925	1441
C	1930	1579
D	1910	1744
E	1900	1823
F	1915	1915
G	1925	1123
H	empty	blank

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
Hwy 30 "B" A	No	110	gray, cloudy, some sed. in bottom
Hwy 30 "B" B	↑	↑	" " "
Hwy 30 "B" C			" " "
Hwy 30 "B" D			" " "
Hwy 30 "B" E			" " "
Hwy 30 "B" F		↓	" " "
Hwy 30 "B" G	↓	110	less gray than others
Hwy 30 "B" H*	No	✓	

Relinquished by (signature)	Received by :	Lab Contact:	Special Instructions/Notes
Dennis Hanglick	Manon Tanner	Abbie Spielman	
Printed Name : Dennis Hanzlick	Printed Name : Manon Tanner	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 28 Jan 08 1215	Date/Time : 1/28/08 1245	Phone: 503-227-8873	

*Hwy 30 "B" H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hazlick/Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	LWG STW
Sample Date:	28 Jan 08
Collection Time:	0920
Site:	Sulzer Pump
Outfall #:	~~WR-4~~
ISCO SN #:	
Extended Program #?: ____	
Data Download Complete?:_____	

Composite Instructions: (measured) A - 1635 ml B - 185 ml

Sulzer

-DISCARD-

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
WR-4 A Sulzer	N	100	clear
WR-4 B	N	10	clear
WR-4 C		0	
WR-4 D		0	
WR-4 E		0	
WR-4 F		0	
WR-4 G	N	0	
WR-4 H* Sulzer	N	✓	

Relinquished : (signature)	Received by :	Lab Contact: Abbie Spielman	Special Instructions/Notes
Printed Name : Dennis Hazlick	Printed Name : Manon Tanner	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 28 Jan 08 1215	Date/Time : 1/28/08 1230	Phone: 503-227-8873	

~~WR-4~~ can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hanzlick/Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	LWG STW	Composite Instructions:
Sample Date:	15 Jan 08	~~DISCARD~~ 15
Collection Time:	1320	Sulzer
Site:	~~Gundersen~~	• collect limited sample (TSS, TOC) from A
Outfall #:	~~WR-142~~	we replaced all jars, even the empties
Telephone #:	206-450-0653	
Extended Program #?: ____		
Data Download Complete?:____		

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
~~WR-142~~ A Sulzer	N	~~100~~	80 clear with dusting of sediment
~~WR-142~~ B	N	0	dry
~~WR-142~~ C			
~~WR-142~~ D			
~~WR-142~~ E			
~~WR-142~~ F			
~~WR-142~~ G			
~~WR-142~~ H* Sulzer	N	0	dry

Relinquished : (signature)	Received by :	Lab Contact:	Special Instructions/Notes
D. Hanzlick	M. Tanner	Abbie Spielman	
Printed Name : D. Hanzlick	Printed Name : M. Tanner	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 15 Jan 08 1400	Date/Time : 1/15/08 1450	Phone: 503-227-8873	

*WR-142 H can represent a Field Blank

Field Chain of Custody Record

Page 1 of 1

Team: Hartwick / Tanner

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	15 Jan 08
Collection Time:	1355
Site:	**Hwy 30**
Outfall #:	Hwy 30 "B"
Telephone #:	**206-450-8531**
Extended Program #?: ____	
Data Download Complete?: ____	

Composite Instructions:

	measured (ml)	sampled (ml)
A	1940	1940
B	1920	1190
C	1910	435
D	1870	445
E	480	37
F		
G	> empty	> empty
H		~~blank~~ YS

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
Hwy 30 "B" A	N	110	GRAY / OPAQUE some SED
Hwy 30 "B" B		110	GRAY, CLOUDY, TRACE SED
Hwy 30 "B" C		110	SAME AS B
Hwy 30 "B" D		110	SAME AS C
Hwy 30 "B" E		25	CLOUDY, TAN
Hwy 30 "B" F		0	
Hwy 30 "B" G		0	
Hwy 30 "B" H*		0	

Relinquished: (signature)	Received by:	Lab Contact:	Special Instructions/Notes
D. Hartwick	M. Tanner	Abbie Spielman	
Printed Name: D. Hartwick	Printed Name: M. Tanner	Lab: Integral Field Lab	
Company: Anchor	Company: Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time: 15 Jan 08 1400	Date/Time: 1/15/08 1450	Phone: 503-227-8873	

*Hwy 30 "B" H can represent a Field Blank

Field Chain of Custody Record

Page 1 of 1

Team: Hardwick / Breyer

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	LWG STW
Sample Date:	11 Jan 08
Collection Time:	0930
Site:	Hwy 30
Outfall #:	Hwy 30 "B"
Telephone #:	206-450-8531
Extended Program #?:	____
Data Download Complete?:	____

Composite Instructions:

A through G were overfilled there was water in the bottom tube up to the drain port

	(ml) Meas	(ml) Sampl
A	1890	1890
B	1890	1890
C	1900	1900
D	1920	1920
E	1920	1920
F	1920	1920
G	1880	1880
H	40	none

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
Hwy 30 "B" A	N	110	slightly grey, trace sed
Hwy 30 "B" B	↑	110	"
Hwy 30 "B" C		110	"
Hwy 30 "B" D		110	"
Hwy 30 "B" E		110	~1/16" sed; clear
Hwy 30 "B" F		110	turbid, trace sed.
Hwy 30 "B" G	↓	110	trace sed
Hwy 30 "B" H*	N	10	clear

Relinquished : (signature) D. Hardwick	Received by : M. Tanner	Lab Contact: Abbie Spielman	Special Instructions/Notes
Printed Name : D. Hardwick	Printed Name : M. Tanner	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 11 Jan 08 1600	Date/Time : 1/11/08 1100	Phone: 503-227-8873	

*Hwy 30 "B" H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hanzlick / Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	11 Jan 08
Collection Time:	0830
Site:	**UPRR Albina**
Outfall #:	WR-218
Telephone #:	**206-450-8447**
Extended Program #?: ____	
Data Download Complete?:_____	

Composite Instructions:

Sulzer
11 Jan 08

Meas(mL)	Sampled(mL)
A-1900	A-1226
B-1910	B-1741
C-80	C-80
D-1210	D-1132
E-170	E, F, G, H } Discard
F-50	
G-430	
H-20	

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
WR-218 A Sulzer	N	110	clear
WR-218 B		110	clear
WR-218 C		5	clear
WR-218 D		70	clear
WR-218 E		10	clear
WR-218 F		5	clear
WR-218 G		20	clear
WR-218 H* Sulzer	N	2%	clear

Relinquished : (signature)	Received by :	Lab Contact:	Special Instructions/Notes
D. Hanzlick	Marian Tanner	Abbie Spielman	
Printed Name : D. Hanzlick	Printed Name : M. Tanner	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 11 Jan 08	Date/Time : 1/11/08 1000	Phone: 503-227-8873	

*WR-218 H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hanzlick / Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	09 Jan 08
Collection Time:	1415
Site:	**Gunderson**
Outfall #:	WR-142
Telephone #:	**206-450-0653**
Extended Program #?: ____	
Data Download Complete?:_____	

Composite Instructions:

	measured (ml)	sampled (ml)
A	1870	1033
B	1900	1900
C	1840	817
D	1800	467
E	1460	417
F	none	none
G	//	
H	//	

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
WR-142 A	N	110	clear, minimal sediment
WR-142 B	↑	110	" "
WR-142 C		"	" "
WR-142 D		110	" "
WR-142 E		80	" "
WR-142 F		0	empty
WR-142 G	↓	0	↓
WR-142 H*	N	0	↓

Relinquished : (signature)	Received by :	Lab Contact:	Special Instructions/Notes
D. Hanzlick	Mannon Tanner	Abbie Spielman	
Printed Name: D. Hanzlick	Printed Name : M. Tanner	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 09Jan08/1600	Date/Time : 1/10/08 1000	Phone: 503-227-8873	

*WR-142/H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hemstock / Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	09 Jan 08
Collection Time:	1300
Site:	**City - Forest Park Area**
Outfall #:	OF-22C, above Hwy 30
Telephone #:	**206-450-8530**
Extended Program #?: ____	
Data Download Complete?:_____	

Composite Instructions:

measured (ml)	sampled (ml)
A - 1680	A - 773
B - 1690	B - 778
C - 1670	C - 778
D - 1680	D - 808
E - 1700	E - 1129
F - 1720	F - 1720
G - 1680	G - 1136
H - none	H - none.

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
OF-22C, above Hwy 30 A	N	100	
OF-22C, above Hwy 30 B		50	grayish with slight sed.
OF-22C, above Hwy 30 C		100	"
OF-22C, above Hwy 30 D		100	" but slightly less suspended
OF-22C, above Hwy 30 E		100	"
OF-22C, above Hwy 30 F		100	"
OF-22C, above Hwy 30 G		100	" with more sed
OF-22C, above Hwy 30 H*	N	✓	ok

Relinquished (signature)	Received by :	Lab Contact:	Special Instructions/Notes
D. Hemstock	M. Tanner	Abbie Spielman	
Printed Name : D. Hemstock	Printed Name : M. Tanner	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 09Jan08 1600	Date/Time : 1/10/08 0900	Phone: 503-227-8873	

*OF-22C, above Hwy 30 H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hanzlick / Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	LWG STW
Sample Date:	29 Nov 07
Collection Time:	1130
Site:	Gunderson
Outfall #:	WR-142
Telephone #:	206-450-0653
Extended Program #?: ____	
Data Download Complete?:_____	

Composite Instructions:

	measured (ml)	sampled (ml)
A-1790	A-1790	A-1790
B-350	B-68	
C, D, E, F, G, H	empty	

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
WR-142 A	N	100	slightly grayish cloudy
WR-142 B	↑	20	"
WR-142 C	↓	0	
WR-142 D		↑	
WR-142 E			
WR-142 F		↓	
WR-142 G	↓	0	
WR-142 H*	N	blank	

Relinquished: (signature)	Received by :	Lab Contact: Abbie Spielman	Special Instructions/Notes
Printed Name : Dennis Hanzlick	Printed Name : Jane Sund	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 29 Nov 07 1430	Date/Time : 11/29/07 1430	Phone: 503-227-8873	

*WR-142 H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hanzlick / Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	29 Nov 07
Collection Time:	1045
Site:	**UPRR Albina**
Outfall #:	WR-218
Telephone #:	**206-450-8447**
Extended Program #?: ____	
Data Download Complete?:____	

Composite Instructions:

measured(ml)	Sampled(ml)
A - 1680	A - 1055
B - 1660	B - 815
C - 1630	C - 1289
D - 1640	D - 1640
E - 1640	E - 1026
F - 1640	F - 569
G - 1680	G - 288
H - empty	H - empty

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
WR-218 A	N	100	cloudy, some sed. grayish
WR-218 B	↑	100	" " "
WR-218 C		100	less cldy, grayish, some sed
WR-218 D		100	similar to C
WR-218 E		100	" " " yellowish
WR-218 F		100	" " " yellowish
WR-218 G	↓	100	" " " yellowish
WR-218 H*	N		blank

Relinquished by (signature)	Received by :	Lab Contact:	Special Instructions/Notes
Dennis Hanzlick	[signature]	Abbie Spielman	
Printed Name : Dennis Hanzlick	Printed Name : Jane Sund	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 29 Nov-07 1115	Date/Time : 11/29/07 1115	Phone: 503-227-8873	

*WR-218 H can represent a Field Blank

: o Not Sample

Field Chain of Custody Record
Page 1 of 1
Team: Hazlett / Brenner

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	27 Nov 07
Collection Time:	1605
Site:	**City - Police Evidence Yard**
Outfall #:	**OF-22C, above Hwy 30**
ISCO SN #:	
Extended Program #?: ___	
Data Download Complete?: ___	

Composite Instructions: (measured)

A - empty
B - 320mL
C - 1480mL
D - 1950mL
E - 1580mL
F - 1370mL
G - 1020mL
H - empty

~~Sample if (not) X~~
A -

not sampled

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
OF-22C, above Hwy 30 A	N	0	
OF-22C, above Hwy 30 B		15	clear
OF-22C, above Hwy 30 C		80	clear
OF-22C, above Hwy 30 D		115	tr sterile clear
OF-22C, above Hwy 30 E		95	clear
OF-22C, above Hwy 30 F		80	clear
OF-22C, above Hwy 30 G		50	clear
OF-22C, above Hwy 30 H*	N	—	blank

Relinquished: (signature)	Received by:	Lab Contact:	Special Instructions/Notes
Dennis Hazlett	Manon Tanner	Abbie Spielman	
Printed Name: Dennis Hazlett	Printed Name: Manon Tanner	Lab: Integral Field Lab	
Company: Anchor	Company: Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time: 27 Nov-07 16.25	Date/Time: 11/27/07 1640	Phone: 503-227-8873	

*OF-22C, above Hwy 30 H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hartzheck / Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	LWG STW
Sample Date:	27 Nov 07
Collection Time:	1515
Site:	~~St. John's Bridge~~
Outfall #:	~~STJ~~ Hwy 30B
ISCO SN #:	
Extended Program #?: ___	
Data Download Complete?: ____	

Composite Instructions:

A = 1900mL → 1900mL
B = 1895 mL → 1593mL
C = 1890 mL → 368 mL
D = 1370 mL
E = empty
F = empty
G = empty
H = empty

Sample ID		Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
~~STJ A~~ Hwy 30B	A	N	110	Cloudy Slight Sed
~~STJ B~~	B		110	Cloudy Trace Sed
~~STJ C~~	C		110	Cloudy No Sed
~~STJ D~~	D		70	Slightly Cloudy/No Sed
~~STJ E~~	E		0	
~~STJ F~~	F		0	
~~STJ G~~	G		0	
~~STJ H*~~ Hwy 30B	H		0	

Relinquished: (signature)	Received by	Lab Contact: Abbie Spielman	Special Instructions/Notes
Printed Name: Dennis Hendrix	Printed Name: Jane Sund	Lab: Integral Field Lab	
Company: Anchor	Company: Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time: 27 Nov 07 1540	Date/Time: 11/27/07 1550	Phone: 503-227-8873	

*STJ H can represent a Field Blank

Field Chain of Custody Record

Page 1 of 1
Team: Hanzlick / Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	27 Nov 07
Collection Time:	1415
Site:	**UPRR Albina**
Outfall #:	**WR-218**
ISCO SN #:	
Extended Program #?: ____	
Data Download Complete?: _____	

Composite Instructions:

A - 1680 mL → 1458 mL
B - 1660 mL → 1660 mL
C - 1660 mL → 418 mL
D - 340 mL
E - empty
F - empty
G - empty
H - empty

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
WR-218 A	N	100	cloudy, yellowish, flocculent red
WR-218 B		100	slightly cloudy, trace sediment
WR-218 C		100	cloudy
WR-218 D		20	clear
WR-218 E		0	
WR-218 F		0	
WR-218 G		0	
WR-218 H*	N	blank	

Relinquished by (signature):	Received by:	Lab Contact:	Special Instructions/Notes
Dennis Hanzlick	Marion Tanner	Abbie Spielman	
Printed Name: Dennis Hanzlick	Printed Name: Marion Tanner	Lab: Integral Field Lab	
Company: Anchor	Company: Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time: 27 Nov 07 1450	Date/Time: 11/27/07 1507	Phone: 503-227-8873	

*WR-218 H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hemstock / Grayson

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	27 Nov 07
Collection Time:	1150
Site:	Hwy 30
Outfall #:	H30
ISCO SN #:	

Composite Instructions:

A - 1520 mL → 1520 mL
B - 1650 mL → 1194 mL
C - 260 mL → 260 mL
D-H - empty

Extended Program #?: ____

Data Download Complete?: ____

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
H30 A	N	90	cloudy, gray, trace sed
H30 B	N	95	clear — "
H30 C	N	10	clear, no sed
H30 D	↑	0	
H30 E		0	
H30 F		0	
H30 G	↓	0	
H30 H*	N	blank	

Relinquished : (signature)	Received by :	Lab Contact:	Special Instructions/Notes
Dennis Hemstock	Manon Tanner	Abbie Spielman	
Printed Name : Dennis Hemstock	Printed Name : Manon Tanner	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 27 Nov 07 1210	Date/Time : 11/27/07 1255	Phone: 503-227-8873	

*H30 H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hamilton / Dragovich

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**	**Composite Instructions:**
Sample Date:	27 Nov-07	Use all volume from A-E
Collection Time:	1300	
Site:	City - in Front Ave.	
Outfall #:	OF-22B	
ISCO SN #:		
Extended Program #?: ____		
Data Download Complete?: ____		

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
OF-22B A	N	105	clear with trace sediment in bottom
OF-22B B	↑	↑	cloudier with more sed than A
OF-22B C			" " " " " B
OF-22B D			same as C
OF-22B E		↓	similar to A
OF-22B F		105	clearer with
OF-22B G	↓	10	clear
OF-22B H*	N	blank	

Relinquished: (signature)	Received by:	Lab Contact:	Special Instructions/Notes
Printed Name: Dennis Hamilton	Printed Name: Marion Tanner	Abbie Spielman	
Company: Anchor	Company: Integral	Lab: Integral Field Lab	
Date/Time: 27 Nov 07 1450	Date/Time: 11/27/07 1515	Address: 1991 NW Upshur St. Portland, OR	
		Phone: 503-227-8873	

*OF-22B H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Hamilton / Gregory

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	27 Nov 07
Collection Time:	1120
Site:	Gunderson
Outfall #:	WR-~~145~~ 142
ISCO SN #:	
Extended Program #?: ____	
Data Download Complete?: ____	

Composite Instructions:

A - 1840 mL → 1840 mL
B - 730 mL → 216 mL
C - empty
D - empty
E - empty
F - empty
G - empty
H - empty

Sample ID (142)	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
WR-145 A	N	100	slightly cloudy, grayish
WR-145 B		40	"
WR-145 C		0	
WR-145 D			
WR-145 E			
WR-145 F			
WR-145 G		0	
WR-145 H*	N	blank	

142

Relinquished by (signature)	Received by :	Lab Contact:	Special Instructions/Notes
Dennis Henzlick	Marion Tanner	Abbie Spielman	
Printed Name : Dennis Henzlick	Printed Name : Marion Tanner	Lab: Integral Field Lab	
Company : Anchor Env	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 27 Nov 07 1200	Date/Time : 11/27/07 1249	Phone: 503-227-8873	

*WR-145 H can represent a Field Blank

LW3 - STW2 - CW10 - WR96

Field Chain of Custody Record	
Page 1 of 1	
Team: Hanzlick, Dennis	

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	LWG STW
Sample Date:	27 Nov-07
Collection Time:	1035
Site:	Arkema
Outfall #:	WR-96
ISCO SN #:	
Extended Program #?:	1
Data Download Complete?:	N/A

Composite Instructions:

A = 1820mL → 1426 mL
B = 1820 mL → 1890 mL
C = 1830mL → 1576 mL
D = 1830 mL → 1397 mL
E = 1810mL → 1113 mL
F = 1820mL → 992 mL
G = 1810 mL → 975 mL
H = empty

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
WR-96 A	N	100	clear, slightly yellow, no sed
WR-96 B	↑	↑	"
WR-96 C			"
WR-96 D			"
WR-96 E			"
WR-96 F		↓	"
WR-96 G	↓	100	"
WR-96 H*	N	blank	

Relinquished: (signature)	Received by:	Lab Contact:	Special Instructions/Notes
Printed Name: Dennis Hanzlick	Printed Name: Marion Tanner	Abbie Spielman	
Company: Anchor Env	Company: Integral	Lab: Integral Field Lab	
Date/Time: 27 Nov-07 1035	Date/Time: 11/27/07 1241	Address: 1991 NW Upshur St. Portland, OR	
		Phone: 503-227-8873	

*WR-96 H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Gregory, Baptista

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	LWG STW
Sample Date:	16 Nov-07
Collection Time:	1630
Site:	City - St. Johns Area
Outfall #:	OF-49
ISCO SN #:	
Extended Program #?: ____	
Data Download Complete?:_____	

Composite Instructions: √ Volume from jar (mL)

		Composite
A	1840 ml	1381
B	1740 ml	1170
C	1840 ml	1174
D	1880 ml	763
E	1910 ml	779
F	1900 ml	1345
G	1860 ml	1559
H	Ø = Blank	

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
OF-49 A	N	~~100~~ 110	cloudy light brown liquid
OF-49 B	↑	100	" "
OF-49 C		110	" "
OF-49 D		110	" "
OF-49 E		110	" "
OF-49 F		110	" "
OF-49 G	↓	110	" "
OF-49 H*	N	0	Blank

NO small

Relinquished (signature):	Received by:	Lab Contact: Abbie Spielman	Special Instructions/Notes
Printed Name: Dennis Havelick	Printed Name:	Lab: Integral Field Lab	
Company: Anchor	Company:	Address: 1991 NW Upshur St. Portland, OR	
Date/Time: 16/Nov/07	Date/Time: 1500 11/16/07	Phone: 503-227-8873	

*OF-49 H can represent a Field Blank

1704

Field Chain of Custody Record

Page 1 of 1

Team:

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	11/16/07
Collection Time:	2:45
Site:	**Hwy 30**
Outfall #:	Hwy 30
ISCO SN #:	
Extended Program #?: ____	
Data Download Complete?: ____	

Composite Instructions:

		Volume from each Bottle
A	960 ml	960
B	1500 ml	Ø
C	~~880 ml~~ Ø	Ø
D	~~168~~ Ø	1362
E	880 ml	810
F	1680 ml	1287
G	1680 ml	1395
H	—	

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
Hwy 30 A	N	50	turbid, sediment, yellow/brown
Hwy 30 B		Ø	
Hwy 30 C		Ø	
Hwy 30 D		90	" " "
Hwy 30 E		40	turbid, light yellow/brown
Hwy 30 F		100	turbid, sediment, yellow brown
Hwy 30 G		100	" "
Hwy 30 H*			

Relinquished : (signature)	Received by :	Lab Contact: Abbie Spielman	Special Instructions/Notes
Printed Name: Amanda S	Printed Name:	Lab: Integral Field Lab	
Company: Anchor	Company: Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time: 3:30 11/16/07	Date/Time: 1530 11/16/07	Phone: 503-227-8873	

*Hwy 30 H can represent a Field Blank

Field Chain of Custody Record
Page 1 of 1
Team: Dennis/Amanda

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	**LWG STW**
Sample Date:	11/16/2007
Collection Time:	2:45pm
Site:	**City - Doane Lake Industrial Area**
Outfall #:	OF-22B
ISCO SN #:	
Extended Program #?:	time
Data Download Complete?:	Y

Composite Instructions:

	meas	Composite Vol
A	1790 ml	1157
B	1845 ml	461
C	1820 mL	1820
D	1860 ml	764
E	1830 ml	762

F - Empty

G - Empty

H - Empty = Blank

Sample ID	Damaged Y/N	% Full	Comments/Description (odor, color, etc.)
OF-22B A	N	100	turbid, fine sed, brown
OF-22B B	N	100	"
OF-22B C	N	100	"
OF-22B D	N	100	"
OF-22B E	N	100	"
OF-22B F	N	—	blank
OF-22B G	N	—	blank
OF-22B H*	N	—	blank

Relinquished : (signature)	Received by :	Lab Contact: Abbie Spielman	Special Instructions/Notes
Printed Name : Amanda S.	Printed Name : Jane Smith	Lab: Integral Field Lab	
Company : Anchor	Company : Integral	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 3:15 11/16/07	Date/Time : 3:15 11/16/07	Phone: 503-227-8873	

*OF-22B H can represent a Field Blank

Field Chain of Custody Record

Page 1 of 1

Team: Gregory, Baptist

ANCHOR ENVIRONMENTAL, L.L.C.

Project Name:	LWG STW
Sample Date:	16 Nov 07
Collection Time:	1540
Site:	Gunderson
Outfall #:	WR-142
ISCO SN #:	
Extended Program #?: ____	
Data Download Complete?: ____	

Composite Instructions:		(Volume to Composite (ml))
A	1690 ml	601
B	1675 ml	745
C	1810 ml	633
D	1785 ml	626
E	820 mL	1820
F	740 mL	999
G	1735 mL	863
H	∅	Blank

Sample ID	**Damaged Y/N**	**% Full**	**Comments/Description (odor, color, etc.)**
WR-142 A	N	100	somewhat turbid, yellowish
WR-142 B	↑	↑	↓ ↓
WR-142 C			
WR-142 D			↓ ↓
WR-142 E			somewhat turbid, slightly grayish
WR-142 F			↓ ↓
WR-142 G	↓	100	↓ ↓
WR-142 H*	N		Blank

Relinquished : (Signature)	Received by :	Lab Contact: Abbie Spielman	Special Instructions/Notes
Printed Name : Dennis Hazlick	Printed Name :	Lab: Integral Field Lab	
Company : Anchor	Company :	Address: 1991 NW Upshur St. Portland, OR	
Date/Time : 1600	Date/Time : 1610 11/16/07	Phone: 503-227-8873	

*WR-142 H can represent a Field Blank

APPENDIX AA

EPA-LWG Communications

Appendix AA – EPA-LWG Emails

AA-1. Anchor. 2007. Anchor email and attachment from Carl Stivers to Stormwater Technical Team dated September 12, 2007 regarding data completeness.

AA-2. Anchor. 2007. Anchor email and attachments from Carl Stivers to Stormwater Technical Team dated October 12, 2007 regarding first round data summaries and path forward

AA-3. Anchor. 2007. Anchor email and attachment from Carl Stivers to Stormwater Technical Team dated October 16, 2007 regarding data needs

AA-4. EPA. 2007. USEPA letter dated November 6, 2007 regarding Stormwater FSP Approval.

AA-5. Anchor. 2007. Anchor email from Carl Stivers to Stormwater Technical Team dated November 30, 2007 regarding Sulzer sampling approach, Hwy 30B, Port of Portland Field Sampling Report, and Loading Methods.

AA-6. EPA. 2007. EPA email from Kristine Koch to Carl Stivers of Anchor (cc Stormwater Technical Team) dated December 7, 2007 regarding EPA approval of Sulzer Sampling Approach

AA-7. City of Portland. 2007. City of Portland email and attachments from Linda Scheffler to Stormwater Technical Team dated December 20, 2007 regarding Sample Equipment Orientation.

AA-8. Anchor. 2007. Anchor email from Carl Stivers to Stormwater Technical Team dated December 20, 2007 regarding fall sampling status, short sediment trap bottles, and schedule

AA-9. Anchor. 2008. Anchor email and attachment from Carl Stivers to Stormwater Technical Team dated January 14, 2008 regarding Notes from Jan. 10th meeting.

AA-10. Anchor. 2008. Anchor email from Amanda Shellenberger to Stormwater Technical Team February 11, 2008 regarding changes in prioritization

AA-11. Anchor. 2008. Anchor email and attachments from Amanda Shellenberger to Stormwater Technical Team dated February 26, 2008 regarding LWG Stormwater - REVISED Sediment Trap Prioritization.

AA-12. Integral. 2008. Integral email from Laura Jones to Stormwater Technical Team dated February 26, 2008 regarding LWG Stormwater - REVISED Sediment Trap Prioritization.

AA-13. City of Portland. 2008. City of Portland email from Linda Scheffler to Stormwater Technical Team dated February 28, 2008 regarding LWG Stormwater - REVISED Sediment Trap Prioritization.

AA-14. EPA. 2008. EPA email from Kristine Koch to Amanda Shellenberger of Anchor dated March 3, 2008 regarding LWG Stormwater - REVISED Sediment Trap Prioritization.

AA-15. Anchor. 2008. Anchor email and attachment from Valerie Oster to EPA dated March 10, 2008 regarding Stormwater Items for EPA review and approval.

AA-16. EPA 2008. USEPA letter dated March 24, 2008 regarding status of Round 3 sampling activities

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From: Carl Stivers
Sent: Wednesday, September 12, 2007 11:43 AM
To: 'Koch.Kristine@epamail.epa.gov'; 'Scheffler, Linda'; 'Amanda Spencer'; 'Andy Koulermos'; 'Laura Jones'; Amanda Shellenberger; 'Sanders, Dawn'; 'LaFranchise, Nicole'; 'TARNOW Karen E'
Cc: 'Christine Hawley'; 'Gene Revelas'; Jim McKenna; Jessica Pisano; Rick Applegate; Bob Wyatt; 'mcoover@ensr.aecom.com'; 'MCCLINCY Matt'; Jessica Pisano
Subject: Next Call Sept 14th at 1:15pm

Stormwater Techncial Team

The next call will be on September 14th starting at 1:15 pm with the same call in number: 1-866-866-2244
6761834#

At the last meeting we previously discussed having some different formats of summary completeness data that focused more on categories of land uses that will be relevant to loading calculations. Anchor and Integral worked with the City to develop the attached tables. My apologies for not getting this out sooner.

Data Complete Summary3.xls (10...

The tables include three types of summaries: one for stormwater, one for sediments, and one for a summary of both. There are some nuances for all tables that I will need to go over during the start of the call. However, one thing that may stand out for you is the stormwater table, which looks at the number of completed samples in two ways. The first way is looking at the sites on an individual basis such that actual samples over the planned number of samples (usually 3) for that site are not calculated to contribute to the total for that land use category. The second way is to look at land use groups as a group and just tally the total number of samples across all groups. The City suggested that this differentiation may be important, and they can explain more about why during the call.

I suggest our agenda for this call is similar to the last one, but with the benefit of having these additional tables. Therefore, the agenda is still:

1. Discuss data adequacy as it relates to FSP Rationale Objectives.
2. If the objectives are not adequately met, discuss if there is a need for more sampling in the fall to better meet these objectives.

Talk to you soon.

Carl

Carl Stivers
Anchor Environmental, L.L.C.
23 South Wenatchee Avenue, Suite 120
Wenatchee, WA 98801
Phone: 509-888-2070
Fax: 509-888-2211

cstivers@anchorenv.com

From: Carl Stivers
Sent: Monday, August 27, 2007 3:24 PM
To: 'Koch.Kristine@epamail.epa.gov'; 'Scheffler, Linda'; 'Amanda Spencer'; 'Andy Koulermos'; 'Laura Jones'; Amanda Shellenberger; 'Sanders, Dawn'; 'LaFranchise, Nicole'; 'TARNOW Karen E'
Cc: 'Christine Hawley'; 'Gene Revelas'; Jim McKenna; Jessica Pisano; Rick Applegate; Bob Wyatt; mcoover@ensr.aecom.com; MCCLINCY Matt; Jessica Pisano
Subject: Highlights Stormwater Technical Team Call Thursday Aug. 23rd at 1 pm

Stormwater Technical Team –

As promised here are highlights from the last call. As always, please let me know if I missed something important.

The next call will be on September 14th starting at 1:15 pm with the same call in number: 1-866-866-2244
6761834#

The three agenda items noted in the email below were discussed.

The first agenda item was to resolve the sediment trap sample handling approach. It was agreed that the approach reflected in the sediment trap summary table provided for the call would be used. LWG members noted that this approach would have to undergo formal LWG Exec approval before the samples would be released for lab analysis. We expect that approval to be discussed on by LWG Exec on August 29th.

The second and third agenda items (regarding data adequacy to meet FSP objectives and any additional sampling needs) was discussed pretty much as a one topic and a variety of concepts were raised and discussed. It was agreed that further data analysis and summarization was needed in order for the group to reach an opinion(s) on the adequacy of the data set. The LWG consultants (Anchor and Integral) with assistance from the City agreed to work on some additional data summarization approaches for presentation to the team. The primary items discussed were:

- In general, organize the completeness data (samples/analytes collected by station) by land use type and site specific (for some industrial sites) categories
- This would be organized separately for stormwater composite samples and sediment trap samples. Then a combined analysis—looking at completeness across these sample types—would also be prepared.
- This would include also reviewing how some specific industrial sites might be used as representative of the heavy industry category in general for some chemicals. For example, pesticides from the Gasco site, which is primarily a PAH site.

It was also discussed that the above analysis could move into examining the actual data (e.g., amounts of detects, magnitude of detects, incidence of blank contamination or other sampling artifacts, variability seen within field replicates etc.) and this might provide additional insight into data adequacy for FSP objectives. However, it was generally agreed that such an analysis would take longer and would not be included in the above initial tasks.

The LWG consultants will work on this with the City such that it can be issued about a week prior to the next call (targeting September 7).

After the call Kristine Koch provided some additional data analysis along the lines of that discussed during the call and summarized the following general concepts that should be examined:

1) The number of minimum samples needed for each land use.

2) A review of the data to see if the data gaps need to be filled. An example here is metals for mixed land use: There are 17 total water, 12 dissolved water, and 1 sediment trap. Do we need more solids samples or is this enough information?

3) A review of the actual analytical data to see if there are other data gaps.

As noted above, the LWG consultants expect to start by focusing on these first two items, at least for right now.

Thanks.

Carl

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From: Carl Stivers
Sent: Wednesday, August 22, 2007 2:38 PM
To: 'Koch.Kristine@epamail.epa.gov'; 'Scheffler, Linda'; 'Amanda Spencer'; 'Andy Koulermos'; 'Laura Jones'; Amanda Shellenberger; 'Sanders, Dawn'; 'LaFranchise, Nicole'; 'TARNOW Karen E'
Cc: 'Christine Hawley'; 'Gene Revelas'; Jim McKenna; Jessica Pisano; Rick Applegate; Bob Wyatt
Subject: RE: Stormwater Technical Team Call Thursday Aug. 23rd at 1 pm

Stormwater Technical Team -

<< File: B010162_Blanks_Phathalates.xls >> << File: Storm Sample Matrix with T4 and GE.xls >> << File: Sediment Trap Summary Est.xls >>

We are having a call at 1 pm tomorrow (Aug. 23). Please use the following call in number:

1-866-866-2244
6761834#

Items on the agenda are:

1. Resolve additional proposal for sediment trap sample handling per City emails since last call.
2. Discuss data adequacy as it relates to FSP Rationale Objectives. The objective are: (with some text explanation of how the data will be used excerpted from the rationale):
    a. Stormwater contribution to fish tissue burdens: “Thus, it is necessary to determine the relative contribution of stormwater (as compared to other sources) to surface water concentrations of selected chemicals in the harbor. For stormwater, this would be done in terms of loading estimates.”
    b. Stormwater contribution to recontamination potential: “To predict whether sediments would recontaminate at levels above the PRGs that will eventually be set for the Site, estimates of stormwater loads are needed for input into estimation tools and models described in Section 1.3; these load estimates must be on a spatial scale consistent with those estimation tools and models. The load estimates should be accompanied by partitioning measurements to assist in the estimation of chemical mass associated with particulates (that may settle to the sediment bed) versus dissolved mass.”Atja
3. If the objectives are not adequately met, discuss if there is a need for more sampling in the fall to better meet these objectives.

With regards to the first item, the group requested via email an analysis of whether the phthalates in stormwater were likely a result of blank contamination or similar sampling artifacts. Attached is a table that summarizes this data analysis. In summary, slightly over one-half (155 of 306 results) of the stormwater results from all sampling events were qualified as estimated or undetected because of detections of phthalates in laboratory and field blanks. The stormwater blank results are attached.

With regards to the second and third items, attached are two tables summarizing the number of samples collected (and analytes for those samples) for all sites including the seven T-4 sites and GE Decommisioning site.

Talk to you tomorrow.

Carl

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Status of Stormwater Outfall Composite Water Samples

Outfall(s)	Facility or Location	River Mile	Land Use Category	Land Use	Number of Samples Excluding Samples Over Site Planned Maximum (over 3)									
					PCB Congeners	TSS	TOC	Pesticides	PAHs	Phthalates	Total Metals	Herbicides	Diss. Metals (filtered)	DOC (filtered)
OF-22	City - Willbridge Industrial Area	7.7	Land Use	Heavy Industrial	3	3	3	NA	3	NA	3	3	2	2
OF-22B	City - Doane Lake Industrial Area	6.9	Land Use	Heavy Industrial	2	2	2	2	2	NA	2	2	2	2
OF-16	City - Heavy Industrial	9.7	Land Use	Heavy Industrial	3	3	3	NA	3	NA	3	3	3	3
WR-218	UPRR Albina	10	Land Use	Heavy Industrial	2	2	2	NA	2	NA	2	1	2	2
WR-67	Siltronic	6.6	Land Use	Heavy Industrial	3	3	3	NA	3	NA	3	3	3	3
WR-183	Basin R Terminal 4 Slip 1	4.3	Land Use	Heavy Industrial	3	3	3	NA	3	3	3	0	3	3
WR-181	Basin Q Terminal 4 Slip 1	4.3	Land Use	Heavy Industrial	2	2	2	2	2	2	1	0	1	2
WR-177	Basin M Terminal 4 Slip 1	4.3	Land Use	Heavy Industrial	3	3	3	3	3	2	3	0	3	3
WR-20	Basin L Terminal 4 Wheeler Bay	4.5	Land Use	Heavy Industrial	3	3	3	3	3	3	3	0	3	3
				Subtotal Planned	27	27	27	3	27	12	27	27	27	27
				Subtotal Actual	24	24	24	10	24	10	23	12	22	23
				Missing	3	3	3	0	3	2	4	15	5	4
				Percent Missing	11%	11%	11%	0%	11%	17%	15%	56%	19%	15%
OF-M1	City - Mocks Bottom Industrial Area	Lagoon	Land Use	Light Industrial	3	3	3	NA	3	NA	3	3	3	3
OF-M2	City - Mocks Bottom Industrial Area	Lagoon	Land Use	Light Industrial	3	3	3	NA	3	3	3	3	2	3
OF-52C	City - Terminal 4 Area	4.3	Land Use	Light Industrial	3	3	3	3	3	3	3	0	3	3
WR-169	Basin D Terminal 4 (Toyota)	4.7	Land Use	Light Industrial	0	3	3	NA	3	1	3	0	3	3
				Subtotal Planned	12	12	12	0	12	9	12	6	12	12
				Subtotal Actual	9	12	12	3	12	7	12	6	11	12
				Missing	3	0	0	0	0	2	0	0	1	0
				Percent Missing	25%	0%	0%	0%	0%	22%	0%	0%	8%	0%
SJB	Highway drainage	5.8		Major Transportation	3	3	3	NA	3	3	3	3	3	3
Hwy 30*	Hwy 30*	TBD	Land Use	Major Transportation*	1	3	3	NA	3	NA	3	2	2	2
				Subtotal Planned	6	6	6	0	6	3	6	6	6	6
				Subtotal Actual	4	6	6	0	6	3	6	5	5	5
				Missing	2	0	0	0	0	0	0	1	1	1
				Percent Missing	33%	0%	0%	0%	0%	0%	0%	17%	17%	17%
OF-22C	City - Forest Park Area	6.9	Land Use	Open Space (Forest Park)	2	2	2	NA	2	2	2	2	1	2
				Subtotal Planned	3	3	3	0	3	3	3	3	3	3
				Subtotal Actual	2	2	2	0	2	2	2	2	1	2
				Missing	1	1	1	0	1	1	1	1	2	1
				Percent Missing	33%	33%	33%	0%	33%	33%	33%	33%	67%	33%
OF-49	City - St. Johns Area	6.5	Land Use	Residential	2	3	3	NA	3	2	3	2	1	2
OF-53	City - Residential above T4	5.1	Land Use	Residential	3	3	3	3	3	3	2	0	2	3
				Subtotal Planned	6	6	6	0	6	6	6	6	6	6
				Subtotal Actual	5	6	6	3	6	5	5	2	3	5
				Missing	1	0	0	0	0	1	1	4	3	1
				Percent Missing	17%	0%	0%	0%	0%	17%	17%	67%	50%	17%
OF-18	City - Multiple Land Uses	9.7	Multiple Land Use	Open Space/Heavy Ind.	3	3	3	NA	3	3	3	3	3	3
OF-19	City - Multiple Land Uses	8.4	Multiple Land Use	Open Space/Heavy Ind.	3	3	3	NA	3	NA	3	3	3	3
				Subtotal Planned	6	6	6	0	6	3	6	6	6	6
				Subtotal Actual	6	6	6	0	6	3	6	6	6	6
				Missing	0	0	0	0	0	0	0	0	0	0
				Percent Missing	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
WR-107	GASCO	6.4	Specific Industrial	Heavy Industrial	3	3	3	NA	3	NA	3	3	3	3
WR-123	Schnitzer International Slip	3.7	Specific Industrial	Heavy Industrial	3	3	3	NA	3	3	3	3	2	3
WR-14	Chevron - Transportation	7.7	Specific Industrial	Heavy Industrial	3	3	3	NA	3	NA	3	3	3	3
WR-142/145	Gunderson	8.9	Specific Industrial	Heavy Industrial	1	2	2	NA	2	1	2	1	1	1
WR-147	Gunderson	9	Specific Industrial	Heavy Industrial	3	3	3	NA	3	3	3	2	3	3
WR-161	Portland Shipyard	8.2	Specific Industrial	Heavy Industrial	3	3	3	NA	3	3	3	3	3	3
WR-22	OSM	2.1	Specific Industrial	Heavy Industrial	3	3	3	NA	3	3	3	3	3	3
WR-384	Schnitzer - Riverside	3.7	Specific Industrial	Heavy Industrial	3	3	3	NA	3	NA	3	3	2	3
WR-4	Sulzer Pump	10.4	Specific Industrial	Heavy Industrial	3	3	3	NA	3	NA	3	3	3	3
WR-96	Arkema	7.3	Specific Industrial	Heavy Industrial	2	3	3	3	3	3	3	1	3	3
Drains to OF-17	GE Decomissioning	9.7	Specific Industrial	Heavy Industrial	1	1	1	NA	1	NA	1	0	1	1
				Subtotal Planned	33	33	33	3	33	18	33	33	33	33
				Subtotal Actual	28	30	30	3	30	16	30	25	27	29
				Missing	5	3	3	0	3	2	3	8	6	4
				Percent Missing	15%	9%	9%	0%	9%	11%	9%	24%	18%	12%

NA - Indicates that samples for this analyte were not planned on being collected for this site. Zeros indicate that samples were planned but none were sucessfully completed.

*These samples were collected at a junction location that likely includes contributions from non-highway drainage area and may not be fully representative of exclusively major transportation runoff.

Indicates that less than planned number of samples were taken for this analyte, which is also an AOPC risk driver.

Status of Stormwater Outfall Composite Water Samples

Outfall(s)	Facility or Location	River Mile	Land Use Category	Land Use	Total Number of Samples Collected										Drains to AOPC	AOPC Risk Drivers
					PCB Congeners	TSS	TOC	Pesticides	PAHs	Phthalates	Total Metals	Herbicides	Diss. Metals (filtered)	DOC (filtered)		
OF-22	City - Willbridge Industrial Area	7.7	Land Use	Heavy Industrial	3	3	3	NA	3	NA	3	3	2	2	17	PCBs, Pesticides
OF-22B	City - Doane Lake Industrial Area	6.9	Land Use	Heavy Industrial	2	2	2	2	2	NA	2	2	2	2	14	Pesticides, PCBs, Metals, Phthalates
OF-16	City - Heavy Industrial	9.7	Land Use	Heavy Industrial	3	5	4	NA	3	NA	5	3	3	3	24	PCBs
WR-218	UPRR Albina	10	Land Use	Heavy Industrial	2	2	2	NA	2	NA	2	1	2	2	25	PCBs
WR-67	Siltronic	6.6	Land Use	Heavy Industrial	4	6	6	NA	4	NA	5	3	4	5	11	PAHs, Pesticides, PCBs,
WR-183	Basin R Terminal 4 Slip 1	4.3	Land Use	Heavy Industrial	3	3	3	NA	3	3	3	0	3	3	T4	PCBs, PAHs, Metals
WR-181	Basin Q Terminal 4 Slip 1	4.3	Land Use	Heavy Industrial	2	2	2	2	2	2	1	0	1	2	T4	PCBs, PAHs, Metals
WR-177	Basin M Terminal 4 Slip 1	4.3	Land Use	Heavy Industrial	3	3	3	3	3	2	3	0	3	3	T4	PCBs, PAHs, Metals
WR-20	Basin L Terminal 4 Wheeler Bay	4.5	Land Use	Heavy Industrial	3	3	3	3	3	3	3	0	3	3	T4	PCBs, PAHs, Metals
				Subtotal Planned	27	27	27	3	27	12	27	27	27	27		
				Subtotal Actual	25	29	28	10	25	10	27	12	23	25		
				Missing	2	0	0	0	2	2	0	15	4	2		
				Percent Missing	7%	0%	0%	0%	7%	17%	0%	56%	15%	7%		
OF-M1	City - Mocks Bottom Industrial Area	Lagoon	Land Use	Light Industrial	3	4	4	NA	3	NA	4	3	3	3	22	PCBs
OF-M2	City - Mocks Bottom Industrial Area	Lagoon	Land Use	Light Industrial	4	4	4	NA	4	4	4	3	2	3	23	PCBs
OF-52C	City - Terminal 4 Area	4.3	Land Use	Light Industrial	3	3	3	3	3	3	3	0	3	3	T4	PCBs, PAHs, Metals
WR-169	Basin D Terminal 4 (Toyota)	4.7	Land Use	Light Industrial	0	3	3	NA	3	1	3	0	3	3	T4	PCBs, PAHs, Metals
				Subtotal Planned	12	12	12	0	12	9	12	6	12	12		
				Subtotal Actual	10	14	14	3	13	8	14	6	11	12		
				Missing	2	0	0	0	0	1	0	0	1	0		
				Percent Missing	17%	0%	0%	0%	0%	11%	0%	0%	8%	0%		
SJB	Highway drainage	5.8		Major Transportation	3	6	6	NA	3	3	4	3	3	5		
			Land Use												None	None
Hwy 30*	Hwy 30*	TBD	Land Use	Major Transportation*	1	3	3	NA	3	NA	3	2	2	2	19	PCBs, Pesticides, Metals, Phthalates, PAHs
				Subtotal Planned	6	6	6	0	6	3	6	6	6	6		
				Subtotal Actual	4	9	9	0	6	3	7	5	5	7		
				Missing	2	0	0	0	0	0	0	1	1	0		
				Percent Missing	33%	0%	0%	0%	0%	0%	0%	17%	17%	0%		
OF-22C	City - Forest Park Area	6.9	Land Use	Open Space (Forest Park)	2	2	2	NA	2	2	2	2	1	2	14	Pesticides, PCBs, Metals, Phthalates
				Subtotal Planned	3	3	3	0	3	3	3	3	3	3		
				Subtotal Actual	2	2	2	0	2	2	2	2	1	2		
				Missing	1	1	1	0	1	1	1	1	2	1		
				Percent Missing	33%	33%	33%	0%	33%	33%	33%	33%	67%	33%		
OF-49	City - St. Johns Area	6.5	Land Use	Residential	2	3	3	NA	3	2	3	2	1	2	None	None
OF-53	City - Residential above T4	5.1	Land Use	Residential	3	3	3	3	3	3	3	2	0	2	3	T4	PCBs, PAHs, Metals
				Subtotal Planned	6	6	6	0	6	6	6	3	6	6		
				Subtotal Actual	5	6	6	3	6	5	5	2	3	5		
				Missing	1	0	0	0	0	1	1	1	3	1		
				Percent Missing	17%	0%	0%	0%	0%	17%	17%	33%	50%	17%		
OF-18	City - Multiple Land Uses	9.7	Multiple Land Use	Open Space/Heavy Ind.	3	4	4	NA	3	3	4	3	3	3	19	PCBs, Pesticides, Metals, Phthalates, PAHs
OF-19	City - Multiple Land Uses	8.4	Multiple Land Use	Open Space/Heavy Ind.	3	5	5	NA	3	NA	4	4	3	4	18	PCBs
				Subtotal Planned	6	6	6	0	6	3	6	6	6	6		
				Subtotal Actual	6	9	9	0	6	3	8	7	6	7		
				Missing	0	0	0	0	0	0	0	0	0	0		
				Percent Missing	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		
WR-107	GASCO	6.4	Specific Industrial	Heavy Industrial	3	4	4	NA	3	NA	4	3	3	3	11	PAHs, Pesticides, PCBs,
WR-123	Schnitzer International Slip	3.7	Specific Industrial	Heavy Industrial	3	5	5	NA	3	3	4	3	2	4	3	PCBs, Phthalates, PAHs, Pesticides, Metals
WR-14	Chevron - Transportation	7.7	Specific Industrial	Heavy Industrial	3	5	5	NA	3	NA	5	3	3	4	17	PCBs, Pesticides
WR-142/145	Gunderson	8.9	Specific Industrial	Heavy Industrial	1	2	2	NA	2	1	2	1	1	1	19	PCBs, Pesticides, Metals, Phthalates, PAHs
WR-147	Gunderson	9	Specific Industrial	Heavy Industrial	3	5	5	NA	3	3	5	2	3	4	19	PCBs, Pesticides, Metals, Phthalates, PAHs
WR-161	Portland Shipyard	8.2	Specific Industrial	Heavy Industrial	3	4	4	NA	3	3	4	3	3	3	21	PCBs, Metals, Phthalates, PAHs
WR-22	OSM	2.1	Specific Industrial	Heavy Industrial	3	4	4	NA	3	3	4	3	3	3	1	Phthalates, PBCs, Metals
WR-384	Schnitzer - Riverside	3.7	Specific Industrial	Heavy Industrial	3	5	5	NA	4	NA	4	3	2	4	4	PCBs
WR-4	Sulzer Pump	10.4	Specific Industrial	Heavy Industrial	3	4	4	NA	3	NA	4	3	3	3	26	PCBs
WR-96	Arkema	7.3	Specific Industrial	Heavy Industrial	2	4	4	3	3	3	4	1	3	4	14	Pesticides, PCBs, Metals, Phthalates
Drains to OF-17	GE Decomissioning	9.7	Specific Industrial	Heavy Industrial	1	1	1	NA	1	NA	1	0	1	1	24	PCBs
				Subtotal Planned	33	33	33	3	33	18	33	33	33	33		
				Subtotal Actual	28	43	43	3	31	16	41	25	27	34		
				Missing	5	0	0	0	2	2	0	8	6	0		
				Percent Missing	15%	0%	0%	0%	6%	11%	0%	24%	18%	0%		

NA - Indicates that samples for this analyte were not planned on being collected for this site. Zeros indicate that sam

*These samples were collected at a junction location that likely includes contributions from non-highway drainage a

Indicates that less than planned number of samples were taken for this analyte, which is also an AOPC risk driver.

Status of Sediment Trap Samples - Showing Target Detection Limit Factors for LWG Sites and Estimated for T4 Sites*

Outfall(s)	Facility or Location	River Mile	Land Use Category	Land Use	PCB Congeners	Percent Solids	TOC	Organochlorine pesticides	PAHs	Phthalates	Metals	Herbicides	Grain size
OF-22	City - Willbridge Industrial Area	7.7	Land Use	Heavy Industrial	1.3	1	1						
OF-22B	City - Doane Lake Industrial Area	6.9	Land Use	Heavy Industrial	1.5	1	1						
OF-16	City - Heavy Industrial	9.7	Land Use	Heavy Industrial	1	1	1	1	1.2	1.2			
WR-218	UPRR Albina	10	Land Use	Heavy Industrial	1.9	1	1						
WR-67	Siltronic	6.6	Land Use	Heavy Industrial	1	1	1	4.8					
WR-183	Basin R Terminal 4 Slip 1	4.3	Land Use	Heavy Industrial									
WR-181	Basin Q Terminal 4 Slip 1	4.3	Land Use	Heavy Industrial									
WR-177	Basin M Terminal 4 Slip 1	4.3	Land Use	Heavy Industrial	1	1	1	1	1	1	1		
WR-20	Basin L Terminal 4 Wheeler Bay	4.5	Land Use	Heavy Industrial	1	1	1	1	1	1	1		
				Subtotal Planned	9	9	9	9	9	9	8	9	9
				Subtotal Actual	7	7	7	4	3	3	2	0	0
				Missing	2	2	2	5	6	6	6	9	9
				Percent Missing	22%	22%	22%	56%	67%	67%	75%	100%	100%
OF-M1	City - Mocks Bottom Industrial Area	Lagoon	Land Use	Light Industrial	1	1	1	1	1.6	1.6			
OF-M2	City - Mocks Bottom Industrial Area	Lagoon	Land Use	Light Industrial	1	1	1	1	1.6	1.6			
OF-52C	City - Terminal 4 Area	4.3	Land Use	Light Industrial	1	1	1	1	1	1	1		
WR-169	Basin D Terminal 4 (Toyota)	4.7	Land Use	Light Industrial	1	1	1	1					
				Subtotal Planned	4	4	4	4	4	4	4	4	4
				Subtotal Actual	4	4	4	4	3	3	1	0	0
				Missing	0	0	0	0	1	1	3	4	4
				Percent Missing	0%	0%	0%	0%	25%	25%	75%	100%	100%
St. Johns Bridge	Highway drainage	5.8	Land Use	Major Transportation	1	1	1	1	2.4	2.4			
Hwy 30**	Hwy 30**	TBD	Land Use	Major Transportation**	1.8	1	1						
				Subtotal Planned	2	2	2	2	2	2	2	2	2
				Subtotal Actual	2	2	2	1	1	1	0	0	0
				Missing	0	0	0	1	1	1	2	2	2
				Percent Missing	0%	0%	0%	50%	50%	50%	100%	100%	100%
OF-22C	City - Forest Park Area	6.9	Land Use	Open Space (Forest Park)	1	1	1	1	1	1	1	1	
				Subtotal Planned	1	1	1	1	1	1	1	1	1
				Subtotal Actual	1	1	1	1	1	1	1	1	0
				Missing	0	0	0	0	0	0	0	0	1
				Percent Missing	0%	0%	0%	0%	0%	0%	0%	0%	100%
OF-49	City - St. Johns Area	6.5	Land Use	Residential		1	1	22.2					
OF-53	City - Residential above T4	5.1	Land Use	Residential	1	1	1	1	1	1	1		
				Subtotal Planned	2	2	2	2	2	2	2	2	2
				Subtotal Actual	1	2	2	2	1	1	1	0	0
				Missing	1	0	0	0	1	1	1	2	2
				Percent Missing	50%	0%	0%	0%	50%	50%	50%	100%	100%
OF-18	City - Multiple Land Uses	9.7	Multiple Land Use	Open Space/Heavy Industrial	1	1	1	1	1.1	1.1			
OF-19	City - Multiple Land Uses	8.4	Multiple Land Use	Open Space/Heavy Industrial	1	1	1	1	1	1	1	1	
				Subtotal Planned	2	2	2	2	2	2	2	2	2
				Subtotal Actual	2	2	2	2	2	2	1	1	0
				Missing	0	0	0	0	0	0	1	1	2
				Percent Missing	0%	0%	0%	0%	0%	0%	50%	50%	100%
WR-107	GASCO	6.4	Specific Industrial	Heavy Industrial	1	1	1	1	1	1	1	1	
WR-123	Schnitzer International Slip	3.7	Specific Industrial	Heavy Industrial	1	1	1	1					
WR-14	Chevron - Transportation	7.7	Specific Industrial	Heavy Industrial	1	1	1	1					
WR-145	Gunderson	8.9	Specific Industrial	Heavy Industrial	6	1	1						
WR-147/148	Gunderson	9	Specific Industrial	Heavy Industrial	1	1	1	5.3					
WR-161	Portland Shipyard	8.2	Specific Industrial	Heavy Industrial	1	1	1	4					
WR-22	OSM	2.1	Specific Industrial	Heavy Industrial	1	1	1	1	1	1	1	1.3	
WR-384	Schnitzer - Riverside	3.7	Specific Industrial	Heavy Industrial	1	1	1	1	1	1	1	1	
WR-4	Sulzer Pump	10.4	Specific Industrial	Heavy Industrial	3.3	1	1						
WR-96	Arkema	7.3	Specific Industrial	Heavy Industrial									
GE (drains to OF-17)	GE Decomissioning	9.7	Specific Industrial	Heavy Industrial	NA	NA	NA	NA	NA	NA	NA	NA	NA
				Subtotal Planned	10	10	10	10	10	10	10	10	10
				Subtotal Actual	9	9	9	7	3	3	3	3	0
				Missing	1	1	1	3	7	7	7	7	10
				Percent Missing	10%	10%	10%	30%	70%	70%	70%	70%	100%

*Detection limit factor shows how the target detection limit (DL) will be exceeded with the sample mass remaining. A factor of 1 means the target detection limit will be achieved. A factor of 2 means the actual DL will be two times higher than the target DL.

NA - Indicates that samples for this analyte were not planned on being collected for this site. Blanks indicate that samples were planned but none were sucessfully completed.

**These samples were collected at a junction location that likely includes contributions from non-highway drainage area and may not be fully representative of exclusively major transportation runoff.

Percent Complete of Stormwater and Sediment Trap Samples By Land Use Category

Land Use Category	Land Use	PCB Congeners		Solids		Organic Carbon		Pesticides		PAHs		Phthalates		Metals		Herbicides	
		Water	Sediment	Water	Sediment	Water	Sediment	Water	Sediment	Water	Sediment	Water	Sediment	Water	Sediment	Water	Sediment
Land Use	Heavy Industrial	93%	78%	100%	78%	100%	78%	100%	44%	93%	33%	NA	33%	100%	25%	44%	0%
Land Use	Light Industrial	83%	100%	100%	100%	100%	100%	100%	100%	100%	75%	89%	75%	100%	25%	100%	0%
Land Use	Major Transportation	67%	100%	100%	100%	100%	100%	NA	50%	100%	50%	100%	50%	100%	0%	83%	0%
Land Use	Open Space (Forest Park)	67%	100%	67%	100%	67%	100%	NA	100%	67%	100%	67%	100%	67%	100%	67%	100%
Land Use	Residential	83%	50%	100%	100%	100%	100%	100%	100%	100%	50%	83%	50%	83%	50%	67%	0%
Multiple Land Use	Open Space/Heavy Industrial	100%	100%	100%	100%	100%	100%	NA	100%	100%	100%	100%	100%	100%	50%	100%	50%
Specific Industrial	Heavy Industrial	85%	90%	100%	90%	100%	90%	100%	70%	94%	30%	89%	30%	100%	30%	76%	30%

100-76% complete
75%-51% complete
50-26% complete
25-0% complete

Sediment analyses at **less than half** the stations have increased detection limits due to insufficient sample volume.

Sediment analyses at **half or more** the stations have increased detection limits due to insufficient sample volume.

From: Carl Stivers
Sent: Friday, October 12, 2007 10:02 AM
To: 'Koch.Kristine@epamail.epa.gov'; 'Andy Koulermos'; Amanda Shellenberger; 'Amanda Spencer'; 'Sanders, Dawn'; 'Scheffler, Linda'; 'Laura Jones'; 'mcoover@ensr.aecom.com'; 'LaFranchise, Nicole'; 'TARNOW Karen E'
Cc: Bob Wyatt; Rick Applegate; 'MCCLINCY Matt'; Jessica Pisano; 'Gene Revelas'; 'Christine Hawley'; Jim McKenna
Subject: RE: Stormwater Technical Team Call October 16 at 1:00 pm

Stormwater Technical Team –


Elements of Loading Analysis O...


20071010_summary_stats_tables_...


20071011_figures_by_outfall.pd...


20071012_figures_by_land_use.p...

Attached are some data summaries to facilitate our next call. In addition, there is a summary of loading estimate calculation method options that was also requested by the team. My suggestion for an agenda based email traffic since our last meeting is:

- Finalize recommendations for fall stormwater/sediment trap sampling
  - Review data summaries
  - Discuss work anticipated at GE and T4 sites and how that fits in
  - Decide on any changes to recommendations
- Discuss path forward to seek approvals and schedule for implementation
- Discuss stormwater loading calculation methods (if time allows)
- Determine next meeting time and content

Also, note that we are planning on providing one additional data table that may be helpful to the group, but that will likely not be available until late today or Monday.

Thanks.

Carl

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Fax: 509-888-2211

cstivers@anchorenv.com

From: Carl Stivers

Sent: Tuesday, October 02, 2007 10:58 AM
To: 'Koch.Kristine@epamail.epa.gov'
Cc: Andy Koulermos; Amanda Shellenberger; Amanda Spencer; Christine Hawley; Sanders, Dawn; Gene Revelas; Jim McKenna; Jessica Pisano; Scheffler, Linda; Laura Jones; MCCLINCY Matt; mcoover@ensr.aecom.com; LaFranchise, Nicole; Rick Applegate; Bob Wyatt; TARNOW Karen E
Subject: Stormwater Technical Team Call October 16 at 1:00 pm

Stormwater Technical Team -

The next call is on October 16th at 1:00 pm as Amanda Shellenberger previously noted. The call in number will be 1-866-866-2244 passcode: 6761834#. (Jessica - Please confirm to me that this number is OK for this time.)

I also wanted to mention that the LWG has been discussing the scheduling of the additional stormwater work currently under consideration. Basically, the work would need to be completed by Dec. 31, 2007 in order for the overall RI/FS project to stay on schedule. Given Kristine's comments (copied below) regarding potential for more data needs based on review of the stormwater detect/concentration data, it is imperative that we make any final decisions on the complete set of data needs at this next call. From that point, I would envision the following schedule:

- Obtain official LWG approval/disapproval between Oct. 16 and October 31.
- Formalize proposal in a technical memo from Oct. 16 to October 31, with EPA approval to proceed on October 31. (Note that this memo would heavily reference the existing FSP and would only note those new items necessary to execute this additional proposed work.)
- Deploy sediment traps from Nov. 1 through Dec. 31
- Be on alert for storm events from Nov. 1 through Dec. 31 and collect storms as possible per the FSP requirements.

Note that LWG consultants are working on a stormwater data detect/concentration summary consistent with the last meetings discussion and plan to get that to the Stormwater Technical team by October 11th after LWG approval on October 10th. The field sampling report is also under preparation, and is due to EPA in mid-October. I think it is unlikely that EPA/DEQ would have this report in hand prior to the October 16th call. However, I don't think this report will have much direct impact on our decisions as compared to the stormwater data summaries.

In the meantime, please let me know if you have any other questions.

Thanks.

Carl

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-----Original Message-----
From: Koch.Kristine@epamail.epa.gov [mailto:Koch.Kristine@epamail.epa.gov]
Sent: Friday, September 21, 2007 9:01 AM
To: Carl Stivers
Cc: Andy Koulermos; Amanda Shellenberger; Amanda Spencer; Christine Hawley; Sanders, Dawn; Gene Revelas; Jim McKenna; Jessica Pisano; Scheffler, Linda; Laura Jones; MCCLINCY Matt; mcoover@ensr.aecom.com; LaFranchise, Nicole; Rick Applegate; Bob Wyatt; TARNOW Karen E
Subject: RE: Notes from Stormwater Tech Team Call Sept 14th at 1:15pm

Carl - First, I'm currently available that week, except 10/17 (9-11) and 10/18 (1:30-2).

Secondly, you did not provide a table or listing of the proposed sampling so that may be where Karen's comment came from. Your statement makes it appear that there are no data gaps and I think it would be helpful for others to see the initial list to grasp the magnitude of this. I really thought our last meeting was going to have more discussion involving the analyzed data. I had provided my list of data gaps earlier, and it seems that the last conference call didn't put us much further ahead. I had identified several data gaps just based on sampling, but agreed that if the data analysis could show that any of these data gaps were filled, then additional sampling would not be necessary. Additionally, the data analysis could show that more sampling is necessary in other areas. I think that it is imperative to look at the data soon and confirm the data gaps by the next meeting to ensure that there is time to get into the field and collect the information to fill the data gaps this fall.

Kristine Koch
Remedial Project Manager
USEPA, Office of Environmental Cleanup

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Draft Elements of Loading Analysis – Portland Harbor Superfund Site

Stormwater Data Loading Calculation

- Cw x Vyr = L
  Cw - Measured Concentration (ug/L) for land use or site
  Vyr - Volume of discharge from land use or site over a year (L/yr)
  L - Load (ug/yr)
- Issues include storms or time of year sampled not representative of loading all year long. Also, determination of Vyr can be difficult (see below).

Sediment Trap Data Loading Calculation

- Cs x TSS x Vyr = L
  Cs - Measured Concentration (ug/kg) for land use or site
  TSS -Total Suspended Sediments (kg/L) in stormwater measured for land use or site
  Vyr - Volume of discharge from land use or site over a year (L/yr)
- Issues include time of year sediment traps deployed (e.g., spring) or TSS from storms not representative of loading all year long. Also, determination of Vyr can be difficult (see below).

Variations of Inputs to Load Calculations

- Volume (Vyr) Variable
  - Model discharge for site or land use over a typical precipitation year or ranges of years (recommended by rationale)
    - Use City Grid Model
    - Use some other model(s)?
  - Use measured volumes for storms (calculate storm loads) and extrapolate to yearly loads based on storm data and/or modeling (not recommended by rationale)
    - Specifics of approach?
  - Others?
- TSS variable
  - Use synoptic TSS/chemical pairs to estimate water concentration prior load estimate
  - Develop TSS average or other statistics that are intended to represent range of TSS for that site or land use and apply to all chemical data
    - Use of historical TSS site data
      - QC screen this for appropriate quality
      - Use grabs or composites or both?
  - Others?

Variations for Concentration (Cw/Cs) Inputs

- Associating Cw/Cs results with land uses and sites
  - Agree on final categories that each site falls into (or use FSP categories)
  - Outlier site analysis to make sure site should be in land use category
    - Remove outliers (by chemical or by site?)

        - Remove *A priori* based on known site uses/sources
        - Remove using statistical outlier approach
        - Both?
    - Use of site-specific industrial sites for non-unique chemicals (e.g., use Gasco for industrial land use category for PCBs)
- Determining Cw/Cs values for each land use or site
    - Group all samples within category
    - Adjust for number of samples from each site in category
    - Sample point outlier analysis?
    - Statistic(s) to use (average, min, max, confidence limits, percentiles, other)
    - Handling of non-detects
        - Don't use
        - Full or half DLs
        - More complex approaches
- Determine basins where land use based approach cannot be used (per rationale)
    - Basin too small?
    - Basin has too many unique sites?
    - Others?
    - Alternative approach for these areas?
- For basins sampled near outfalls
    - Determine which outfalls fall in this category
    - Use land use approach? (not recommended by rationale)
    - Use calculated loads (recommended by rationale)?
    - Use both approaches?

Evaluation of Loading Estimates

- Comparison of stormwater loads to sediment trap loads
    - Total (water) vs. particulate (sediment) issue
    - When to use only one
    - When to use both
    - How to combine into overall range of loads
- Comparison of measured loads to those calculated on land use basis for some outfalls ("cross check" recommended in rationale)

Table: Summary Stats by Individual Stormwater Outfall

Non-detect Treatment	Analyte	Land Use Group	Outfall ID	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 1/2 DL[a]											
	Total PCBs	Open Space (Forest Park)	OF22C	2	1	50	53.5	53.5	26.2	80.8	pg/L
		Residential	OF49	2	0	100	1180	1180	1140	1220	pg/L
		Major Transportation	H30	1	0	100	17500	17500	17500	17500	pg/L
			SJB	4	0	100	86300	75900	8500	185000	pg/L
		Open Space/Heavy Ind.	OF18	4	0	100	178000	99200	12300	503000	pg/L
			OF19	3	0	100	34600	25000	11100	67700	pg/L
		Light Industrial	OFM1	3	0	100	10110	9040	3490	17800	pg/L
			OFM2	4	0	100	8960	7520	1700	19100	pg/L
		Heavy Industrial	OF16	3	0	100	146000	117000	88500	232000	pg/L
			OF22	4	0	100	24295	23100	9380	41600	pg/L
			OF22B	3	0	100	138000	143000	27800	244000	pg/L
			WR218	2	0	100	34850	34900	17600	52100	pg/L
			WR67	4	0	100	1689	732	344	4950	pg/L
		Arkema	WR96	3	0	100	12250	8340	8210	20200	pg/L
		Chevron - Transportation	WR14	3	0	100	5697	5520	971	10600	pg/L
		GASCO	WR107	4	0	100	2495	2525	510	4420	pg/L
		Gunderson	WR142	2	0	100	1226	1226	852	1600	pg/L
			WR147	3	0	100	658000	428000	237000	1310000	pg/L
		OSM	WR22	4	0	100	278000	272000	243000	325000	pg/L
		Portland Shipyard	WR161	5	0	100	125000	119000	1400	302000	pg/L
		Schnitzer - Riverside	WR384	4	0	100	5125000	4400000	100000	11600000	pg/L
		Schnitzer International Slip	WR123	4	0	100	277000	256000	56700	539000	pg/L
		Sulzer Pump	WR4	3	0	100	8593	4860	4820	16100	pg/L
	Total suspended solids	Open Space (Forest Park)	OF22C	2	0	100	10.0	10.0	10.0	10.0	mg/L
		Residential	OF49	3	0	100	20.7	16.0	8.0	38.0	mg/L
		Major Transportation	H30	3	0	100	46.7	47.0	33.0	60.0	mg/L
			SJB	7	0	100	112	85.0	13.0	248	mg/L
		Open Space/Heavy Ind.	OF18	5	0	100	115	113	17.0	212	mg/L
			OF19	5	0	100	103	81.0	34.0	191	mg/L
		Light Industrial	OFM1	4	0	100	67.0	62.5	46.0	97.0	mg/L
			OFM2	4	0	100	51.3	46.5	31.0	81.0	mg/L
		Heavy Industrial	OF16	5	0	100	89.4	78.0	34.0	171	mg/L
			OF22	4	0	100	176	143	69.0	351	mg/L
			OF22B	3	0	100	220	229	164	266	mg/L
			WR218	2	0	100	52.5	52.5	28.0	77.0	mg/L
			WR67	6	0	100	27.5	18.5	6.0	59.0	mg/L
		Arkema	WR96	5	0	100	12.0	11.0	5.0	20.0	mg/L
		Chevron - Transportation	WR14	5	0	100	38.4	42.0	12.0	51.0	mg/L
		GASCO	WR107	5	0	100	24.0	26.0	10.0	36.0	mg/L
		Gunderson	WR142	2	0	100	11.5	11.5	8.0	15.0	mg/L
			WR145	1	0	100	9.0	9.0	9.0	9.0	mg/L
			WR147	5	0	100	48.2	28.0	15.0	119	mg/L
		OSM	WR22	5	0	100	208	146	128	401	mg/L
		Portland Shipyard	WR161	6	0	100	80.3	39.5	8.0	256	mg/L
		Schnitzer - Riverside	WR384	5	0	100	264	167	6.0	780	mg/L
		Schnitzer International Slip	WR123	6	0	100	231	230	58.0	414	mg/L
		Sulzer Pump	WR4	4	0	100	14.0	13.5	5.0	24.0	mg/L

Table: Summary Stats by Individual Stormwater Outfall

Non-detect Treatment	Analyte	Land Use Group	Outfall ID	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 1/2 DL[a]											
	Total organic carbon	Open Space (Forest Park)	OF22C	2	0	100	3.1	3.1	2.8	3.3	mg/L
		Residential	OF49	3	0	100	9.4	6.8	5.7	15.6	mg/L
		Major Transportation	H30	3	0	100	19.9	15.7	13.5	30.6	mg/L
			SJB	7	0	100	21.9	22.3	3.9	39.5	mg/L
		Open Space/Heavy Ind.	OF18	5	0	100	10.1	7.8	4.3	19.0	mg/L
			OF19	5	0	100	6.4	5.9	4.1	10.1	mg/L
		Light Industrial	OFM1	4	0	100	11.1	12.1	6.1	14.1	mg/L
			OFM2	4	0	100	6.7	5.8	3.2	11.8	mg/L
		Heavy Industrial	OF16	4	0	100	10.3	8.4	6.7	17.5	mg/L
			OF22	4	0	100	22.8	12.1	7.1	60.0	mg/L
			OF22B	3	0	100	26.0	28.3	14.1	35.6	mg/L
			WR218	2	0	100	14.3	14.3	7.1	21.5	mg/L
			WR67	6	0	100	9.2	8.7	4.3	15.4	mg/L
		Arkema	WR96	5	0	100	11.4	7.5	4.5	30.8	mg/L
		Chevron - Transportation	WR14	5	0	100	10.3	6.4	4.1	23.6	mg/L
		GASCO	WR107	5	0	100	4.2	4.2	2.9	5.6	mg/L
		Gunderson	WR142	2	0	100	17.4	17.4	12.0	22.7	mg/L
			WR145	1	0	100	8.1	8.1	8.1	8.1	mg/L
			WR147	5	0	100	15.2	11.7	5.5	38.6	mg/L
		OSM	WR22	5	0	100	5.8	6.0	3.2	8.2	mg/L
		Portland Shipyard	WR161	6	0	100	50.1	13.8	4.1	144	mg/L
		Schnitzer - Riverside	WR384	5	0	100	27.2	23.7	21.7	42.3	mg/L
		Schnitzer International Slip	WR123	6	0	100	14.6	13.1	8.8	27.5	mg/L
		Sulzer Pump	WR4	4	0	100	6.2	5.2	2.9	11.4	mg/L
	Total of 2,4' and 4,4'-DDD, -DDE, -DDT	Heavy Industrial	OF22B	3	0	100	97.7	71.0	12.0	210	mg/L
		Arkema	WR96	4	0	100	4300	2650	900	11000	ng/L
	Low Molecular Weight PAH	Open Space (Forest Park)	OF22C	2	2	0	0.0080	0.0080	0.0075	0.0085	ng/L
		Residential	OF49	3	1	67	0.017	0.019	0.0095	0.021	ug/L
		Major Transportation	H30	3	0	100	0.099	0.076	0.071	0.15	ug/L
			SJB	4	0	100	1.4	0.67	0.31	4.1	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	0.16	0.072	0.0084	0.47	ug/L
			OF19	3	0	100	0.15	0.15	0.100	0.19	ug/L
		Light Industrial	OFM1	3	0	100	0.33	0.32	0.20	0.46	ug/L
			OFM2	4	0	100	0.086	0.086	0.053	0.12	ug/L
		Heavy Industrial	OF16	3	0	100	0.32	0.31	0.20	0.44	ug/L
			OF22	4	0	100	0.82	0.17	0.040	2.9	ug/L
			OF22B	3	0	100	1.8	0.59	0.51	4.3	ug/L
			WR218	2	0	100	0.12	0.12	0.097	0.14	ug/L
			WR67	4	0	100	0.099	0.085	0.067	0.16	ug/L
		Arkema	WR96	4	0	100	0.013	0.013	0.0067	0.018	ug/L
		Chevron - Transportation	WR14	3	0	100	0.44	0.45	0.19	0.69	ug/L
		GASCO	WR107	4	0	100	0.85	0.46	0.20	2.3	ug/L
		Gunderson	WR142	2	1	50	0.091	0.091	0.0025	0.18	ug/L
			WR145	1	0	100	0.20	0.20	0.20	0.20	ug/L
			WR147	3	0	100	0.17	0.21	0.092	0.22	ug/L
		OSM	WR22	4	0	100	0.30	0.19	0.13	0.68	ug/L
		Portland Shipyard	WR161	5	0	100	0.17	0.21	0.042	0.22	ug/L
		Schnitzer - Riverside	WR384	3	1	67	1.08	1.4	0.046	1.8	ug/L
		Schnitzer International Slip	WR123	4	0	100	0.25	0.16	0.062	0.64	ug/L
		Sulzer Pump	WR4	3	0	100	0.087	0.087	0.087	0.087	ug/L

Table: Summary Stats by Individual Stormwater Outfall

Non-detect Treatment	Analyte	Land Use Group	Outfall ID	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 1/2 DL[a]											
	High Molecular Weight PAH	Open Space (Forest Park)	OF22C	2	2	0	0.0028	0.0028	0.0027	0.0028	ug/L
		Residential	OF49	3	0	100	0.075	0.071	0.055	0.100	ug/L
		Major Transportation	H30	3	0	100	0.47	0.32	0.20	0.88	ug/L
			SJB	4	0	100	3.4	2.3	0.85	8.1	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	0.79	0.50	0.075	2.1	ug/L
			OF19	3	0	100	0.81	0.83	0.65	0.95	ug/L
		Light Industrial	OFM1	3	0	100	1.1	1.2	0.89	1.2	ug/L
			OFM2	4	0	100	0.38	0.31	0.21	0.68	ug/L
		Heavy Industrial	OF16	3	0	100	0.58	0.69	0.28	0.78	ug/L
			OF22	4	0	100	0.96	0.88	0.48	1.6	ug/L
			OF22B	3	0	100	0.90	0.64	0.57	1.5	ug/L
			WR218	2	0	100	0.37	0.37	0.35	0.38	ug/L
			WR67	4	0	100	0.53	0.52	0.24	0.86	ug/L
		Arkema	WR96	4	0	100	0.044	0.042	0.038	0.054	ug/L
		Chevron - Transportation	WR14	3	0	100	4.7	4.7	1.2	8.1	ug/L
		GASCO	WR107	4	0	100	4.9	4.1	1.8	9.7	ug/L
		Gunderson	WR142	2	0	100	0.34	0.34	0.17	0.51	ug/L
			WR145	1	0	100	0.70	0.70	0.70	0.70	ug/L
			WR147	3	0	100	0.28	0.36	0.13	0.36	ug/L
		OSM	WR22	4	0	100	0.55	0.54	0.29	0.83	ug/L
		Portland Shipyard	WR161	5	0	100	0.47	0.53	0.076	0.90	ug/L
		Schnitzer - Riverside	WR384	3	0	100	13.5	11.0	0.35	29.0	ug/L
		Schnitzer International Slip	WR123	4	0	100	0.84	0.79	0.37	1.4	ug/L
		Sulzer Pump	WR4	3	0	100	0.16	0.12	0.056	0.31	ug/L
	Total PAHs	Open Space (Forest Park)	OF22C	2	2	0	0.0080	0.0080	0.0075	0.0085	ug/L
		Residential	OF49	3	0	100	0.089	0.092	0.074	0.100	ug/L
		Major Transportation	H30	3	0	100	0.56	0.39	0.28	1.00	ug/L
			SJB	4	0	100	4.8	2.9	1.2	12.0	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	0.96	0.58	0.083	2.6	ug/L
			OF19	3	0	100	0.94	0.98	0.75	1.1	ug/L
		Light Industrial	OFM1	3	0	100	1.4	1.5	1.10	1.6	ug/L
			OFM2	4	0	100	0.46	0.39	0.26	0.80	ug/L
		Heavy Industrial	OF16	3	0	100	0.90	0.98	0.71	1.00	ug/L
			OF22	4	0	100	1.8	1.04	0.52	4.5	ug/L
			OF22B	3	0	100	2.7	2.1	1.2	4.9	ug/L
			WR218	2	0	100	0.48	0.48	0.44	0.52	ug/L
			WR67	4	0	100	0.63	0.60	0.31	1.00	ug/L
		Arkema	WR96	4	0	100	0.056	0.053	0.048	0.072	ug/L
		Chevron - Transportation	WR14	3	0	100	5.1	5.1	1.4	8.8	ug/L
		GASCO	WR107	4	0	100	5.8	4.5	2.0	12.0	ug/L
		Gunderson	WR142	2	0	100	0.43	0.43	0.17	0.69	ug/L
			WR145	1	0	100	0.90	0.90	0.90	0.90	ug/L
			WR147	3	0	100	0.45	0.56	0.22	0.58	ug/L
		OSM	WR22	4	0	100	0.84	0.72	0.42	1.5	ug/L
		Portland Shipyard	WR161	5	0	100	0.64	0.71	0.12	1.1	ug/L
		Schnitzer - Riverside	WR384	3	0	100	14.1	12.0	0.35	30.0	ug/L
		Schnitzer International Slip	WR123	4	0	100	1.1	1.1	0.44	1.7	ug/L
		Sulzer Pump	WR4	3	0	100	0.25	0.21	0.14	0.40	ug/L

Table: Summary Stats by Individual Stormwater Outfall

Non-detect Treatment	Analyte	Land Use Group	Outfall ID	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 1/2 DL[a]											
	Arsenic	Open Space (Forest Park)	OF22C	2	0	100	0.20	0.20	0.20	0.20	ug/L
		Residential	OF49	3	0	100	0.34	0.29	0.26	0.47	ug/L
		Major Transportation	H30	3	0	100	0.50	0.49	0.49	0.53	ug/L
			SJB	4	0	100	0.88	0.86	0.82	0.98	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	1.7	1.7	1.4	1.8	ug/L
			OF19	4	0	100	1.5	1.6	0.77	2.2	ug/L
		Light Industrial	OFM1	4	0	100	0.93	0.94	0.72	1.1	ug/L
			OFM2	4	0	100	1.6	1.5	0.99	2.3	ug/L
		Heavy Industrial	OF16	5	0	100	0.63	0.71	0.34	0.79	ug/L
			OF22	3	0	100	3.3	3.6	2.4	4.0	ug/L
			OF22B	2	0	100	4.9	4.9	4.0	5.8	ug/L
			WR218	2	0	100	1.1	1.1	0.94	1.3	ug/L
			WR67	5	0	100	0.31	0.23	0.13	0.59	ug/L
		Arkema	WR96	4	0	100	17.9	17.5	16.9	19.8	ug/L
		Chevron - Transportation	WR14	5	0	100	0.51	0.54	0.27	0.71	ug/L
		GASCO	WR107	4	0	100	0.76	0.72	0.27	1.3	ug/L
		Gunderson	WR142	1	0	100	0.87	0.87	0.87	0.87	ug/L
			WR145	1	1	0	0.0035	0.0035	0.0035	0.0035	ug/L
			WR147	5	0	100	0.68	0.63	0.38	1.07	ug/L
		OSM	WR22	4	0	100	6.6	6.9	4.2	8.4	ug/L
		Portland Shipyard	WR161	4	0	100	1.5	1.5	1.10	1.8	ug/L
		Schnitzer - Riverside	WR384	4	0	100	2.0	1.9	1.5	2.9	ug/L
		Schnitzer International Slip	WR123	4	0	100	8.2	8.0	2.7	14.3	ug/L
		Sulzer Pump	WR4	4	0	100	0.29	0.27	0.21	0.42	ug/L
	Lead	Open Space (Forest Park)	OF22C	2	0	100	0.42	0.42	0.40	0.44	ug/L
		Residential	OF49	3	0	100	2.8	2.8	1.4	4.3	ug/L
		Major Transportation	H30	3	0	100	8.6	7.1	5.4	13.2	ug/L
			SJB	4	0	100	39.6	30.0	23.2	75.2	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	44.5	39.3	23.2	76.3	ug/L
			OF19	4	0	100	21.8	17.9	10.4	41.0	ug/L
		Light Industrial	OFM1	4	0	100	8.8	4.8	4.2	21.4	ug/L
			OFM2	4	0	100	4.7	3.8	2.9	8.4	ug/L
		Heavy Industrial	OF16	5	0	100	30.4	22.4	13.4	55.4	ug/L
			OF22	3	0	100	16.4	14.7	9.7	24.7	ug/L
			OF22B	2	0	100	148	148	101	195	ug/L
			WR218	2	0	100	12.6	12.6	5.7	19.5	ug/L
			WR67	5	0	100	3.4	1.7	0.62	9.3	ug/L
		Arkema	WR96	4	0	100	12.7	13.5	8.5	15.3	ug/L
		Chevron - Transportation	WR14	5	0	100	7.0	6.7	2.6	11.4	ug/L
		GASCO	WR107	4	0	100	4.9	4.5	2.8	7.8	ug/L
		Gunderson	WR142	1	0	100	1.2	1.2	1.2	1.2	ug/L
			WR145	1	0	100	7.0	7.0	7.0	7.0	ug/L
			WR147	5	0	100	63.3	34.8	14.6	143	ug/L
		OSM	WR22	4	0	100	48.3	49.0	39.1	56.1	ug/L
		Portland Shipyard	WR161	4	0	100	27.8	14.8	11.4	70.0	ug/L
		Schnitzer - Riverside	WR384	4	0	100	377	433	6.2	635	ug/L
		Schnitzer International Slip	WR123	4	0	100	41.7	38.6	17.7	71.8	ug/L
		Sulzer Pump	WR4	4	0	100	6.3	5.1	1.9	13.0	ug/L

Table: Summary Stats by Individual Stormwater Outfall

Non-detect Treatment	Analyte	Land Use Group	Outfall ID	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 1/2 DL[a]											
	Mercury	Open Space (Forest Park)	OF22C	2	2	0	0.015	0.015	0.015	0.015	ug/L
		Residential	OF49	3	3	0	0.015	0.015	0.015	0.015	ug/L
		Major Transportation	H30	3	2	33	0.025	0.030	0.015	0.030	ug/L
			SJB	4	3	25	0.030	0.025	0.010	0.060	ug/L
		Open Space/Heavy Ind.	OF18	4	1	75	0.035	0.040	0.020	0.040	ug/L
			OF19	4	4	0	0.021	0.015	0.010	0.045	ug/L
		Light Industrial	OFM1	4	4	0	0.014	0.015	0.010	0.015	ug/L
			OFM2	4	4	0	0.019	0.015	0.015	0.030	ug/L
		Heavy Industrial	OF16	5	3	40	0.033	0.040	0.015	0.045	ug/L
			OF22	3	2	33	0.032	0.040	0.015	0.040	ug/L
			OF22B	2	0	100	0.55	0.55	0.21	0.89	ug/L
			WR218	2	2	0	0.023	0.023	0.015	0.030	ug/L
			WR67	5	5	0	0.017	0.015	0.015	0.025	ug/L
		Arkema	WR96	4	1	75	0.25	0.23	0.19	0.36	ug/L
		Chevron - Transportation	WR14	5	5	0	0.017	0.015	0.010	0.030	ug/L
		GASCO	WR107	4	4	0	0.015	0.015	0.010	0.020	ug/L
		Gunderson	WR142	1	1	0	0.015	0.015	0.015	0.015	ug/L
			WR145	1	1	0	0.015	0.015	0.015	0.015	ug/L
			WR147	5	4	20	0.040	0.015	0.015	0.085	ug/L
		OSM	WR22	4	1	75	0.084	0.093	0.050	0.100	ug/L
		Portland Shipyard	WR161	4	3	25	0.024	0.023	0.010	0.040	ug/L
		Schnitzer - Riverside	WR384	4	0	100	0.87	0.81	0.080	1.8	ug/L
		Schnitzer International Slip	WR123	4	3	25	0.041	0.035	0.015	0.080	ug/L
		Sulzer Pump	WR4	4	4	0	0.016	0.015	0.010	0.025	ug/L
	2,4-D	Open Space (Forest Park)	OF22C	2	2	0	0.018	0.018	0.017	0.018	ug/L
		Residential	OF49	2	0	100	1.2	1.2	0.34	2.0	ug/L
		Major Transportation	H30	2	1	50	0.21	0.21	0.20	0.22	ug/L
			SJB	4	3	25	0.39	0.20	0.085	1.1	ug/L
		Open Space/Heavy Ind.	OF18	4	2	50	0.067	0.076	0.017	0.097	ug/L
			OF19	4	1	75	0.090	0.076	0.057	0.15	ug/L
		Light Industrial	OFM1	3	1	67	0.106	0.11	0.017	0.19	ug/L
			OFM2	3	0	100	0.46	0.19	0.083	1.1	ug/L
		Heavy Industrial	OF16	3	0	100	0.33	0.28	0.058	0.64	ug/L
			OF22	3	2	33	0.38	0.18	0.018	0.94	ug/L
			OF22B	3	0	100	1.9	0.78	0.76	4.1	ug/L
			WR218	1	0	100	16.0	16.0	16.0	16.0	ug/L
			WR67	2	2	0	0.11	0.11	0.050	0.17	ug/L
		Arkema	WR96	2	2	0	0.19	0.19	0.19	0.19	ug/L
		Chevron - Transportation	WR14	3	3	0	0.13	0.19	0.018	0.19	ug/L
		GASCO	WR107	4	4	0	0.32	0.059	0.018	1.2	ug/L
		Gunderson	WR142	2	2	0	0.13	0.13	0.085	0.18	ug/L
			WR147	2	2	0	0.18	0.18	0.17	0.18	ug/L
		OSM	WR22	4	4	0	0.036	0.018	0.017	0.090	ug/L
		Portland Shipyard	WR161	5	5	0	0.48	0.19	0.018	1.8	ug/L
		Schnitzer - Riverside	WR384	3	0	100	1.01	1.2	0.64	1.2	ug/L
		Schnitzer International Slip	WR123	4	1	75	0.21	0.20	0.13	0.30	ug/L
		Sulzer Pump	WR4	3	1	67	0.076	0.100	0.017	0.11	ug/L
	Total Phthalates	Open Space (Forest Park)	OF22C	2	1	50	0.14	0.14	0.044	0.23	ug/L
		Residential	OF49	2	0	100	2.0	2.0	1.3	2.7	ug/L
		Major Transportation	SJB	4	0	100	13.8	15.5	3.2	21.0	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	6.3	6.4	2.3	10.0	ug/L
		Light Industrial	OFM2	4	0	100	3.1	2.5	1.9	5.5	ug/L
		Arkema	WR96	4	1	75	0.31	0.30	0.035	0.59	ug/L
		Gunderson	WR142	2	0	100	0.66	0.66	0.48	0.84	ug/L
			WR147	3	0	100	3.2	2.3	2.1	5.1	ug/L
		OSM	WR22	4	0	100	1.2	1.1	0.072	2.4	ug/L
		Portland Shipyard	WR161	5	0	100	2.5	1.3	0.34	7.4	ug/L
		Schnitzer International Slip	WR123	3	1	67	2.5	2.4	0.17	4.8	ug/L

Table: Summary Stats by Individual Stormwater Outfall

Non-detect Treatment	Analyte	Land Use Group	Outfall ID	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 0[b]											
	Total PCBs	Open Space (Forest Park)	OF22C	2	1	50	40.4	40.4	0	80.8	pg/L
		Residential	OF49	2	0	100	1180	1180	1140	1220	pg/L
		Major Transportation	H30	1	0	100	17500	17500	17500	17500	pg/L
			SJB	4	0	100	86300	75900	8500	185000	pg/L
		Open Space/Heavy Ind.	OF18	4	0	100	178000	99200	12300	503000	pg/L
			OF19	3	0	100	34600	25000	11100	67700	pg/L
		Light Industrial	OFM1	3	0	100	10110	9040	3490	17800	pg/L
			OFM2	4	0	100	8960	7520	1700	19100	pg/L
		Heavy Industrial	OF16	3	0	100	146000	117000	88500	232000	pg/L
			OF22	4	0	100	24295	23100	9380	41600	pg/L
			OF22B	3	0	100	138000	143000	27800	244000	pg/L
			WR218	2	0	100	34850	34900	17600	52100	pg/L
			WR67	4	0	100	1689	732	344	4950	pg/L
		Arkema	WR96	3	0	100	12250	8340	8210	20200	pg/L
		Chevron - Transportation	WR14	3	0	100	5697	5520	971	10600	pg/L
		GASCO	WR107	4	0	100	2495	2525	510	4420	pg/L
		Gunderson	WR142	2	0	100	1226	1226	852	1600	pg/L
			WR147	3	0	100	658000	428000	237000	1310000	pg/L
		OSM	WR22	4	0	100	278000	272000	243000	325000	pg/L
		Portland Shipyard	WR161	5	0	100	125000	119000	1400	302000	pg/L
		Schnitzer - Riverside	WR384	4	0	100	5125000	4400000	100000	11600000	pg/L
		Schnitzer International Slip	WR123	4	0	100	277000	256000	56700	539000	pg/L
		Sulzer Pump	WR4	3	0	100	8593	4860	4820	16100	pg/L
	Total suspended solids	Open Space (Forest Park)	OF22C	2	0	100	10.0	10.0	10.0	10.0	mg/L
		Residential	OF49	3	0	100	20.7	16.0	8.0	38.0	mg/L
		Major Transportation	H30	3	0	100	46.7	47.0	33.0	60.0	mg/L
			SJB	7	0	100	112	85.0	13.0	248	mg/L
		Open Space/Heavy Ind.	OF18	5	0	100	115	113	17.0	212	mg/L
			OF19	5	0	100	103	81.0	34.0	191	mg/L
		Light Industrial	OFM1	4	0	100	67.0	62.5	46.0	97.0	mg/L
			OFM2	4	0	100	51.3	46.5	31.0	81.0	mg/L
		Heavy Industrial	OF16	5	0	100	89.4	78.0	34.0	171	mg/L
			OF22	4	0	100	176	143	69.0	351	mg/L
			OF22B	3	0	100	220	229	164	266	mg/L
			WR218	2	0	100	52.5	52.5	28.0	77.0	mg/L
			WR67	6	0	100	27.5	18.5	6.0	59.0	mg/L
		Arkema	WR96	5	0	100	12.0	11.0	5.0	20.0	mg/L
		Chevron - Transportation	WR14	5	0	100	38.4	42.0	12.0	51.0	mg/L
		GASCO	WR107	5	0	100	24.0	26.0	10.0	36.0	mg/L
		Gunderson	WR142	2	0	100	11.5	11.5	8.0	15.0	mg/L
			WR145	1	0	100	9.0	9.0	9.0	9.0	mg/L
			WR147	5	0	100	48.2	28.0	15.0	119	mg/L
		OSM	WR22	5	0	100	208	146	128	401	mg/L
		Portland Shipyard	WR161	6	0	100	80.3	39.5	8.0	256	mg/L
		Schnitzer - Riverside	WR384	5	0	100	264	167	6.0	780	mg/L
		Schnitzer International Slip	WR123	6	0	100	231	230	58.0	414	mg/L
		Sulzer Pump	WR4	4	0	100	14.0	13.5	5.0	24.0	mg/L

Table: Summary Stats by Individual Stormwater Outfall

Non-detect Treatment	Analyte	Land Use Group	Outfall ID	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 0[b]											
	Total organic carbon	Open Space (Forest Park)	OF22C	2	0	100	3.1	3.1	2.8	3.3	mg/L
		Residential	OF49	3	0	100	9.4	6.8	5.7	15.6	mg/L
		Major Transportation	H30	3	0	100	19.9	15.7	13.5	30.6	mg/L
			SJB	7	0	100	21.9	22.3	3.9	39.5	mg/L
		Open Space/Heavy Ind.	OF18	5	0	100	10.1	7.8	4.3	19.0	mg/L
			OF19	5	0	100	6.4	5.9	4.1	10.1	mg/L
		Light Industrial	OFM1	4	0	100	11.1	12.1	6.1	14.1	mg/L
			OFM2	4	0	100	6.7	5.8	3.2	11.8	mg/L
		Heavy Industrial	OF16	4	0	100	10.3	8.4	6.7	17.5	mg/L
			OF22	4	0	100	22.8	12.1	7.1	60.0	mg/L
			OF22B	3	0	100	26.0	28.3	14.1	35.6	mg/L
			WR218	2	0	100	14.3	14.3	7.1	21.5	mg/L
			WR67	6	0	100	9.2	8.7	4.3	15.4	mg/L
		Arkema	WR96	5	0	100	11.4	7.5	4.5	30.8	mg/L
		Chevron - Transportation	WR14	5	0	100	10.3	6.4	4.1	23.6	mg/L
		GASCO	WR107	5	0	100	4.2	4.2	2.9	5.6	mg/L
		Gunderson	WR142	2	0	100	17.4	17.4	12.0	22.7	mg/L
			WR145	1	0	100	8.1	8.1	8.1	8.1	mg/L
			WR147	5	0	100	15.2	11.7	5.5	38.6	mg/L
		OSM	WR22	5	0	100	5.8	6.0	3.2	8.2	mg/L
		Portland Shipyard	WR161	6	0	100	50.1	13.8	4.1	144	mg/L
		Schnitzer - Riverside	WR384	5	0	100	27.2	23.7	21.7	42.3	mg/L
		Schnitzer International Slip	WR123	6	0	100	14.6	13.1	8.8	27.5	mg/L
		Sulzer Pump	WR4	4	0	100	6.2	5.2	2.9	11.4	mg/L
	Total of 2,4' and 4,4'-DDD, -DDE, -DDT	Heavy Industrial	OF22B	3	0	100	97.7	71.0	12.0	210	ng/L
		Arkema	WR96	4	0	100	4300	2650	900	11000	ng/L
	Low Molecular Weight PAH	Open Space (Forest Park)	OF22C	2	2	0	0	0	0	0	ug/L
		Residential	OF49	3	1	67	0.013	0.019	0	0.021	ug/L
		Major Transportation	H30	3	0	100	0.099	0.076	0.071	0.15	ug/L
			SJB	4	0	100	1.4	0.67	0.31	4.1	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	0.16	0.072	0.0084	0.47	ug/L
			OF19	3	0	100	0.15	0.15	0.100	0.19	ug/L
		Light Industrial	OFM1	3	0	100	0.33	0.32	0.20	0.46	ug/L
			OFM2	4	0	100	0.086	0.086	0.053	0.12	ug/L
		Heavy Industrial	OF16	3	0	100	0.32	0.31	0.20	0.44	ug/L
			OF22	4	0	100	0.82	0.17	0.040	2.9	ug/L
			OF22B	3	0	100	1.8	0.59	0.51	4.3	ug/L
			WR218	2	0	100	0.12	0.12	0.097	0.14	ug/L
			WR67	4	0	100	0.099	0.085	0.067	0.16	ug/L
		Arkema	WR96	4	0	100	0.013	0.013	0.0067	0.018	ug/L
		Chevron - Transportation	WR14	3	0	100	0.44	0.45	0.19	0.69	ug/L
		GASCO	WR107	4	0	100	0.85	0.46	0.20	2.3	ug/L
		Gunderson	WR142	2	1	50	0.090	0.090	0	0.18	ug/L
			WR145	1	0	100	0.20	0.20	0.20	0.20	ug/L
			WR147	3	0	100	0.17	0.21	0.092	0.22	ug/L
		OSM	WR22	4	0	100	0.30	0.19	0.13	0.68	ug/L
		Portland Shipyard	WR161	5	0	100	0.17	0.21	0.042	0.22	ug/L
		Schnitzer - Riverside	WR384	3	1	67	1.07	1.4	0	1.8	ug/L
		Schnitzer International Slip	WR123	4	0	100	0.25	0.16	0.062	0.64	ug/L
		Sulzer Pump	WR4	3	0	100	0.087	0.087	0.087	0.087	ug/L

Table: Summary Stats by Individual Stormwater Outfall

Non-detect Treatment	Analyte	Land Use Group	Outfall ID	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 0[b]											
	High Molecular Weight PAH	Open Space (Forest Park)	OF22C	2	2	0	0	0	0	0	ug/L
		Residential	OF49	3	0	100	0.075	0.071	0.055	0.100	ug/L
		Major Transportation	H30	3	0	100	0.47	0.32	0.20	0.88	ug/L
			SJB	4	0	100	3.4	2.3	0.85	8.1	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	0.79	0.50	0.075	2.1	ug/L
			OF19	3	0	100	0.81	0.83	0.65	0.95	ug/L
		Light Industrial	OFM1	3	0	100	1.1	1.2	0.89	1.2	ug/L
			OFM2	4	0	100	0.38	0.31	0.21	0.68	ug/L
		Heavy Industrial	OF16	3	0	100	0.58	0.69	0.28	0.78	ug/L
			OF22	4	0	100	0.96	0.88	0.48	1.6	ug/L
			OF22B	3	0	100	0.90	0.64	0.57	1.5	ug/L
			WR218	2	0	100	0.37	0.37	0.35	0.38	ug/L
			WR67	4	0	100	0.53	0.52	0.24	0.86	ug/L
		Arkema	WR96	4	0	100	0.044	0.042	0.038	0.054	ug/L
		Chevron - Transportation	WR14	3	0	100	4.7	4.7	1.2	8.1	ug/L
		GASCO	WR107	4	0	100	4.9	4.1	1.8	9.7	ug/L
		Gunderson	WR142	2	0	100	0.34	0.34	0.17	0.51	ug/L
			WR145	1	0	100	0.70	0.70	0.70	0.70	ug/L
			WR147	3	0	100	0.28	0.36	0.13	0.36	ug/L
		OSM	WR22	4	0	100	0.55	0.54	0.29	0.83	ug/L
		Portland Shipyard	WR161	5	0	100	0.47	0.53	0.076	0.90	ug/L
		Schnitzer - Riverside	WR384	3	0	100	13.5	11.0	0.35	29.0	ug/L
		Schnitzer International Slip	WR123	4	0	100	0.84	0.79	0.37	1.4	ug/L
		Sulzer Pump	WR4	3	0	100	0.16	0.12	0.056	0.31	ug/L
	Total PAHs	Open Space (Forest Park)	OF22C	2	2	0	0	0	0	0	ug/L
		Residential	OF49	3	0	100	0.089	0.092	0.074	0.100	ug/L
		Major Transportation	H30	3	0	100	0.56	0.39	0.28	1.00	ug/L
			SJB	4	0	100	4.8	2.9	1.2	12.0	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	0.96	0.58	0.083	2.6	ug/L
			OF19	3	0	100	0.94	0.98	0.75	1.1	ug/L
		Light Industrial	OFM1	3	0	100	1.4	1.5	1.10	1.6	ug/L
			OFM2	4	0	100	0.46	0.39	0.26	0.80	ug/L
		Heavy Industrial	OF16	3	0	100	0.90	0.98	0.71	1.00	ug/L
			OF22	4	0	100	1.8	1.04	0.52	4.5	ug/L
			OF22B	3	0	100	2.7	2.1	1.2	4.9	ug/L
			WR218	2	0	100	0.48	0.48	0.44	0.52	ug/L
			WR67	4	0	100	0.63	0.60	0.31	1.00	ug/L
		Arkema	WR96	4	0	100	0.056	0.053	0.048	0.072	ug/L
		Chevron - Transportation	WR14	3	0	100	5.1	5.1	1.4	8.8	ug/L
		GASCO	WR107	4	0	100	5.8	4.5	2.0	12.0	ug/L
		Gunderson	WR142	2	0	100	0.43	0.43	0.17	0.69	ug/L
			WR145	1	0	100	0.90	0.90	0.90	0.90	ug/L
			WR147	3	0	100	0.45	0.56	0.22	0.58	ug/L
		OSM	WR22	4	0	100	0.84	0.72	0.42	1.5	ug/L
		Portland Shipyard	WR161	5	0	100	0.64	0.71	0.12	1.1	ug/L
		Schnitzer - Riverside	WR384	3	0	100	14.1	12.0	0.35	30.0	ug/L
		Schnitzer International Slip	WR123	4	0	100	1.1	1.1	0.44	1.7	ug/L
		Sulzer Pump	WR4	3	0	100	0.25	0.21	0.14	0.40	ug/L

Table: Summary Stats by Individual Stormwater Outfall

Non-detect Treatment	Analyte	Land Use Group	Outfall ID	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 0[b]											
	Arsenic	Open Space (Forest Park)	OF22C	2	0	100	0.20	0.20	0.20	0.20	ug/L
		Residential	OF49	3	0	100	0.34	0.29	0.26	0.47	ug/L
		Major Transportation	H30	3	0	100	0.50	0.49	0.49	0.53	ug/L
			SJB	4	0	100	0.88	0.86	0.82	0.98	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	1.7	1.7	1.4	1.8	ug/L
			OF19	4	0	100	1.5	1.6	0.77	2.2	ug/L
		Light Industrial	OFM1	4	0	100	0.93	0.94	0.72	1.1	ug/L
			OFM2	4	0	100	1.6	1.5	0.99	2.3	ug/L
		Heavy Industrial	OF16	5	0	100	0.63	0.71	0.34	0.79	ug/L
			OF22	3	0	100	3.3	3.6	2.4	4.0	ug/L
			OF22B	2	0	100	4.9	4.9	4.0	5.8	ug/L
			WR218	2	0	100	1.1	1.1	0.94	1.3	ug/L
			WR67	5	0	100	0.31	0.23	0.13	0.59	ug/L
		Arkema	WR96	4	0	100	17.9	17.5	16.9	19.8	ug/L
		Chevron - Transportation	WR14	5	0	100	0.51	0.54	0.27	0.71	ug/L
		GASCO	WR107	4	0	100	0.76	0.72	0.27	1.3	ug/L
		Gunderson	WR142	1	0	100	0.87	0.87	0.87	0.87	ug/L
			WR145	1	1	0	0	0	0	0	ug/L
			WR147	5	0	100	0.68	0.63	0.38	1.07	ug/L
		OSM	WR22	4	0	100	6.6	6.9	4.2	8.4	ug/L
		Portland Shipyard	WR161	4	0	100	1.5	1.5	1.10	1.8	ug/L
		Schnitzer - Riverside	WR384	4	0	100	2.0	1.9	1.5	2.9	ug/L
		Schnitzer International Slip	WR123	4	0	100	8.2	8.0	2.7	14.3	ug/L
		Sulzer Pump	WR4	4	0	100	0.29	0.27	0.21	0.42	ug/L
	Lead	Open Space (Forest Park)	OF22C	2	0	100	0.42	0.42	0.40	0.44	ug/L
		Residential	OF49	3	0	100	2.8	2.8	1.4	4.3	ug/L
		Major Transportation	H30	3	0	100	8.6	7.1	5.4	13.2	ug/L
			SJB	4	0	100	39.6	30.0	23.2	75.2	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	44.5	39.3	23.2	76.3	ug/L
			OF19	4	0	100	21.8	17.9	10.4	41.0	ug/L
		Light Industrial	OFM1	4	0	100	8.8	4.8	4.2	21.4	ug/L
			OFM2	4	0	100	4.7	3.8	2.9	8.4	ug/L
		Heavy Industrial	OF16	5	0	100	30.4	22.4	13.4	55.4	ug/L
			OF22	3	0	100	16.4	14.7	9.7	24.7	ug/L
			OF22B	2	0	100	148	148	101	195	ug/L
			WR218	2	0	100	12.6	12.6	5.7	19.5	ug/L
			WR67	5	0	100	3.4	1.7	0.62	9.3	ug/L
		Arkema	WR96	4	0	100	12.7	13.5	8.5	15.3	ug/L
		Chevron - Transportation	WR14	5	0	100	7.0	6.7	2.6	11.4	ug/L
		GASCO	WR107	4	0	100	4.9	4.5	2.8	7.8	ug/L
		Gunderson	WR142	1	0	100	1.2	1.2	1.2	1.2	ug/L
			WR145	1	0	100	7.0	7.0	7.0	7.0	ug/L
			WR147	5	0	100	63.3	34.8	14.6	143	ug/L
		OSM	WR22	4	0	100	48.3	49.0	39.1	56.1	ug/L
		Portland Shipyard	WR161	4	0	100	27.8	14.8	11.4	70.0	ug/L
		Schnitzer - Riverside	WR384	4	0	100	377	433	6.2	635	ug/L
		Schnitzer International Slip	WR123	4	0	100	41.7	38.6	17.7	71.8	ug/L
		Sulzer Pump	WR4	4	0	100	6.3	5.1	1.9	13.0	ug/L

Table: Summary Stats by Individual Stormwater Outfall

Non-detect Treatment	Analyte	Land Use Group	Outfall ID	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 0[b]											
	Mercury	Open Space (Forest Park)	OF22C	2	2	0	0	0	0	0	ug/L
		Residential	OF49	3	3	0	0	0	0	0	ug/L
		Major Transportation	H30	3	2	33	0.010	0	0	0.030	ug/L
			SJB	4	3	25	0.015	0	0	0.060	ug/L
		Open Space/Heavy Ind.	OF18	4	1	75	0.025	0.030	0	0.040	ug/L
			OF19	4	4	0	0	0	0	0	ug/L
		Light Industrial	OFM1	4	4	0	0	0	0	0	ug/L
			OFM2	4	4	0	0	0	0	0	ug/L
		Heavy Industrial	OF16	5	3	40	0.016	0	0	0.040	ug/L
			OF22	3	2	33	0.013	0	0	0.040	ug/L
			OF22B	2	0	100	0.55	0.55	0.21	0.89	ug/L
			WR218	2	2	0	0	0	0	0	ug/L
			WR67	5	5	0	0	0	0	0	ug/L
		Arkema	WR96	4	1	75	0.20	0.22	0	0.36	ug/L
		Chevron - Transportation	WR14	5	5	0	0	0	0	0	ug/L
		GASCO	WR107	4	4	0	0	0	0	0	ug/L
		Gunderson	WR142	1	1	0	0	0	0	0	ug/L
			WR145	1	1	0	0	0	0	0	ug/L
			WR147	5	4	20	0.014	0	0	0.070	ug/L
		OSM	WR22	4	1	75	0.063	0.075	0	0.100	ug/L
		Portland Shipyard	WR161	4	3	25	0.0075	0	0	0.030	ug/L
		Schnitzer - Riverside	WR384	4	0	100	0.87	0.81	0.080	1.8	ug/L
		Schnitzer International Slip	WR123	4	3	25	0.020	0	0	0.080	ug/L
		Sulzer Pump	WR4	4	4	0	0	0	0	0	ug/L
	2,4-D	Open Space (Forest Park)	OF22C	2	2	0	0	0	0	0	ug/L
		Residential	OF49	2	0	100	1.2	1.2	0.34	2.0	ug/L
		Major Transportation	H30	2	1	50	0.11	0.11	0	0.22	ug/L
			SJB	4	3	25	0.28	0	0	1.1	ug/L
		Open Space/Heavy Ind.	OF18	4	2	50	0.041	0.034	0	0.097	ug/L
			OF19	4	1	75	0.072	0.069	0	0.15	ug/L
		Light Industrial	OFM1	3	1	67	0.100	0.11	0	0.19	ug/L
			OFM2	3	0	100	0.46	0.19	0.083	1.1	ug/L
		Heavy Industrial	OF16	3	0	100	0.33	0.28	0.058	0.64	ug/L
			OF22	3	2	33	0.31	0	0	0.94	ug/L
			OF22B	3	0	100	1.9	0.78	0.76	4.1	ug/L
			WR218	1	0	100	16.0	16.0	16.0	16.0	ug/L
			WR67	2	2	0	0	0	0	0	ug/L
		Arkema	WR96	2	2	0	0	0	0	0	ug/L
		Chevron - Transportation	WR14	3	3	0	0	0	0	0	ug/L
		GASCO	WR107	4	4	0	0	0	0	0	ug/L
		Gunderson	WR142	2	2	0	0	0	0	0	ug/L
			WR147	2	2	0	0	0	0	0	ug/L
		OSM	WR22	4	4	0	0	0	0	0	ug/L
		Portland Shipyard	WR161	5	5	0	0	0	0	0	ug/L
		Schnitzer - Riverside	WR384	3	0	100	1.01	1.2	0.64	1.2	ug/L
		Schnitzer International Slip	WR123	4	1	75	0.16	0.18	0	0.30	ug/L
		Sulzer Pump	WR4	3	1	67	0.070	0.100	0	0.11	ug/L
	Total Phthalates	Open Space (Forest Park)	OF22C	2	1	50	0.12	0.12	0	0.23	ug/L
		Residential	OF49	2	0	100	2.0	2.0	1.3	2.7	ug/L
		Major Transportation	SJB	4	0	100	13.8	15.5	3.2	21.0	ug/L
		Open Space/Heavy Ind.	OF18	4	0	100	6.3	6.4	2.3	10.0	ug/L
		Light Industrial	OFM2	4	0	100	3.1	2.5	1.9	5.5	ug/L
		Arkema	WR96	4	1	75	0.28	0.27	0	0.59	ug/L
		Gunderson	WR142	2	0	100	0.66	0.66	0.48	0.84	ug/L
			WR147	3	0	100	3.2	2.3	2.1	5.1	ug/L
		OSM	WR22	4	0	100	1.2	1.1	0.072	2.4	ug/L
		Portland Shipyard	WR161	5	0	100	2.5	1.3	0.34	7.4	ug/L
		Schnitzer International Slip	WR123	3	1	67	2.4	2.4	0	4.8	ug/L

NOTE: For the calculation of summed Totals, individual component ND are set to 0.

[a] When summed Total is ND (all component concentrations are ND), the value is substituted with ½ the DL.

[b] When summed Total is ND (all component concentrations are ND) the value is substituted with 0.

Table: Summary Stats by Land Use Group

Non-detect Treatment	Analyte	Land Use Group	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 1/2 DL[a]										
	Total PCBs	Open Space (Forest Park)	2	1	50	53.5	53.5	26.2	80.8	pg/L
		Residential	2	0	100	1180	1180	1140	1220	pg/L
		Major Transportation	5	0	100	72500	66000	8500	185000	pg/L
		Open Space/Heavy Ind.	7	0	100	117000	67700	11100	503000	pg/L
		Light Industrial	7	0	100	9450	9040	1700	19100	pg/L
		Heavy Industrial	16	0	100	64100	30400	344	244000	pg/L
		Arkema	3	0	100	12300	8340	8210	20200	pg/L
		Chevron - Transportation	3	0	100	5700	5520	971	10600	pg/L
		GASCO	4	0	100	2500	2530	510	4420	pg/L
		Gunderson	5	0	100	395000	237000	852	1310000	pg/L
		OSM	4	0	100	278000	271500	243000	325000	pg/L
		Portland Shipyard	5	0	100	125000	119000	1400	302000	pg/L
		Schnitzer - Riverside	4	0	100	5130000	4400000	100000	11600000	pg/L
		Schnitzer International Slip	4	0	100	277000	255500	56700	539000	pg/L
		Sulzer Pump	3	0	100	8590	4860	4820	16100	pg/L
	Total suspended solids	Open Space (Forest Park)	2	0	100	10.0	10.0	10.0	10.0	mg/L
		Residential	3	0	100	20.7	16.0	8.0	38.0	mg/L
		Major Transportation	10	0	100	92.2	71.0	13.0	248	mg/L
		Open Space/Heavy Ind.	10	0	100	109	104	17.0	212	mg/L
		Light Industrial	8	0	100	59.1	53.0	31.0	97.0	mg/L
		Heavy Industrial	20	0	100	104	73.0	6.0	351	mg/L
		Arkema	5	0	100	12.0	11.0	5.0	20.0	mg/L
		Chevron - Transportation	5	0	100	38.4	42.0	12.0	51.0	mg/L
		GASCO	5	0	100	24.0	26.0	10.0	36.0	mg/L
		Gunderson	8	0	100	34.1	17.0	8.0	119	mg/L
		OSM	5	0	100	208	146	128	401	mg/L
		Portland Shipyard	6	0	100	80.3	39.5	8.0	256	mg/L
		Schnitzer - Riverside	5	0	100	264	167	6.0	780	mg/L
		Schnitzer International Slip	6	0	100	231	230	58.0	414	mg/L
		Sulzer Pump	4	0	100	14.0	13.5	5.0	24.0	mg/L
	Total organic carbon	Open Space (Forest Park)	2	0	100	3.1	3.1	2.8	3.3	mg/L
		Residential	3	0	100	9.4	6.8	5.7	15.6	mg/L
		Major Transportation	10	0	100	21.3	19.8	3.9	39.5	mg/L
		Open Space/Heavy Ind.	10	0	100	8.3	7.0	4.1	19.0	mg/L
		Light Industrial	8	0	100	8.9	9.0	3.2	14.1	mg/L
		Heavy Industrial	19	0	100	15.5	10.6	4.3	60.0	mg/L
		Arkema	5	0	100	11.4	7.5	4.5	30.8	mg/L
		Chevron - Transportation	5	0	100	10.3	6.4	4.1	23.6	mg/L
		GASCO	5	0	100	4.2	4.2	2.9	5.6	mg/L
		Gunderson	8	0	100	14.9	11.9	5.5	38.6	mg/L
		OSM	5	0	100	5.8	6.0	3.2	8.2	mg/L
		Portland Shipyard	6	0	100	50.1	13.8	4.1	144	mg/L
		Schnitzer - Riverside	5	0	100	27.2	23.7	21.7	42.3	mg/L
		Schnitzer International Slip	6	0	100	14.6	13.1	8.8	27.5	mg/L
		Sulzer Pump	4	0	100	6.2	5.2	2.9	11.4	mg/L

Table: Summary Stats by Land Use Group

Non-detect Treatment	Analyte	Land Use Group	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 1/2 DL[a]										
	Total of 2,4' and 4,4'-DDD, -DDE, -DDT	Heavy Industrial	3	0	100	97.7	71.0	12.0	210	ng/L
		Arkema	4	0	100	4300	2650	900	11000	ng/L
	Low Molecular Weight PAH	Open Space (Forest Park)	2	2	0	0.0080	0.0080	0.0075	0.0085	ug/L
		Residential	3	1	67	0.017	0.019	0.0095	0.021	ug/L
		Major Transportation	7	0	100	0.86	0.31	0.071	4.1	ug/L
		Open Space/Heavy Ind.	7	0	100	0.15	0.100	0.0084	0.47	ug/L
		Light Industrial	7	0	100	0.19	0.12	0.053	0.46	ug/L
		Heavy Industrial	16	0	100	0.64	0.18	0.040	4.3	ug/L
		Arkema	4	0	100	0.013	0.013	0.0067	0.018	ug/L
		Chevron - Transportation	3	0	100	0.44	0.45	0.19	0.69	ug/L
		GASCO	4	0	100	0.85	0.46	0.20	2.3	ug/L
		Gunderson	6	1	83	0.15	0.19	0.0025	0.22	ug/L
		OSM	4	0	100	0.30	0.19	0.13	0.68	ug/L
		Portland Shipyard	5	0	100	0.17	0.21	0.042	0.22	ug/L
		Schnitzer - Riverside	3	1	67	1.08	1.4	0.046	1.8	ug/L
		Schnitzer International Slip	4	0	100	0.25	0.16	0.062	0.64	ug/L
		Sulzer Pump	3	0	100	0.087	0.087	0.087	0.087	ug/L
	High Molecular Weight PAH	Open Space (Forest Park)	2	2	0	0.0028	0.0028	0.0027	0.0028	ug/L
		Residential	3	0	100	0.075	0.071	0.055	0.100	ug/L
		Major Transportation	7	0	100	2.1	0.88	0.20	8.1	ug/L
		Open Space/Heavy Ind.	7	0	100	0.80	0.65	0.075	2.1	ug/L
		Light Industrial	7	0	100	0.69	0.68	0.21	1.2	ug/L
		Heavy Industrial	16	0	100	0.70	0.62	0.24	1.6	ug/L
		Arkema	4	0	100	0.044	0.042	0.038	0.054	ug/L
		Chevron - Transportation	3	0	100	4.7	4.7	1.2	8.1	ug/L
		GASCO	4	0	100	4.9	4.1	1.8	9.7	ug/L
		Gunderson	6	0	100	0.37	0.36	0.13	0.70	ug/L
		OSM	4	0	100	0.55	0.54	0.29	0.83	ug/L
		Portland Shipyard	5	0	100	0.47	0.53	0.076	0.90	ug/L
		Schnitzer - Riverside	3	0	100	13.5	11.0	0.35	29.0	ug/L
		Schnitzer International Slip	4	0	100	0.84	0.79	0.37	1.4	ug/L
		Sulzer Pump	3	0	100	0.16	0.12	0.056	0.31	ug/L
	Total PAHs	Open Space (Forest Park)	2	2	0	0.0080	0.0080	0.0075	0.0085	ug/L
		Residential	3	0	100	0.089	0.092	0.074	0.100	ug/L
		Major Transportation	7	0	100	3.0	1.2	0.28	12.0	ug/L
		Open Space/Heavy Ind.	7	0	100	0.95	0.75	0.083	2.6	ug/L
		Light Industrial	7	0	100	0.86	0.80	0.26	1.6	ug/L
		Heavy Industrial	16	0	100	1.3	0.88	0.31	4.9	ug/L
		Arkema	4	0	100	0.056	0.053	0.048	0.072	ug/L
		Chevron - Transportation	3	0	100	5.1	5.1	1.4	8.8	ug/L
		GASCO	4	0	100	5.8	4.5	2.0	12.0	ug/L
		Gunderson	6	0	100	0.52	0.57	0.17	0.90	ug/L
		OSM	4	0	100	0.84	0.72	0.42	1.5	ug/L
		Portland Shipyard	5	0	100	0.64	0.71	0.12	1.1	ug/L
		Schnitzer - Riverside	3	0	100	14.1	12.0	0.35	30.0	ug/L
		Schnitzer International Slip	4	0	100	1.10	1.1	0.44	1.7	ug/L
		Sulzer Pump	3	0	100	0.25	0.21	0.14	0.40	ug/L

Table: Summary Stats by Land Use Group

Non-detect Treatment	Analyte	Land Use Group	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 1/2 DL[a]										
	Arsenic	Open Space (Forest Park)	2	0	100	0.20	0.20	0.20	0.20	ug/L
		Residential	3	0	100	0.34	0.29	0.26	0.47	ug/L
		Major Transportation	7	0	100	0.72	0.82	0.49	0.98	ug/L
		Open Space/Heavy Ind.	8	0	100	1.6	1.7	0.77	2.2	ug/L
		Light Industrial	8	0	100	1.3	1.06	0.72	2.3	ug/L
		Heavy Industrial	17	0	100	1.6	0.78	0.13	5.8	ug/L
		Arkema	4	0	100	17.9	17.5	16.9	19.8	ug/L
		Chevron - Transportation	5	0	100	0.51	0.54	0.27	0.71	ug/L
		GASCO	4	0	100	0.76	0.72	0.27	1.3	ug/L
		Gunderson	7	1	86	0.61	0.63	0.0035	1.07	ug/L
		OSM	4	0	100	6.6	6.9	4.2	8.4	ug/L
		Portland Shipyard	4	0	100	1.5	1.5	1.10	1.8	ug/L
		Schnitzer - Riverside	4	0	100	2.0	1.9	1.5	2.9	ug/L
		Schnitzer International Slip	4	0	100	8.2	8.0	2.7	14.3	ug/L
		Sulzer Pump	4	0	100	0.29	0.27	0.21	0.42	ug/L
	Lead	Open Space (Forest Park)	2	0	100	0.42	0.42	0.40	0.44	ug/L
		Residential	3	0	100	2.8	2.8	1.4	4.3	ug/L
		Major Transportation	7	0	100	26.3	23.2	5.4	75.2	ug/L
		Open Space/Heavy Ind.	8	0	100	33.2	24.2	10.4	76.3	ug/L
		Light Industrial	8	0	100	6.7	4.2	2.9	21.4	ug/L
		Heavy Industrial	17	0	100	31.7	14.7	0.62	195	ug/L
		Arkema	4	0	100	12.7	13.5	8.5	15.3	ug/L
		Chevron - Transportation	5	0	100	7.0	6.7	2.6	11.4	ug/L
		GASCO	4	0	100	4.9	4.5	2.8	7.8	ug/L
		Gunderson	7	0	100	46.4	25.5	1.2	143	ug/L
		OSM	4	0	100	48.3	49.0	39.1	56.1	ug/L
		Portland Shipyard	4	0	100	27.8	14.8	11.4	70.0	ug/L
		Schnitzer - Riverside	4	0	100	377	433	6.2	635	ug/L
		Schnitzer International Slip	4	0	100	41.7	38.6	17.7	71.8	ug/L
		Sulzer Pump	4	0	100	6.3	5.1	1.9	13.0	ug/L
	Mercury	Open Space (Forest Park)	2	2	0	0.015	0.015	0.015	0.015	ug/L
		Residential	3	3	0	0.015	0.015	0.015	0.015	ug/L
		Major Transportation	7	5	29	0.028	0.030	0.010	0.060	ug/L
		Open Space/Heavy Ind.	8	5	38	0.028	0.030	0.010	0.045	ug/L
		Light Industrial	8	8	0	0.016	0.015	0.010	0.030	ug/L
		Heavy Industrial	17	12	29	0.088	0.025	0.015	0.89	ug/L
		Arkema	4	1	75	0.25	0.23	0.19	0.36	ug/L
		Chevron - Transportation	5	5	0	0.017	0.015	0.010	0.030	ug/L
		GASCO	4	4	0	0.015	0.015	0.010	0.020	ug/L
		Gunderson	7	6	14	0.033	0.015	0.015	0.085	ug/L
		OSM	4	1	75	0.084	0.093	0.050	0.100	ug/L
		Portland Shipyard	4	3	25	0.024	0.023	0.010	0.040	ug/L
		Schnitzer - Riverside	4	0	100	0.87	0.81	0.080	1.8	ug/L
		Schnitzer International Slip	4	3	25	0.041	0.035	0.015	0.080	ug/L
		Sulzer Pump	4	4	0	0.016	0.015	0.010	0.025	ug/L

Table: Summary Stats by Land Use Group

Non-detect Treatment	Analyte	Land Use Group	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 1/2 DL[a]										
	2,4-D	Open Space (Forest Park)	2	2	0	0.018	0.018	0.017	0.018	ug/L
		Residential	2	0	100	1.2	1.2	0.34	2.0	ug/L
		Major Transportation	6	4	33	0.33	0.20	0.085	1.1	ug/L
		Open Space/Heavy Ind.	8	3	63	0.078	0.076	0.017	0.15	ug/L
		Light Industrial	6	1	83	0.28	0.15	0.017	1.1	ug/L
		Heavy Industrial	12	4	67	2.0	0.46	0.018	16.0	ug/L
		Arkema	2	2	0	0.19	0.19	0.19	0.19	ug/L
		Chevron - Transportation	3	3	0	0.13	0.19	0.018	0.19	ug/L
		GASCO	4	4	0	0.32	0.059	0.018	1.2	ug/L
		Gunderson	4	4	0	0.15	0.18	0.085	0.18	ug/L
		OSM	4	4	0	0.036	0.018	0.017	0.090	ug/L
		Portland Shipyard	5	5	0	0.48	0.19	0.018	1.8	ug/L
		Schnitzer - Riverside	3	0	100	1.01	1.2	0.64	1.2	ug/L
		Schnitzer International Slip	4	1	75	0.21	0.20	0.13	0.30	ug/L
		Sulzer Pump	3	1	67	0.076	0.100	0.017	0.11	ug/L
	Total Phthalates	Open Space (Forest Park)	2	1	50	0.14	0.14	0.044	0.23	ug/L
		Residential	2	0	100	2.0	2.0	1.3	2.7	ug/L
		Major Transportation	4	0	100	13.8	15.5	3.2	21.0	ug/L
		Open Space/Heavy Ind.	4	0	100	6.3	6.4	2.3	10.0	ug/L
		Light Industrial	4	0	100	3.1	2.5	1.9	5.5	ug/L
		Arkema	4	1	75	0.31	0.30	0.035	0.59	ug/L
		Gunderson	5	0	100	2.2	2.1	0.48	5.1	ug/L
		OSM	4	0	100	1.2	1.1	0.072	2.4	ug/L
		Portland Shipyard	5	0	100	2.5	1.3	0.34	7.4	ug/L
		Schnitzer International Slip	3	1	67	2.5	2.4	0.17	4.8	ug/L

Table: Summary Stats by Land Use Group

Non-detect Treatment	Analyte	Land Use Group	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 0[p]										
	Total PCBs	Open Space (Forest Park)	2	1	50	40.4	40.4	0	80.8	pg/L
		Residential	2	0	100	1180	1180	1140	1220	pg/L
		Major Transportation	5	0	100	72500	66000	8500	185000	pg/L
		Open Space/Heavy Ind.	7	0	100	117000	67700	11100	503000	pg/L
		Light Industrial	7	0	100	9450	9040	1700	19100	pg/L
		Heavy Industrial	16	0	100	64100	30400	344	244000	pg/L
		Arkema	3	0	100	12300	8340	8210	20200	pg/L
		Chevron - Transportation	3	0	100	5700	5520	971	10600	pg/L
		GASCO	4	0	100	2500	2530	510	4420	pg/L
		Gunderson	5	0	100	395000	237000	852	1310000	pg/L
		OSM	4	0	100	278000	271500	243000	325000	pg/L
		Portland Shipyard	5	0	100	125000	119000	1400	302000	pg/L
		Schnitzer - Riverside	4	0	100	5130000	4400000	100000	11600000	pg/L
		Schnitzer International Slip	4	0	100	277000	255500	56700	539000	pg/L
		Sulzer Pump	3	0	100	8590	4860	4820	16100	pg/L
	Total suspended solids	Open Space (Forest Park)	2	0	100	10.0	10.0	10.0	10.0	mg/L
		Residential	3	0	100	20.7	16.0	8.0	38.0	mg/L
		Major Transportation	10	0	100	92.2	71.0	13.0	248	mg/L
		Open Space/Heavy Ind.	10	0	100	109	104	17.0	212	mg/L
		Light Industrial	8	0	100	59.1	53.0	31.0	97.0	mg/L
		Heavy Industrial	20	0	100	104	73.0	6.0	351	mg/L
		Arkema	5	0	100	12.0	11.0	5.0	20.0	mg/L
		Chevron - Transportation	5	0	100	38.4	42.0	12.0	51.0	mg/L
		GASCO	5	0	100	24.0	26.0	10.0	36.0	mg/L
		Gunderson	8	0	100	34.1	17.0	8.0	119	mg/L
		OSM	5	0	100	208	146	128	401	mg/L
		Portland Shipyard	6	0	100	80.3	39.5	8.0	256	mg/L
		Schnitzer - Riverside	5	0	100	264	167	6.0	780	mg/L
		Schnitzer International Slip	6	0	100	231	230	58.0	414	mg/L
		Sulzer Pump	4	0	100	14.0	13.5	5.0	24.0	mg/L
	Total organic carbon	Open Space (Forest Park)	2	0	100	3.1	3.1	2.8	3.3	mg/L
		Residential	3	0	100	9.4	6.8	5.7	15.6	mg/L
		Major Transportation	10	0	100	21.3	19.8	3.9	39.5	mg/L
		Open Space/Heavy Ind.	10	0	100	8.3	7.0	4.1	19.0	mg/L
		Light Industrial	8	0	100	8.9	9.0	3.2	14.1	mg/L
		Heavy Industrial	19	0	100	15.5	10.6	4.3	60.0	mg/L
		Arkema	5	0	100	11.4	7.5	4.5	30.8	mg/L
		Chevron - Transportation	5	0	100	10.3	6.4	4.1	23.6	mg/L
		GASCO	5	0	100	4.2	4.2	2.9	5.6	mg/L
		Gunderson	8	0	100	14.9	11.9	5.5	38.6	mg/L
		OSM	5	0	100	5.8	6.0	3.2	8.2	mg/L
		Portland Shipyard	6	0	100	50.1	13.8	4.1	144	mg/L
		Schnitzer - Riverside	5	0	100	27.2	23.7	21.7	42.3	mg/L
		Schnitzer International Slip	6	0	100	14.6	13.1	8.8	27.5	mg/L
		Sulzer Pump	4	0	100	6.2	5.2	2.9	11.4	mg/L

Table: Summary Stats by Land Use Group

Non-detect Treatment	Analyte	Land Use Group	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 0[p]										
	Total of 2,4' and 4,4'-DDD, -DDE, -DDT	Heavy Industrial	3	0	100	97.7	71.0	12.0	210	ng/L
		Arkema	4	0	100	4300	2650	900	11000	ng/L
	Low Molecular Weight PAH	Open Space (Forest Park)	2	2	0	0	0	0	0	ug/L
		Residential	3	1	67	0.013	0.019	0	0.021	ug/L
		Major Transportation	7	0	100	0.86	0.31	0.071	4.1	ug/L
		Open Space/Heavy Ind.	7	0	100	0.15	0.100	0.0084	0.47	ug/L
		Light Industrial	7	0	100	0.19	0.12	0.053	0.46	ug/L
		Heavy Industrial	16	0	100	0.64	0.18	0.040	4.3	ug/L
		Arkema	4	0	100	0.013	0.013	0.0067	0.018	ug/L
		Chevron - Transportation	3	0	100	0.44	0.45	0.19	0.69	ug/L
		GASCO	4	0	100	0.85	0.46	0.20	2.3	ug/L
		Gunderson	6	1	83	0.15	0.19	0	0.22	ug/L
		OSM	4	0	100	0.30	0.19	0.13	0.68	ug/L
		Portland Shipyard	5	0	100	0.17	0.21	0.042	0.22	ug/L
		Schnitzer - Riverside	3	1	67	1.07	1.4	0	1.8	ug/L
		Schnitzer International Slip	4	0	100	0.25	0.16	0.062	0.64	ug/L
		Sulzer Pump	3	0	100	0.087	0.087	0.087	0.087	ug/L
	High Molecular Weight PAH	Open Space (Forest Park)	2	2	0	0	0	0	0	ug/L
		Residential	3	0	100	0.075	0.071	0.055	0.100	ug/L
		Major Transportation	7	0	100	2.1	0.88	0.20	8.1	ug/L
		Open Space/Heavy Ind.	7	0	100	0.80	0.65	0.075	2.1	ug/L
		Light Industrial	7	0	100	0.69	0.68	0.21	1.2	ug/L
		Heavy Industrial	16	0	100	0.70	0.62	0.24	1.6	ug/L
		Arkema	4	0	100	0.044	0.042	0.038	0.054	ug/L
		Chevron - Transportation	3	0	100	4.7	4.7	1.2	8.1	ug/L
		GASCO	4	0	100	4.9	4.1	1.8	9.7	ug/L
		Gunderson	6	0	100	0.37	0.36	0.13	0.70	ug/L
		OSM	4	0	100	0.55	0.54	0.29	0.83	ug/L
		Portland Shipyard	5	0	100	0.47	0.53	0.076	0.90	ug/L
		Schnitzer - Riverside	3	0	100	13.5	11.0	0.35	29.0	ug/L
		Schnitzer International Slip	4	0	100	0.84	0.79	0.37	1.4	ug/L
		Sulzer Pump	3	0	100	0.16	0.12	0.056	0.31	ug/L
	Total PAHs	Open Space (Forest Park)	2	2	0	0	0	0	0	ug/L
		Residential	3	0	100	0.089	0.092	0.074	0.100	ug/L
		Major Transportation	7	0	100	3.0	1.2	0.28	12.0	ug/L
		Open Space/Heavy Ind.	7	0	100	0.95	0.75	0.083	2.6	ug/L
		Light Industrial	7	0	100	0.86	0.80	0.26	1.6	ug/L
		Heavy Industrial	16	0	100	1.3	0.88	0.31	4.9	ug/L
		Arkema	4	0	100	0.056	0.053	0.048	0.072	ug/L
		Chevron - Transportation	3	0	100	5.1	5.1	1.4	8.8	ug/L
		GASCO	4	0	100	5.8	4.5	2.0	12.0	ug/L
		Gunderson	6	0	100	0.52	0.57	0.17	0.90	ug/L
		OSM	4	0	100	0.84	0.72	0.42	1.5	ug/L
		Portland Shipyard	5	0	100	0.64	0.71	0.12	1.1	ug/L
		Schnitzer - Riverside	3	0	100	14.1	12.0	0.35	30.0	ug/L
		Schnitzer International Slip	4	0	100	1.10	1.1	0.44	1.7	ug/L
		Sulzer Pump	3	0	100	0.25	0.21	0.14	0.40	ug/L

Table: Summary Stats by Land Use Group

Non-detect Treatment	Analyte	Land Use Group	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 0[p]										
	Arsenic	Open Space (Forest Park)	2	0	100	0.20	0.20	0.20	0.20	ug/L
		Residential	3	0	100	0.34	0.29	0.26	0.47	ug/L
		Major Transportation	7	0	100	0.72	0.82	0.49	0.98	ug/L
		Open Space/Heavy Ind.	8	0	100	1.6	1.7	0.77	2.2	ug/L
		Light Industrial	8	0	100	1.3	1.06	0.72	2.3	ug/L
		Heavy Industrial	17	0	100	1.6	0.78	0.13	5.8	ug/L
		Arkema	4	0	100	17.9	17.5	16.9	19.8	ug/L
		Chevron - Transportation	5	0	100	0.51	0.54	0.27	0.71	ug/L
		GASCO	4	0	100	0.76	0.72	0.27	1.3	ug/L
		Gunderson	7	1	86	0.61	0.63	0	1.07	ug/L
		OSM	4	0	100	6.6	6.9	4.2	8.4	ug/L
		Portland Shipyard	4	0	100	1.5	1.5	1.10	1.8	ug/L
		Schnitzer - Riverside	4	0	100	2.0	1.9	1.5	2.9	ug/L
		Schnitzer International Slip	4	0	100	8.2	8.0	2.7	14.3	ug/L
		Sulzer Pump	4	0	100	0.29	0.27	0.21	0.42	ug/L
	Lead	Open Space (Forest Park)	2	0	100	0.42	0.42	0.40	0.44	ug/L
		Residential	3	0	100	2.8	2.8	1.4	4.3	ug/L
		Major Transportation	7	0	100	26.3	23.2	5.4	75.2	ug/L
		Open Space/Heavy Ind.	8	0	100	33.2	24.2	10.4	76.3	ug/L
		Light Industrial	8	0	100	6.7	4.2	2.9	21.4	ug/L
		Heavy Industrial	17	0	100	31.7	14.7	0.62	195	ug/L
		Arkema	4	0	100	12.7	13.5	8.5	15.3	ug/L
		Chevron - Transportation	5	0	100	7.0	6.7	2.6	11.4	ug/L
		GASCO	4	0	100	4.9	4.5	2.8	7.8	ug/L
		Gunderson	7	0	100	46.4	25.5	1.2	143	ug/L
		OSM	4	0	100	48.3	49.0	39.1	56.1	ug/L
		Portland Shipyard	4	0	100	27.8	14.8	11.4	70.0	ug/L
		Schnitzer - Riverside	4	0	100	377	433	6.2	635	ug/L
		Schnitzer International Slip	4	0	100	41.7	38.6	17.7	71.8	ug/L
		Sulzer Pump	4	0	100	6.3	5.1	1.9	13.0	ug/L
	Mercury	Open Space (Forest Park)	2	2	0	0	0	0	0	ug/L
		Residential	3	3	0	0	0	0	0	ug/L
		Major Transportation	7	5	29	0.013	0	0	0.060	ug/L
		Open Space/Heavy Ind.	8	5	38	0.013	0	0	0.040	ug/L
		Light Industrial	8	8	0	0	0	0	0	ug/L
		Heavy Industrial	17	12	29	0.072	0	0	0.89	ug/L
		Arkema	4	1	75	0.20	0.22	0	0.36	ug/L
		Chevron - Transportation	5	5	0	0	0	0	0	ug/L
		GASCO	4	4	0	0	0	0	0	ug/L
		Gunderson	7	6	14	0.0100	0	0	0.070	ug/L
		OSM	4	1	75	0.063	0.075	0	0.100	ug/L
		Portland Shipyard	4	3	25	0.0075	0	0	0.030	ug/L
		Schnitzer - Riverside	4	0	100	0.87	0.81	0.080	1.8	ug/L
		Schnitzer International Slip	4	3	25	0.020	0	0	0.080	ug/L
		Sulzer Pump	4	4	0	0	0	0	0	ug/L

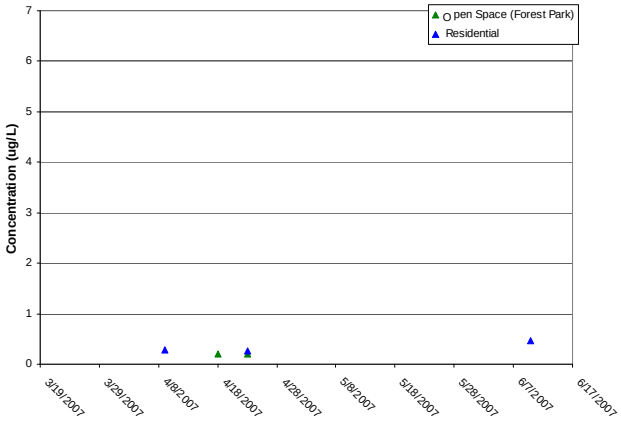
Table: Summary Stats by Land Use Group

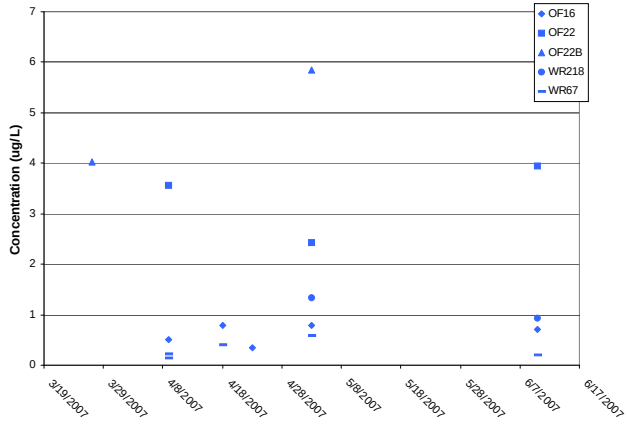
Non-detect Treatment	Analyte	Land Use Group	Number of Samples	Number of Non-Detects	Detection Frequency (%)	Mean	Median	Minimum	Maximum	units
Substitution of ND at 0[b]										
	2,4-D	Open Space (Forest Park)	2	2	0	0	0	0	0	ug/L
		Residential	2	0	100	1.2	1.2	0.34	2.0	ug/L
		Major Transportation	6	4	33	0.22	0	0	1.1	ug/L
		Open Space/Heavy Ind.	8	3	63	0.057	0.062	0	0.15	ug/L
		Light Industrial	6	1	83	0.28	0.15	0	1.1	ug/L
		Heavy Industrial	12	4	67	2.0	0.46	0	16.0	ug/L
		Arkema	2	2	0	0	0	0	0	ug/L
		Chevron - Transportation	3	3	0	0	0	0	0	ug/L
		GASCO	4	4	0	0	0	0	0	ug/L
		Gunderson	4	4	0	0	0	0	0	ug/L
		OSM	4	4	0	0	0	0	0	ug/L
		Portland Shipyard	5	5	0	0	0	0	0	ug/L
		Schnitzer - Riverside	3	0	100	1.01	1.2	0.64	1.2	ug/L
		Schnitzer International Slip	4	1	75	0.16	0.18	0	0.30	ug/L
		Sulzer Pump	3	1	67	0.070	0.100	0	0.11	ug/L
	Total Phthalates	Open Space (Forest Park)	2	1	50	0.12	0.12	0	0.23	ug/L
		Residential	2	0	100	2.0	2.0	1.3	2.7	ug/L
		Major Transportation	4	0	100	13.8	15.5	3.2	21.0	ug/L
		Open Space/Heavy Ind.	4	0	100	6.3	6.4	2.3	10.0	ug/L
		Light Industrial	4	0	100	3.1	2.5	1.9	5.5	ug/L
		Arkema	4	1	75	0.28	0.27	0	0.59	ug/L
		Gunderson	5	0	100	2.2	2.1	0.48	5.1	ug/L
		OSM	4	0	100	1.2	1.1	0.072	2.4	ug/L
		Portland Shipyard	5	0	100	2.5	1.3	0.34	7.4	ug/L
		Schnitzer International Slip	3	1	67	2.4	2.4	0	4.8	ug/L

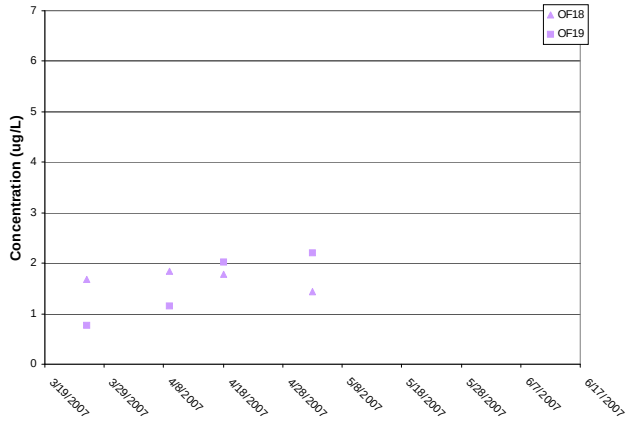
NOTE: For the calculation of summed Totals, individual component ND are set to 0.

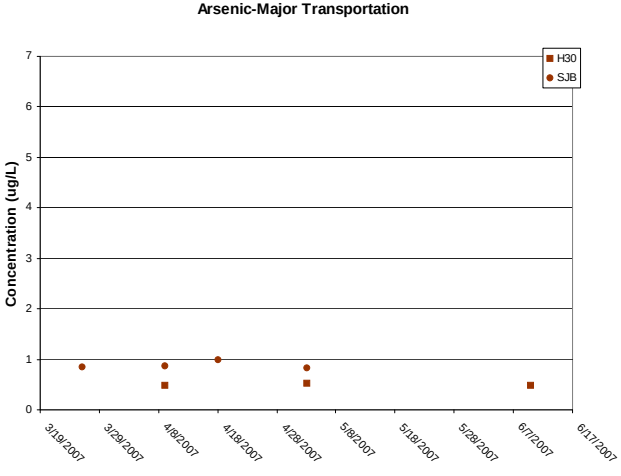
[a] When summed Total is ND (all component concentrations are ND), the value is substituted with ½ the DL.

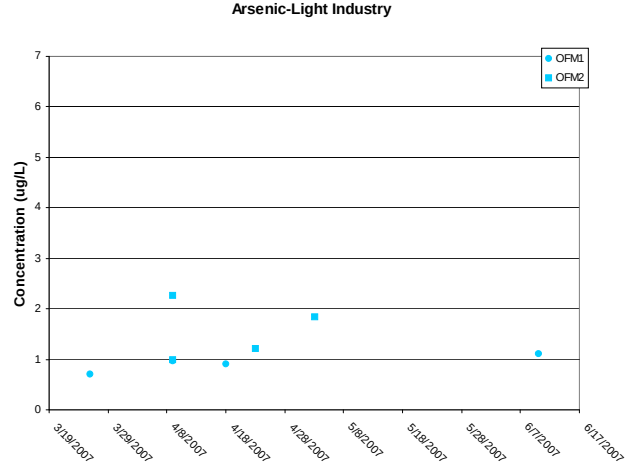
[b] When summed Total is ND (all component concentrations are ND) the value is substituted with 0.

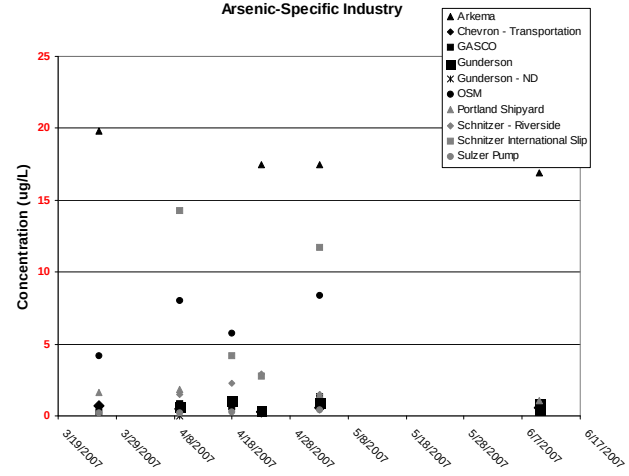






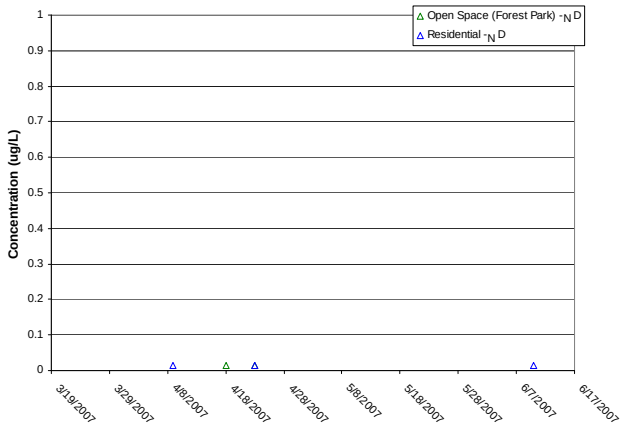




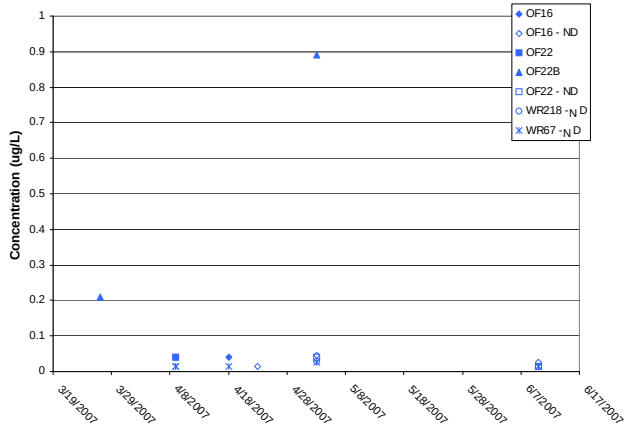


Note: Land Use grouping is based on Stormwater FSP.
Note: Non-detects (hollow symbols) substituted at ½ the detection limit.

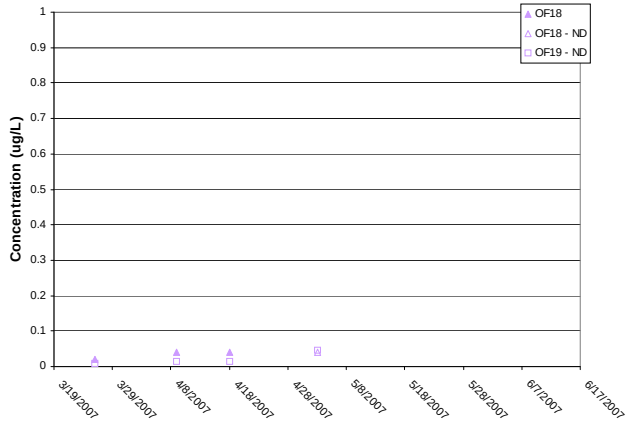
Mercury-Open Space and Residential



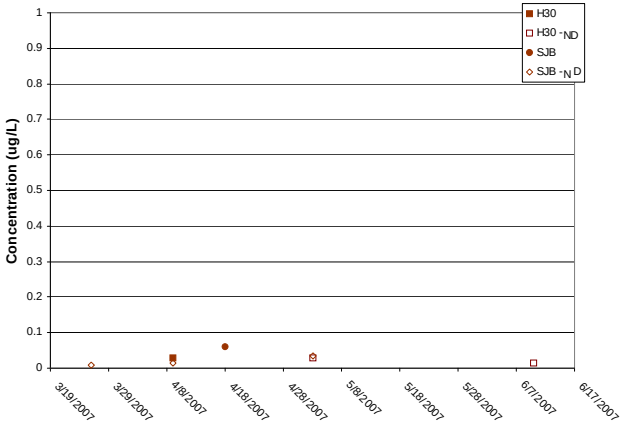
Mercury-Heavy Industry



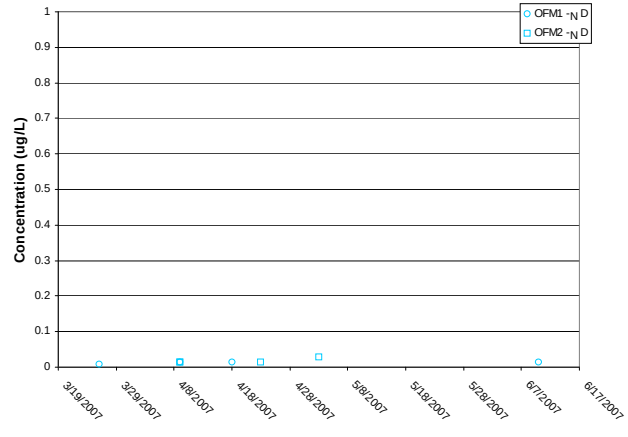
Mercury-Open Space/Heavy Industry



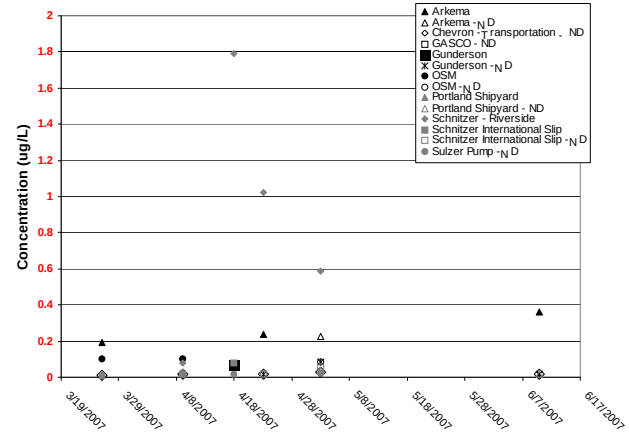
Mercury-Major Transportation



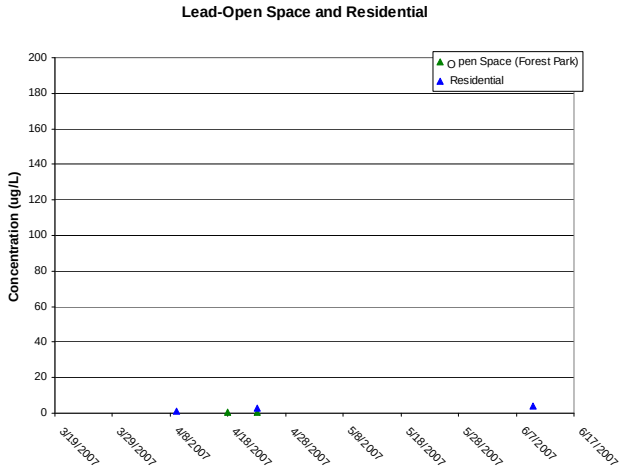
Mercury-Light Industry

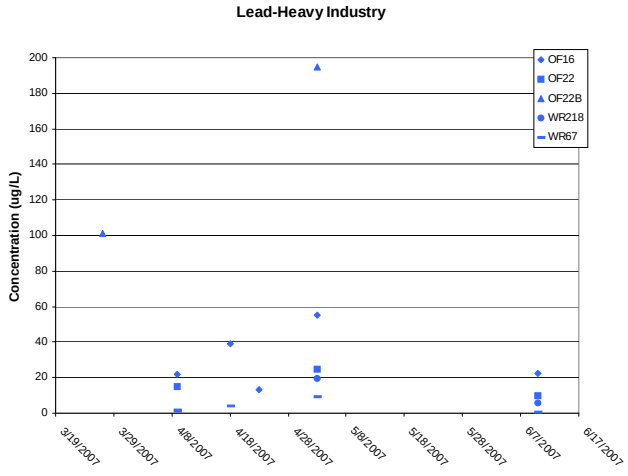


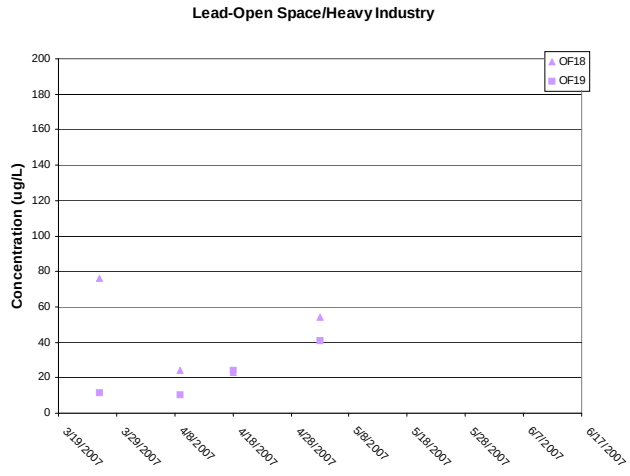
Mercury-Specific Industry

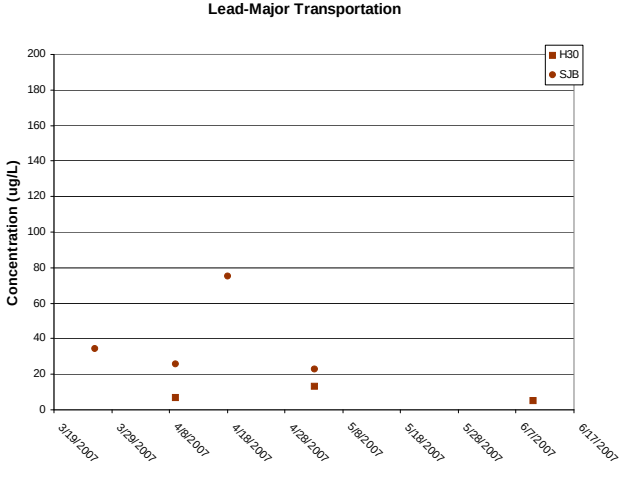


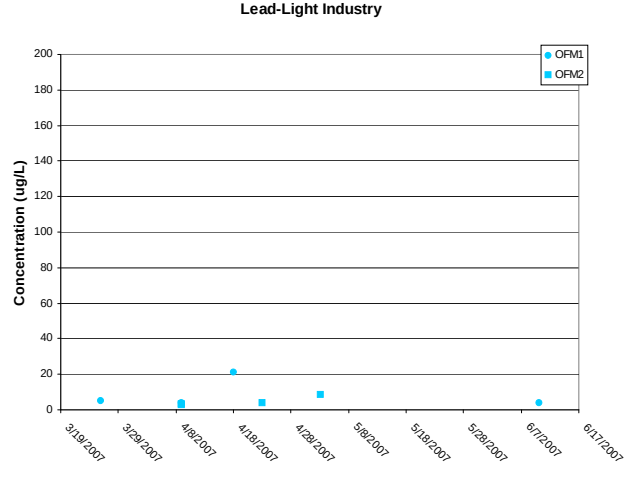
Note: L and Use grouping is based on Stormwater FSP.
Note: No n-detects (hollow symbols) substituted at ½ the detection limit.

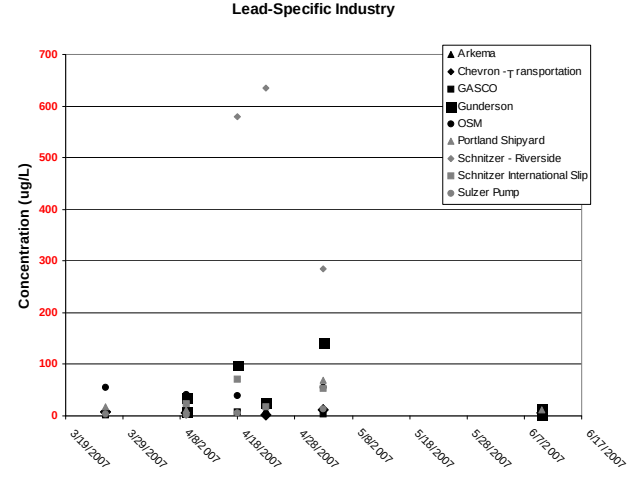




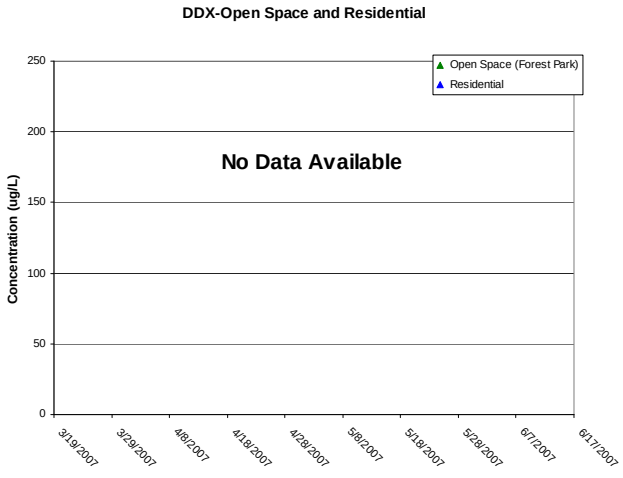


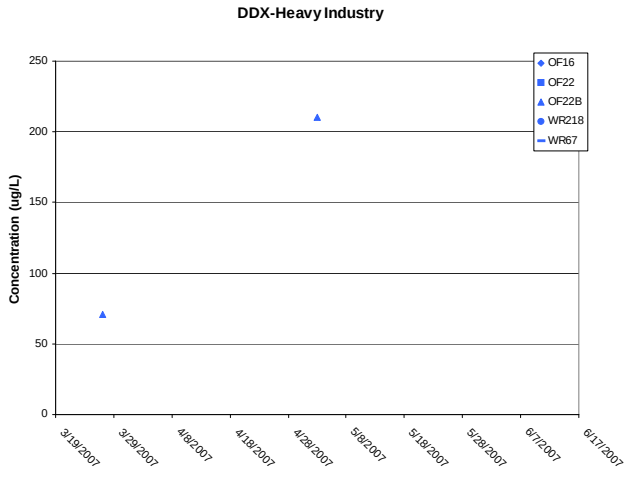


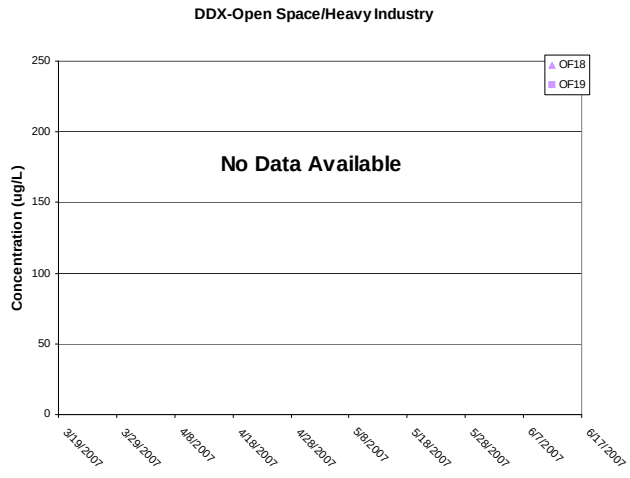


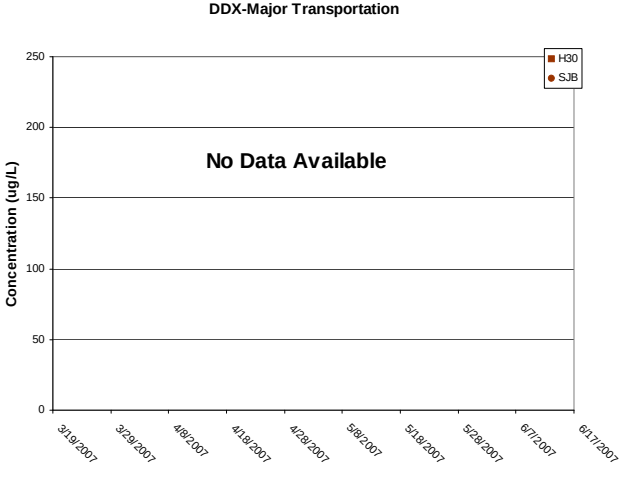


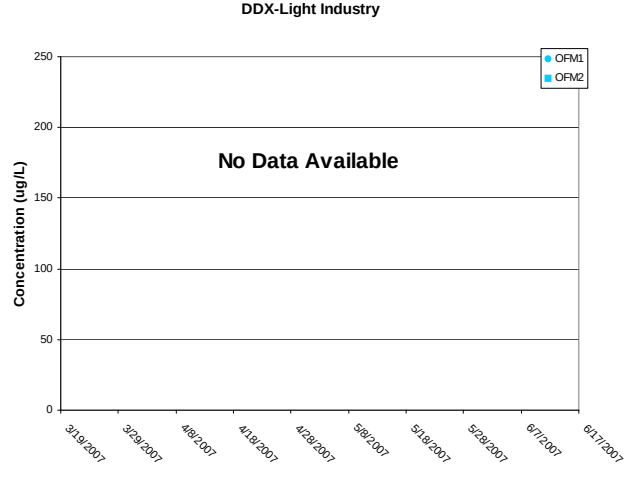
Note: Land Use grouping is based on Stormwater FSP.
Note: Non-detects (hollow symbols) substituted at ½ the detection limit.

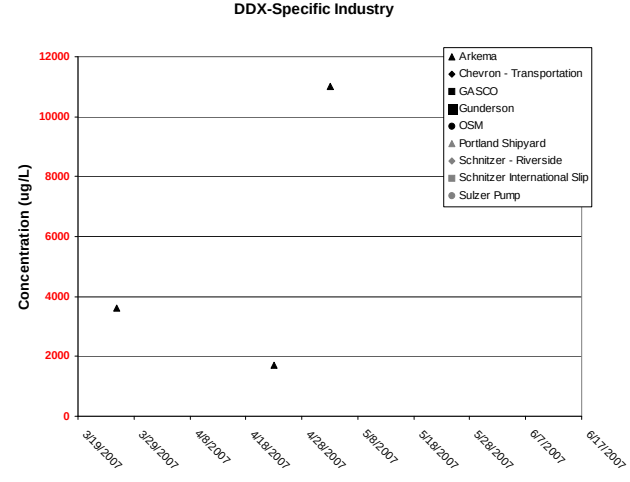




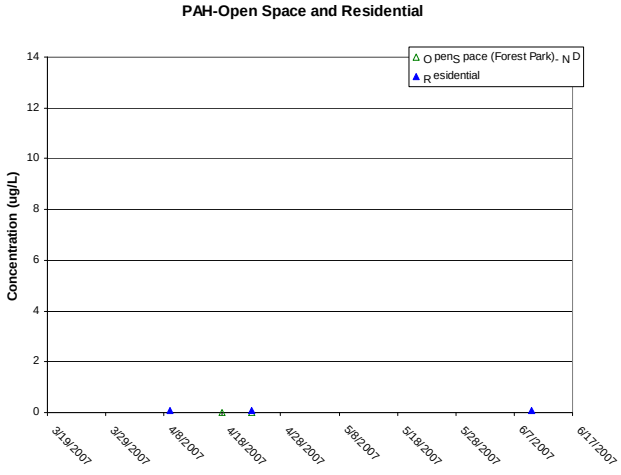


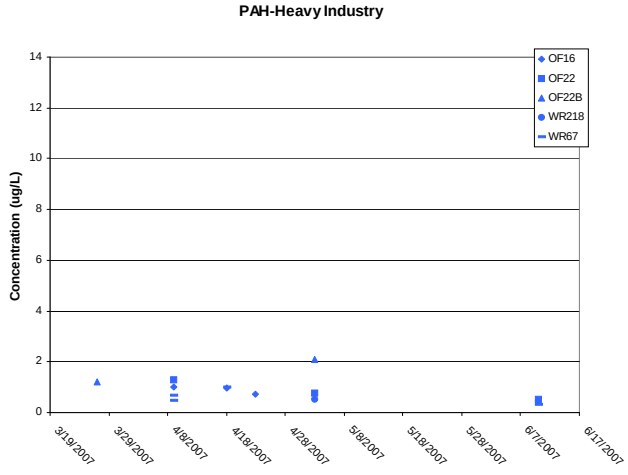


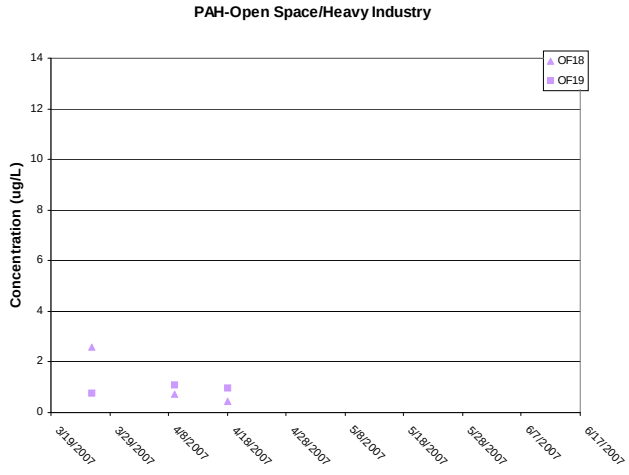


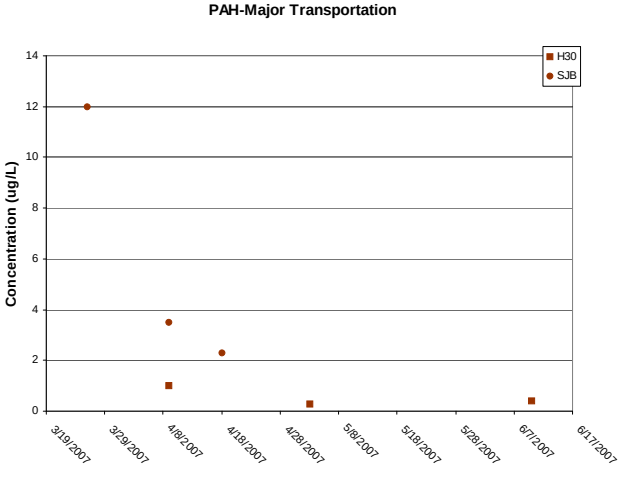


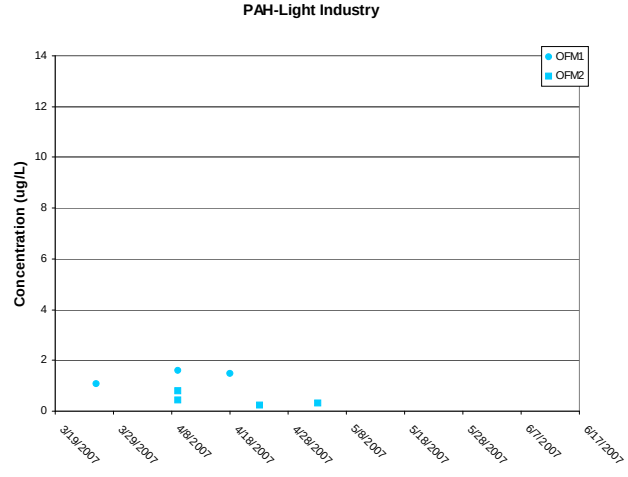
Note: Land Use grouping is based on Stormwater FSP.
Note: For the calculation of summed Totals, individual component ND are set to 0.
Note: When summed Total is ND (all component concentrations are ND), presented as hollow symbols, the value is substituted with ½ the DL.

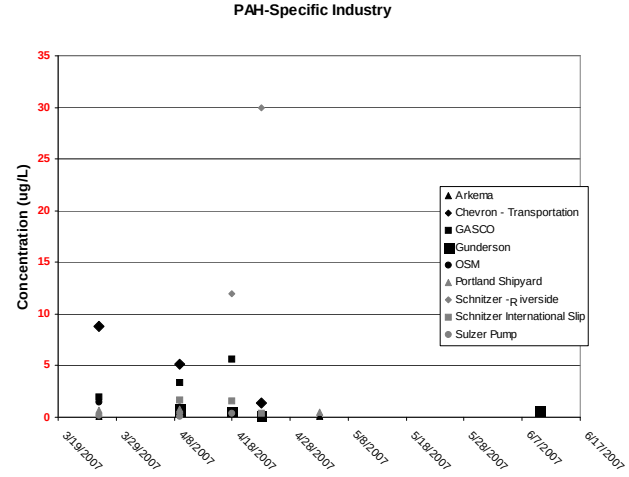




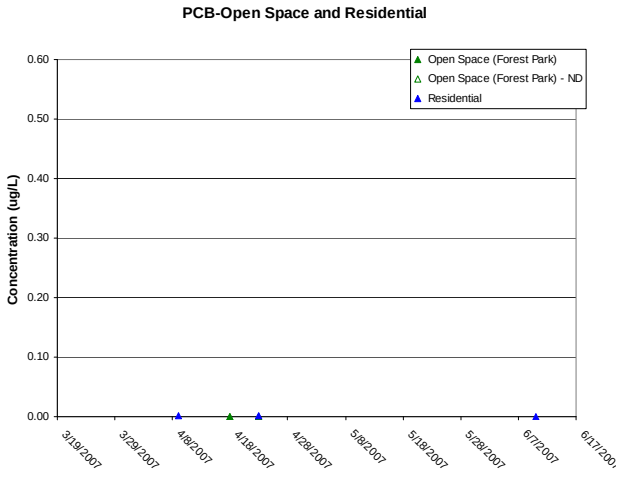


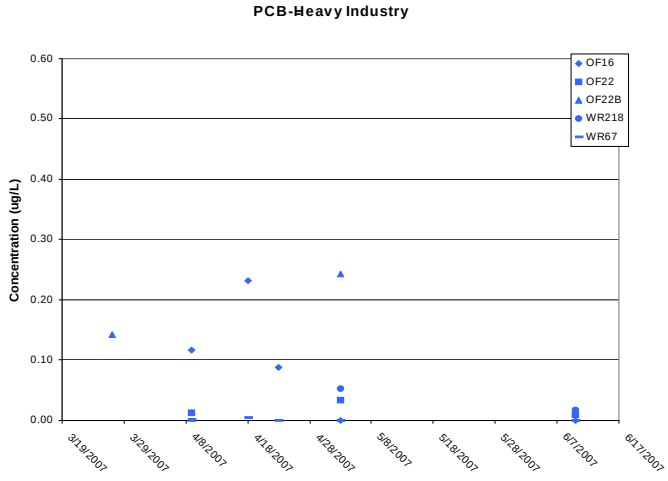


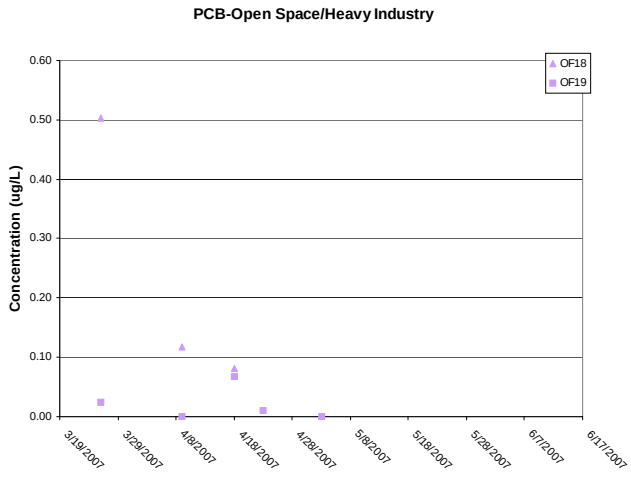


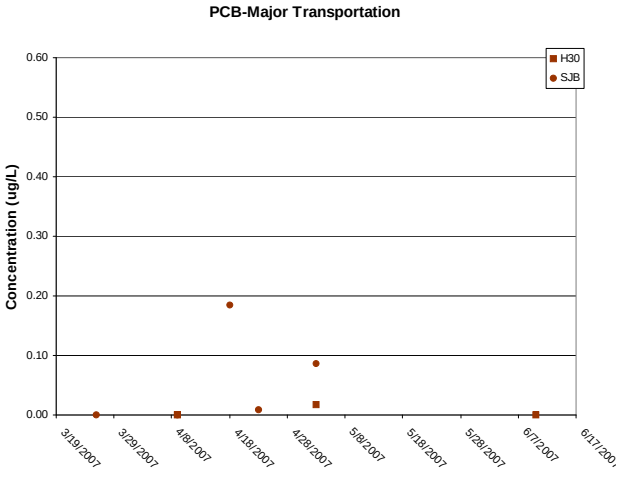


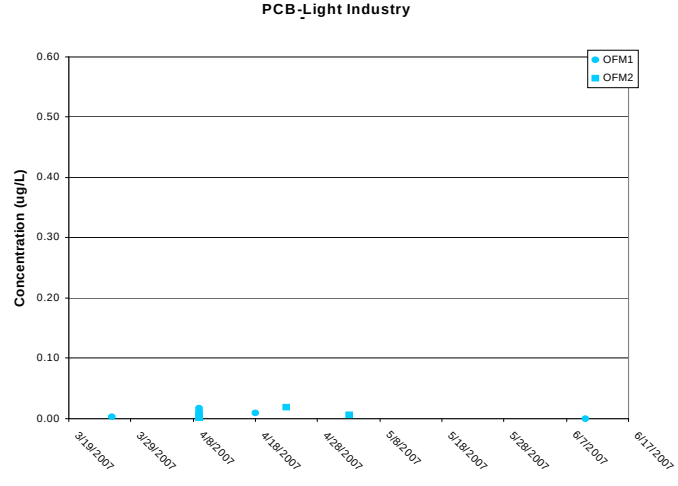
Note: L and Use grouping is based on Stormwater FSP.
Note: For the calculation of summed Totals, individual component ND are set to 0.
Note: When summed Total is ND (all component concentrations are ND), presented as hollow symbols, the value is substituted with ½ the DL.

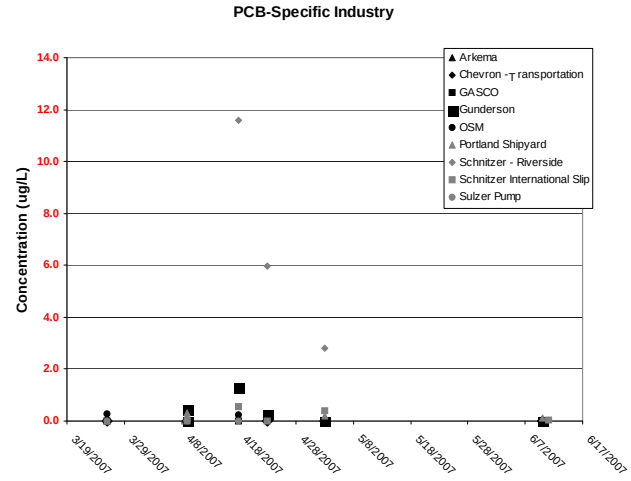




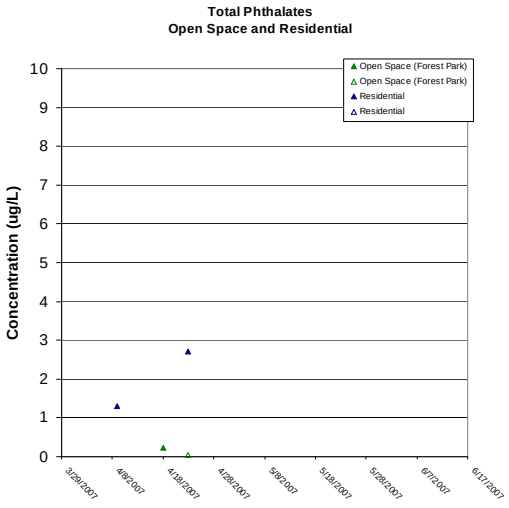


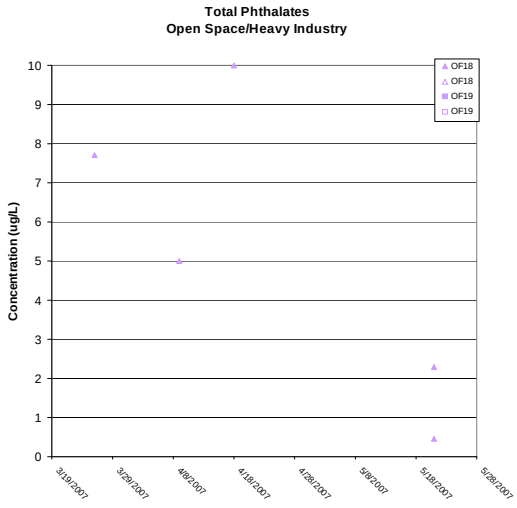


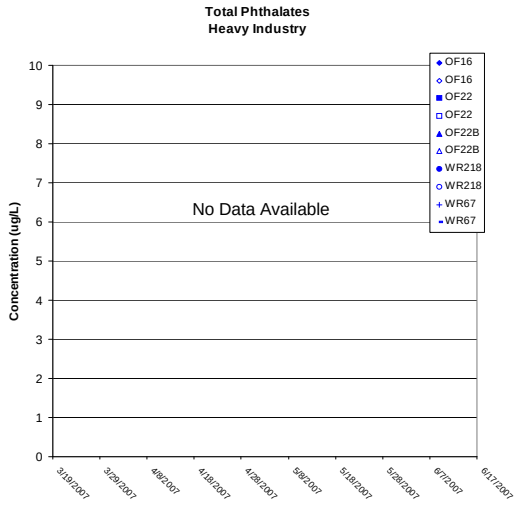


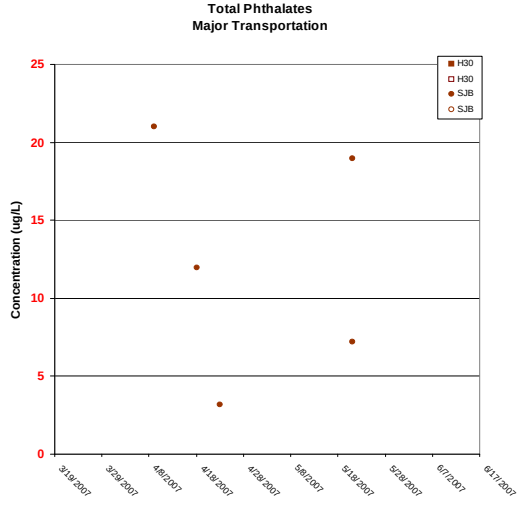


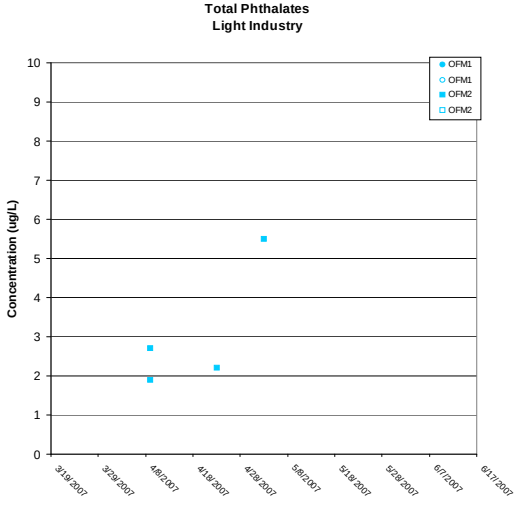
Note: Land Use grouping is based on Stormwater FSP.
Note: For the calculation of summed Totals, individual component ND are set to 0.
Note: When summed Total is ND (all component concentrations are ND), presented as hollow symbols, the value is substituted with ½ the DL.

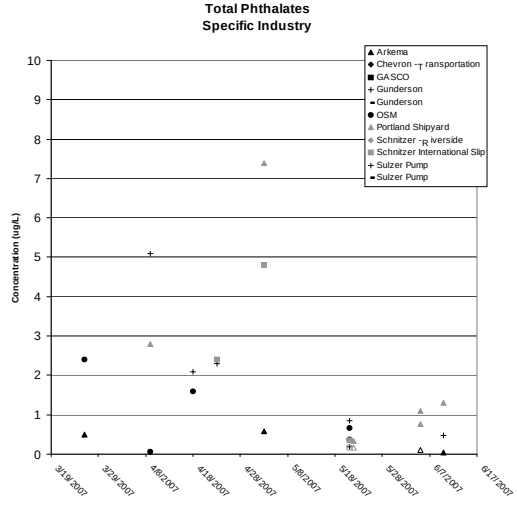




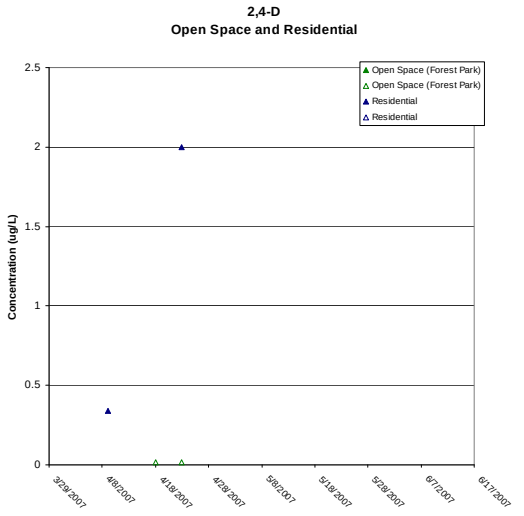


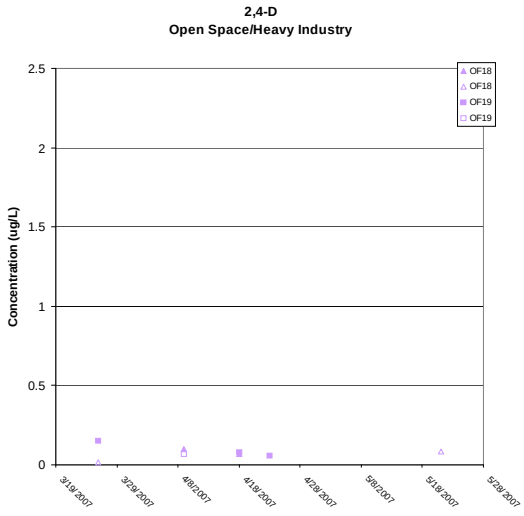


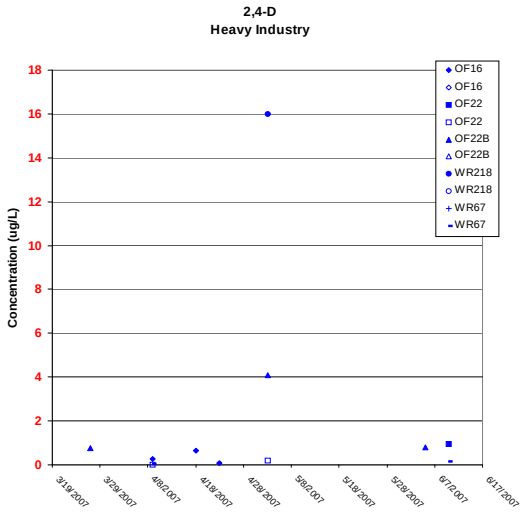


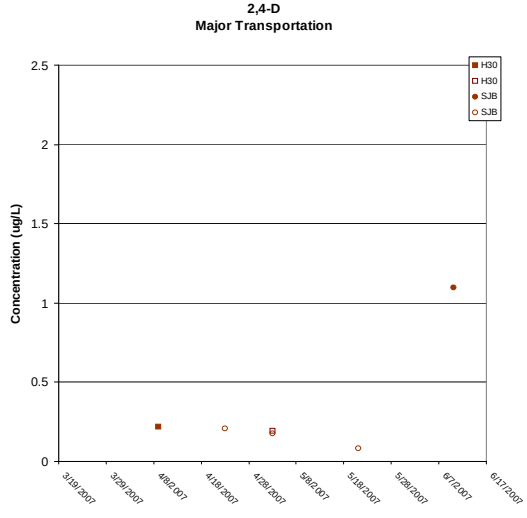


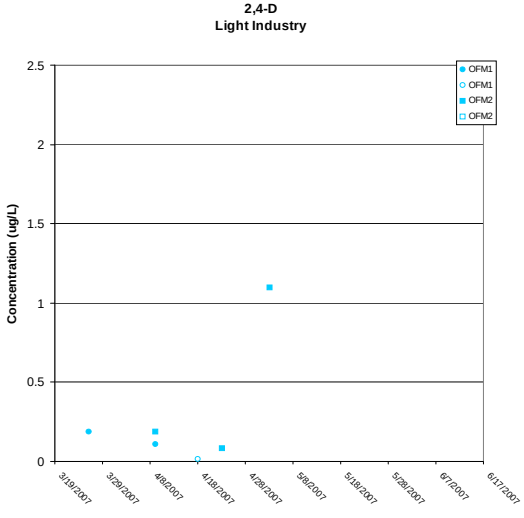
Note: L and Use grouping is based on Stormwater FSP.
Note: For the calculation of summed Totals, individual component ND are set to 0.
Note: When summed Total is ND (all component concentrations are ND), presented as hollow symbols, the value is substituted with ½ the DL.

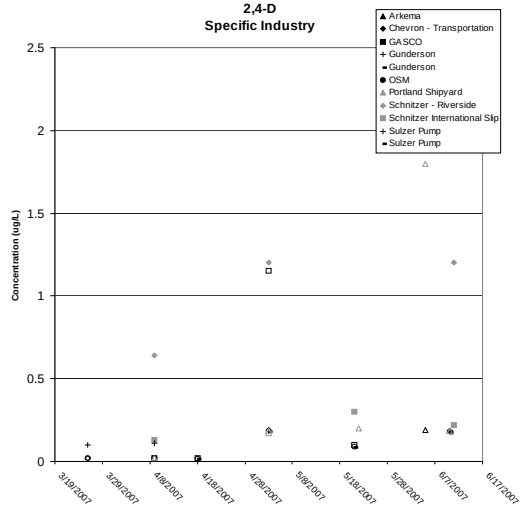






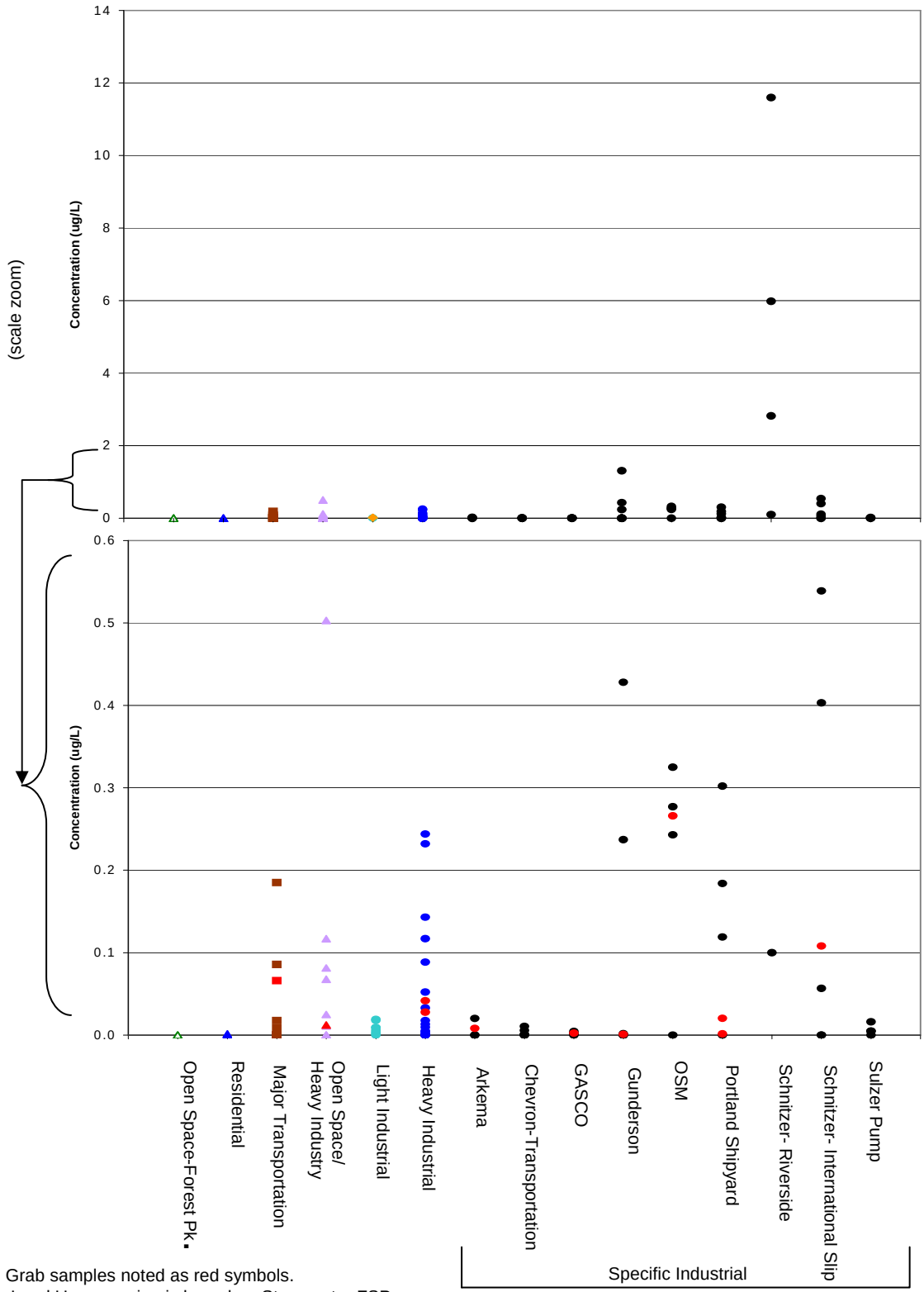






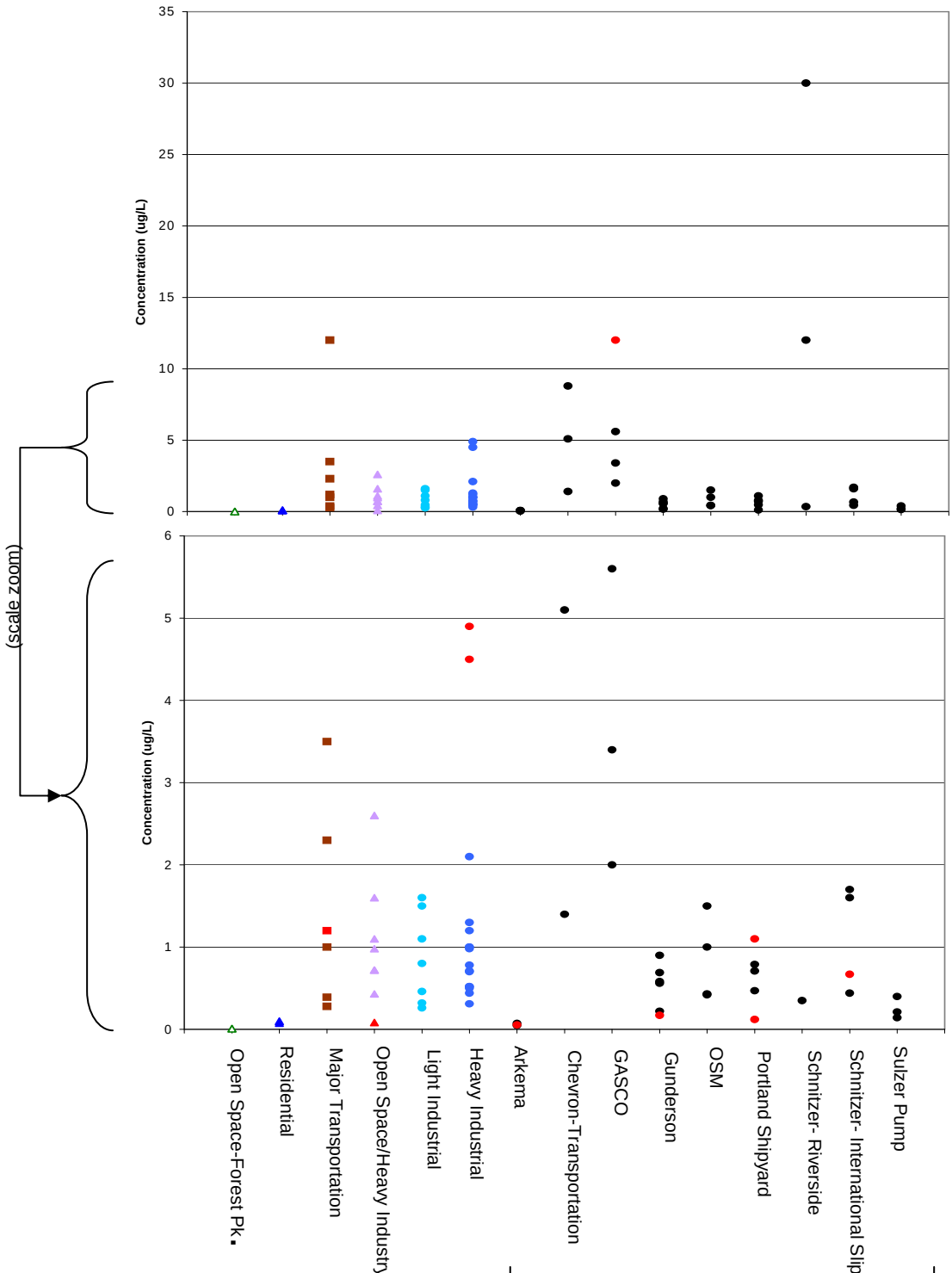
Note: $_{L}$ and Use grouping is based on Stormwater FSP.
Note: $_{No}$ n-detects (hollow symbols) substituted at ½ the detection limit.

Total PCBs



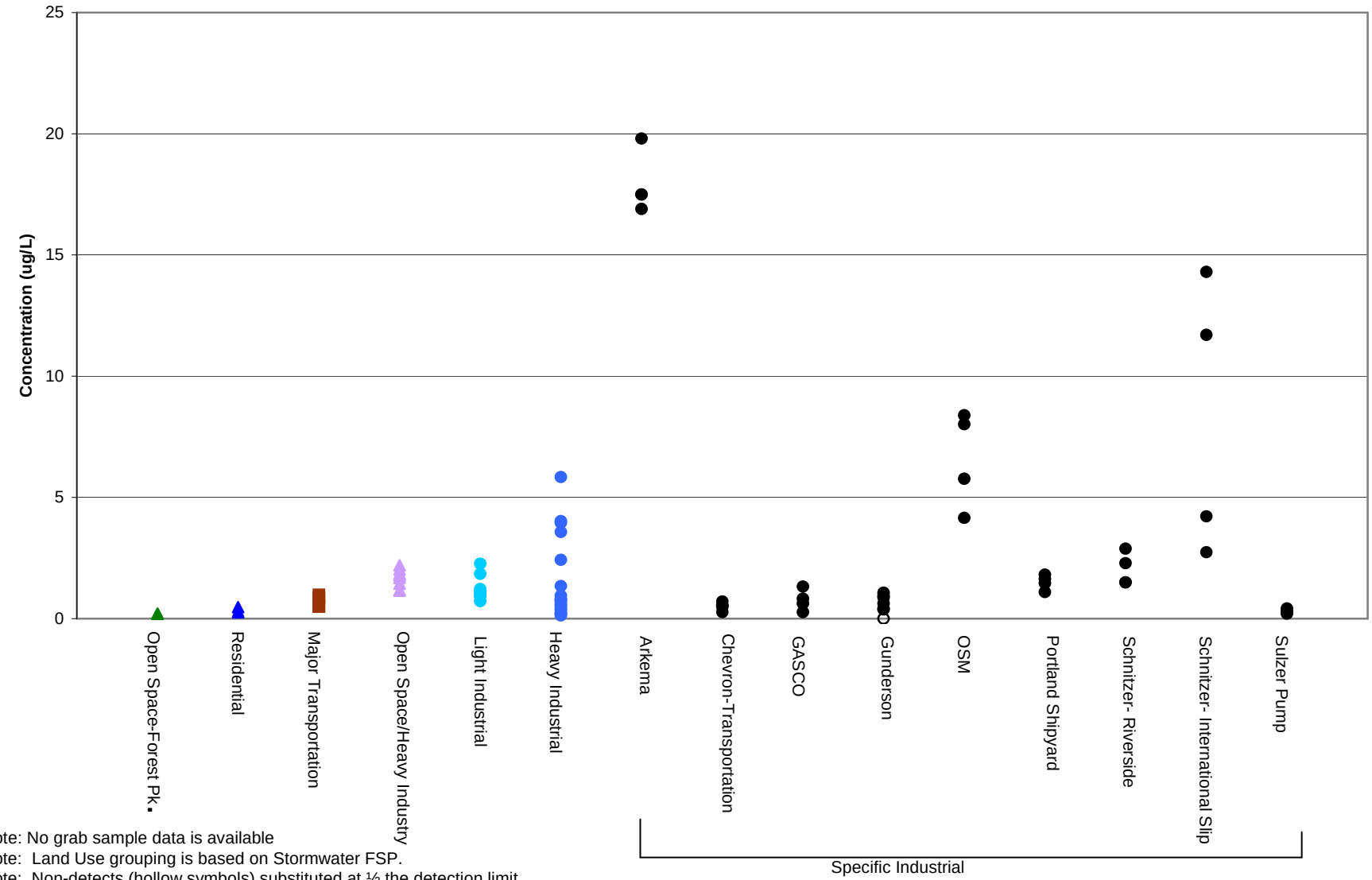
Note: Grab samples noted as red symbols.
Note: Land Use grouping is based on Stormwater FSP.
Note: For the calculation of summed Totals, individual component ND are set to 0.
Note: When summed Total is ND (all component concentrations are ND), presented as hollow symbols, the value is substituted with ½ the DL.

Total PAH



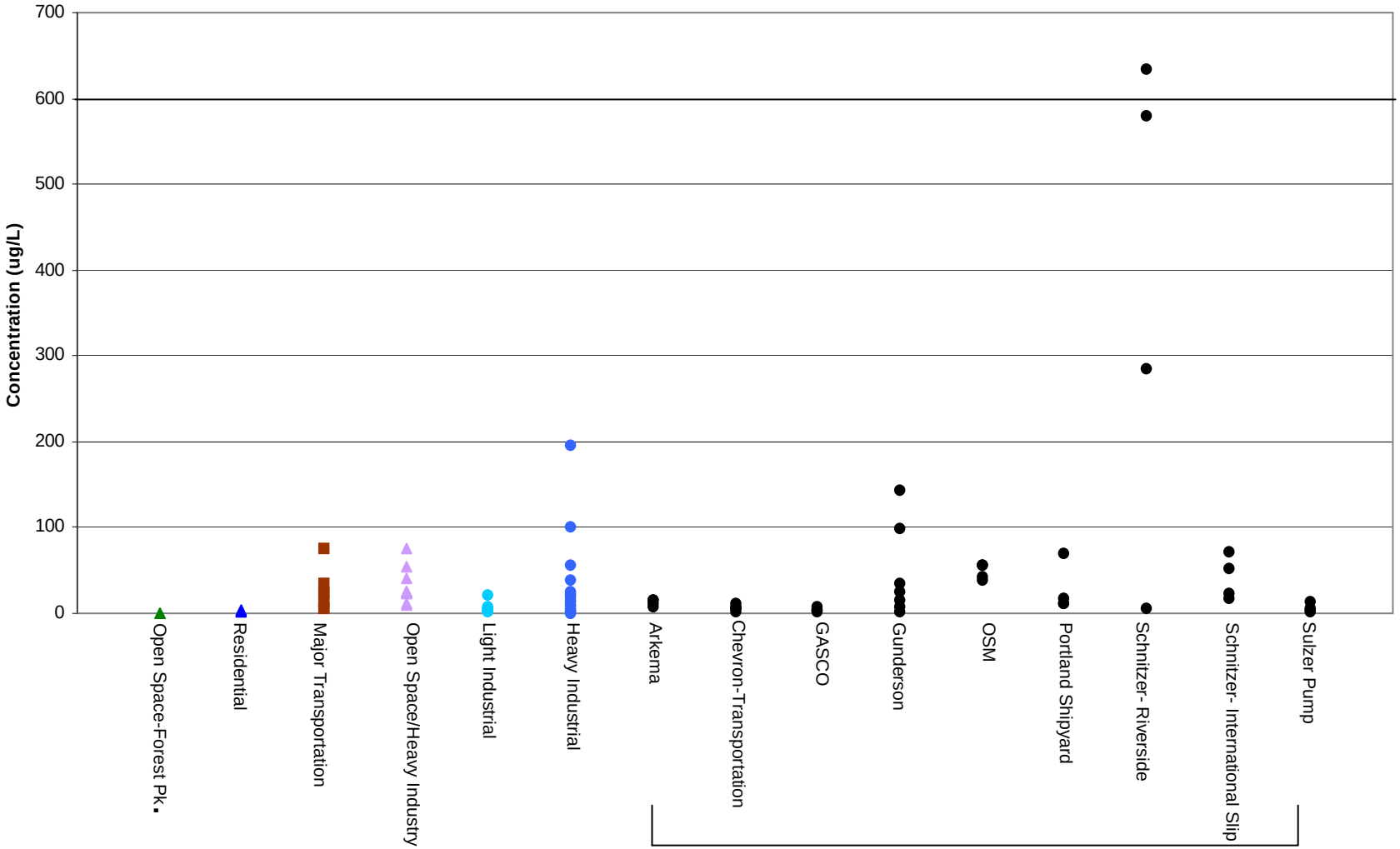
Note: Grab samples noted as red symbols.
Note: Land Use grouping is based on Stormwater FSP.
Note: For the calculation of summed Totals, individual component ND are set to 0.
Note: When summed Total is ND (all component concentrations are ND), presented as hollow symbols, the value is substituted with ½ the DL.

Total Arsenic



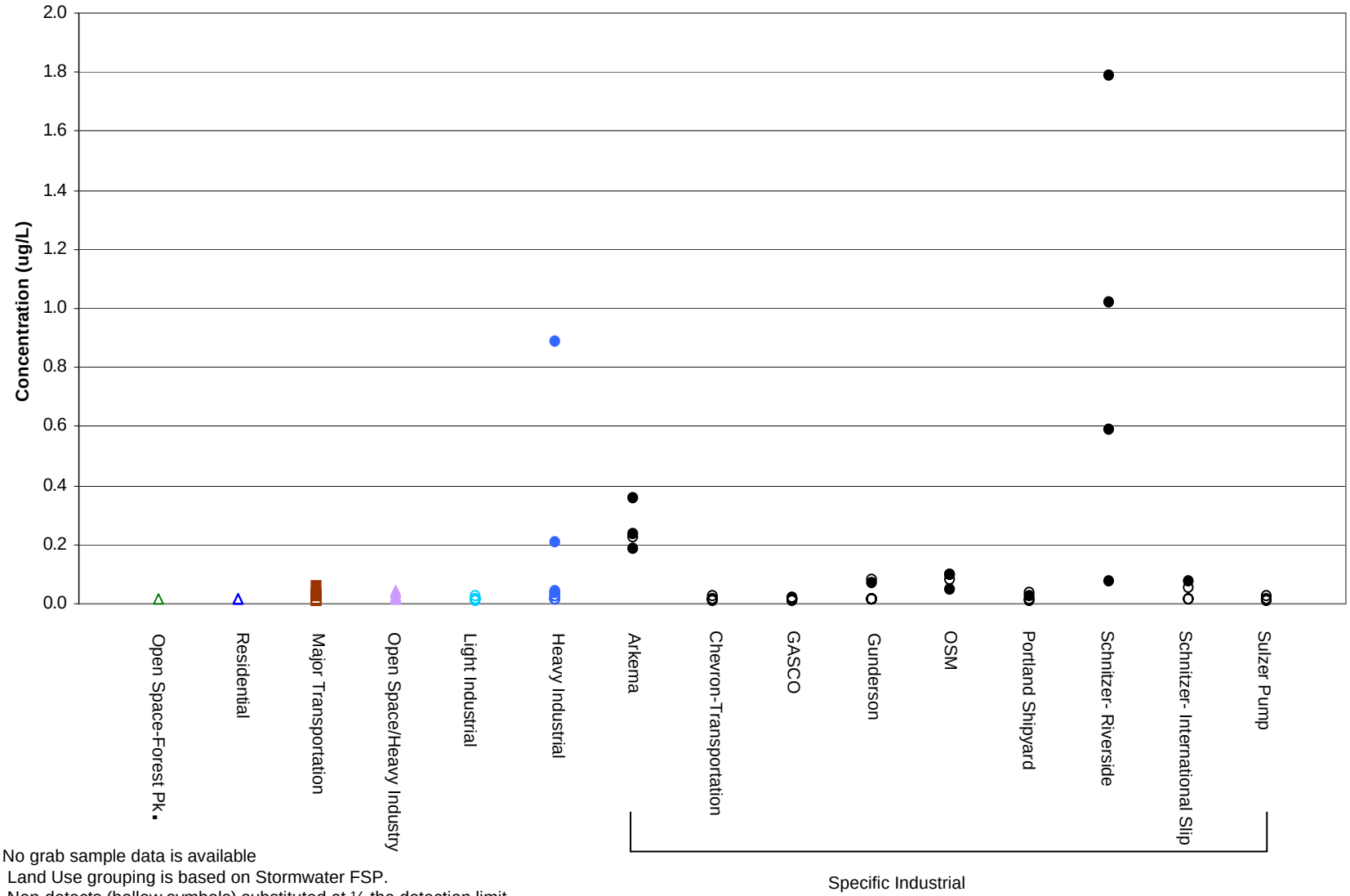
Note: No grab sample data is available
Note: Land Use grouping is based on Stormwater FSP.
Note: Non-detects (hollow symbols) substituted at ½ the detection limit.

Total Lead



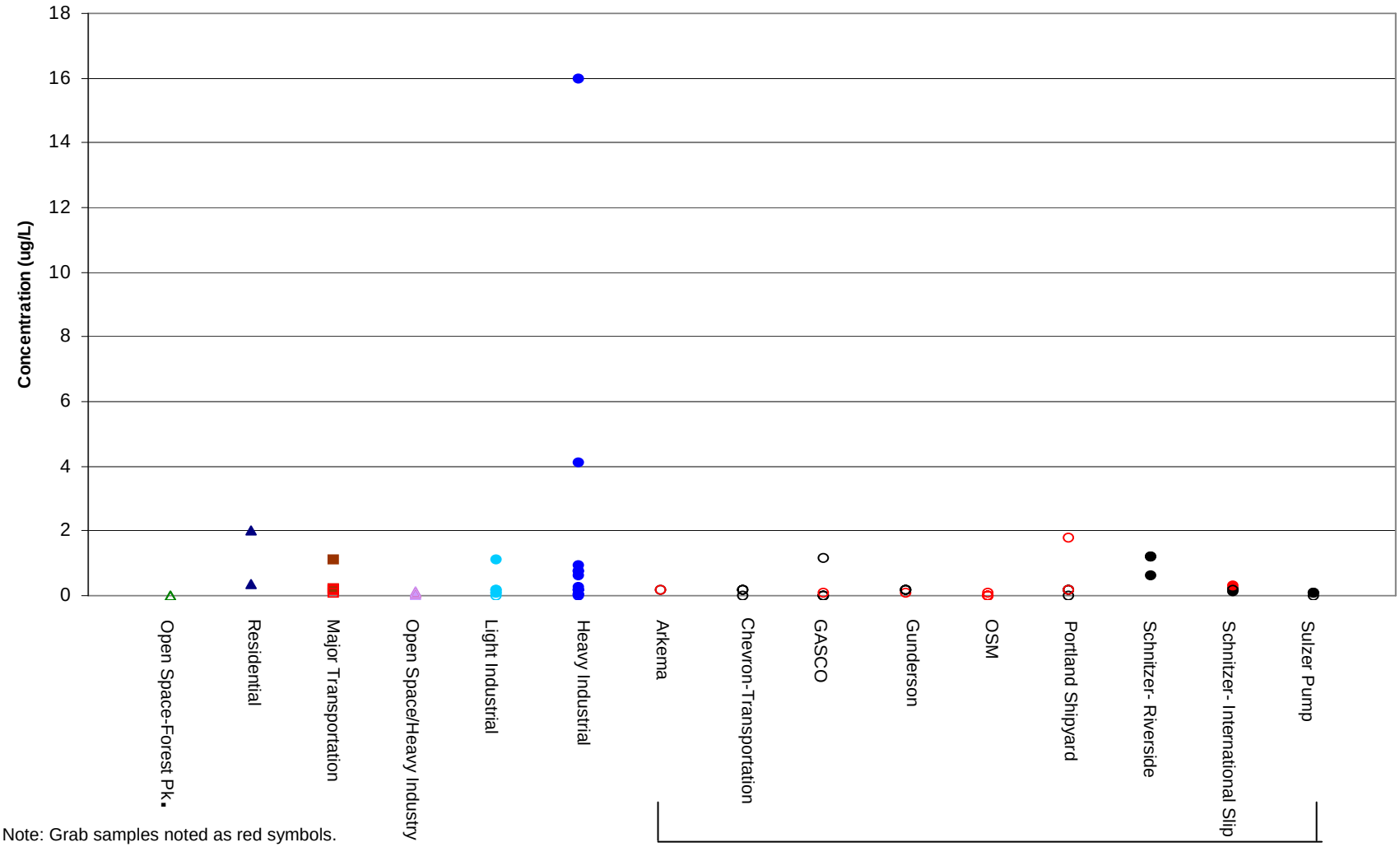
Note: No grab sample data is available
Note: Land Use grouping is based on Stormwater FSP.
Note: Non-detects (hollow symbols) substituted at ½ the detection limit.

Total Mercury



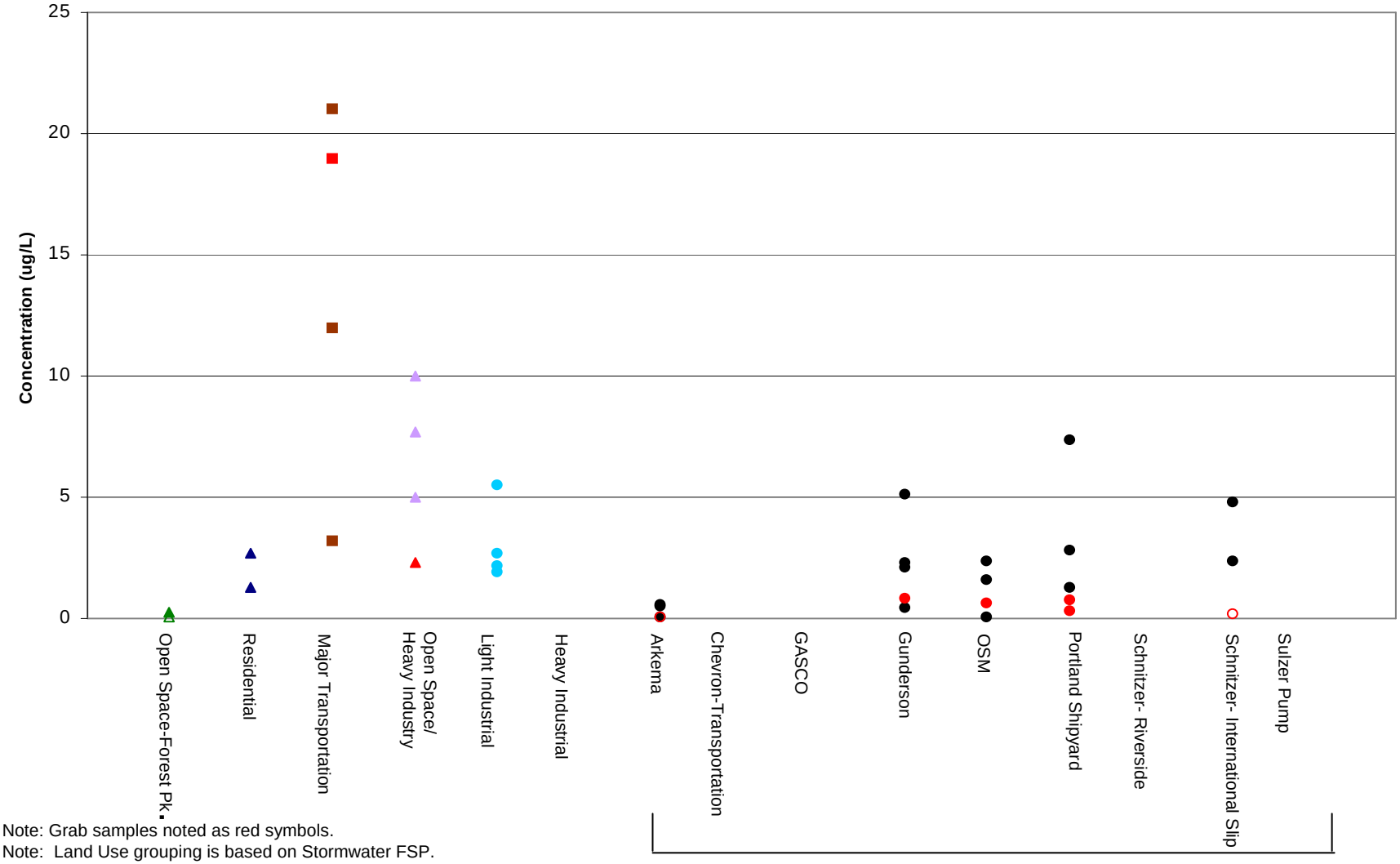
Note: No grab sample data is available
Note: Land Use grouping is based on Stormwater FSP.
Note: Non-detects (hollow symbols) substituted at ½ the detection limit.

2,4-D

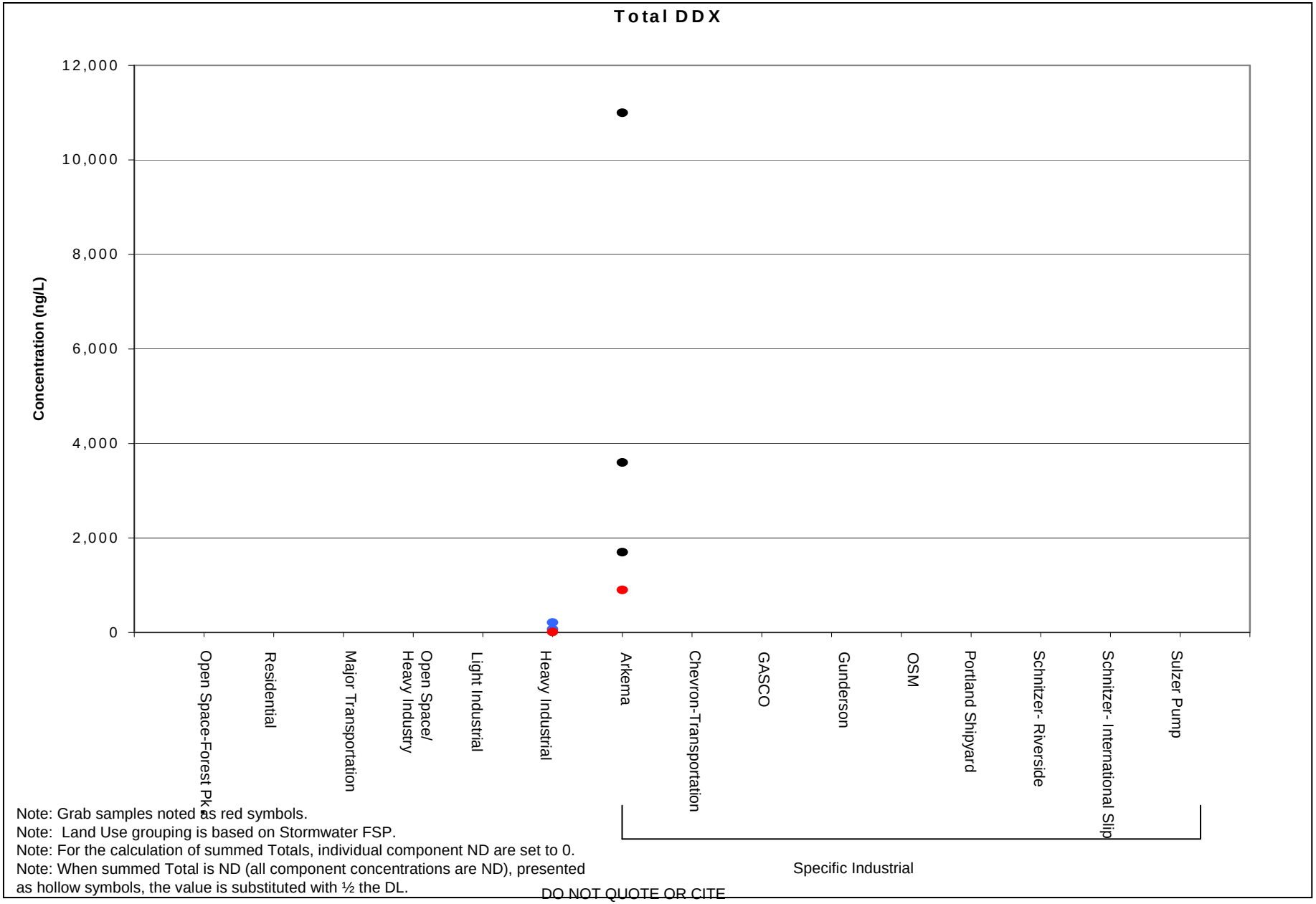


Note: Grab samples noted as red symbols.
Note: Land Use grouping is based on Stormwater FSP.
Note: Non-detects (hollow symbols) substituted at ½ the detection limit.

Total Phthalates



Note: Grab samples noted as red symbols.
Note: Land Use grouping is based on Stormwater FSP.
Note: For the calculation of summed Totals, individual component ND are set to 0.
Note: When summed Total is ND (all component concentrations are ND), presented as hollow symbols, the value is substituted with ½ the DL.



Note: Grab samples noted as red symbols.
Note: Land Use grouping is based on Stormwater FSP.
Note: For the calculation of summed Totals, individual component ND are set to 0.
Note: When summed Total is ND (all component concentrations are ND), presented as hollow symbols, the value is substituted with ½ the DL.

From: Carl Stivers
Sent: Tuesday, October 16, 2007 5:18 PM
To: Carl Stivers; 'Koch.Kristine@epamail.epa.gov'; 'Andy Koulermos'; Amanda Shellenberger; 'Amanda Spencer'; 'Sanders, Dawn'; 'Scheffler, Linda'; 'Laura Jones'; 'mcoover@ensr.aecom.com'; 'LaFranchise, Nicole'; 'TARNOW Karen E'
Cc: Bob Wyatt; Rick Applegate; 'MCCLINCY Matt'; Jessica Pisano; 'Gene Revelas'; 'Christine Hawley'; Jim McKenna
Subject: Notes from Oct. 16 Stormwater Technical Team Meeting

Stormwater Technical Team –

Data Needs
ummary Oct 16.xls .

Here are the highlights and action items from today's call. We decided that the next meeting (in person for most folks) will be on November **13th from 12:30 to 3 pm.** A meeting location will be confirmed in a later email. The primary topic of discussion for this meeting will be the methods for loading calculations and estimates.

The primary topic of conversation for the Oct. 16 meeting was to finalize the data needs proposal. The attached table shows the data needs developed by the group. Note that there was disagreement on the need for sampling the T-4 site (WR-169) per the attached table, but the group agreed that we are requesting LWG discuss their position on sampling at this location in light of the Port's objections to this data need.

Note that the group also agreed that in general flow meters do not need to be deployed at sites where only sediment traps are being proposed. One exception, for WR-4, is noted in the attached table.

Please let me know ASAP if you have any objections or changes to this table before we provide it to the LWG Exec. for requested approval. I would like to send this to the LWG tomorrow if at all possible. Remember that any changes at this point need to be clear omissions or clarification based on the meeting discussions. Otherwise we would have to reconvene to discuss, which the current timeline does not allow.

Per the group's request, we are also working on an additional table that shows the fall/winter data collection ongoing or proposed for the T-4 and GE sites. This will come out in a later email.

It was agreed that the general path forward would be:

- Obtain official LWG approval/disapproval between Oct. 16 and October 31. Target date October 24.
- Assuming approval is provided, formalize proposal in a technical memo from Oct. 16 to October 31, with EPA approval to proceed on or about October 31. (Note that this memo would heavily reference the existing FSP and would only note those new items necessary to execute this additional proposed work.) After the meeting, I thought about this a little more, and I think the earliest that this FSP addendum would come to EPA for approval is November 1. So, we will be seeking EPA approval essentially as fast as possible.
- Deploy sediment traps from approximately Nov. 1 (depending on date of EPA approval) through Dec. 31
- Be on alert for storm events from approximately Nov. 1 (depending on data of EPA approval) through Dec. 31 and collect storms as possible per the FSP requirements.

Additional items and action items that were discussed:

- Per Merv's suggestion, Anchor will look into the ability to deploy twice the number (or possibly more) of sediment trap bottles at the fall sampling locations to improve sampling volumes.
- In addition to the general description of the fall sampling, the FSP addendum would describe only those items that differ from the existing FSP. Examples discussed include: prioritization changes of sediment trap analytes based on data available already as well as that flow meters will not be deployed at sediment trap only locations.
- Andy Koulermos will look into the status of the WR-169 sediment trap and stormwater sampling to see how this might impact the requested LWG discussion on potentially sampling for PCBs at this site.
- For the next meeting:
    - Anchor/Integral will assess the distributions of stormwater data (assess for normality) and will provide a summary of this to the team prior to the next meeting.
    - Anchor will sort through options provided in the previous stormwater loading options description and propose a reasonable specific approach to facilitate discussions next time.
    - Anchor/Integral will discuss what form we currently have T-4 data and determine whether we need it in some other form to start to integrate it into the overall stormwater database.
    - Anchor/Integral will also discuss a proposed path forward for integrating these data and will report back on a proposed plan at the next meeting.

Let me know if I missed anything. Thanks much.

Carl

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No.	Station	Stormwater Events	Sediment Trap	Rationale	Other Notes
1	OF-22C	1		Only one open space station, and it is currently not complete for stormwater	
2	Hwy 30	3	1	Location inadvertantly included industrial drainage--not applicable to transportation	
2a	Hwy 30"B"	3	1	St. Johns Bridge site was recently re-paved and painted and may not be representative of overall transportation type	Hwy 30 and Reed St. appears to be a reasonable site, but will require reconnaissance to confirm.
3	OF-22B	1	1	Could be unique site for pesticides or PCBs and missing a storm for both and pesticides in sediments	Prioritize sediment traps for missing analytes (starting with pesticides)
4	OF-49	1	1	Only two residential sites and this one missing a storm for some analytes and almost all sediment analytes	Need all analytes in sediments
5	OF-18		1	Only one of two multiple land use sites and missing metals in sediment	Prioritize sediment traps for missing analytes (starting with metals)
6	WR-145/142	2	1	Only 1 storm for PCBs and missing almost all sediment analytes	Need all analytes in sediments
7	WR-96	1	1	Missing one storm for PCBs and two for herbicides and sediment traps missing all analytes	
8	WR-14		1	Missing most analytes in sediment	Prioritize traps for missing analytes.
9	WR-4		1	Missing most analytes in sediment	Prioritize traps for missing analytes. Place flow meter at this site as well due to process water discharges present here.
10	WR-161		1	Missing most analytes in sediment	Prioritize traps for missing analytes.
11	WR-123		1	Missing most analytes in sediment	Prioritize traps for missing analytes.
12	WR-147		1	Missing most analytes in sediment	Prioritize traps for missing analytes.
13	WR-218	1	1	Could be unique site for some chemicals and missing a storm and most sediment analytes	Prioritize sediment traps for missing analytes
14	WR-169?	3	1	PCB congeners in stormwater and possibly also sediment traps missing for this site. Data needed to support light industrial land use loading estimates.	There is a gap between the expectations of the LWG FSP and the T-4 FSP. **The Port expressed a general objection to the need for these data points.** It was agreed the Port would discuss this potential data need with the wider LWG to see if any compromises could be reached. One potential way to resolve the sediment trap data need is if there is sufficient sample from the already deployed T-4 sediment trap, an aliquot for PCB congeners could be provided. Also, the Port's ability to do any stormwater sampling may be contingent upon whether the scheduled fall storm event
Totals		12	13		
Previous Totals		9	12		

Yellow highlights indicate cells that changed from the Sep. 18 version of this table.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 98101-3140

November 6, 2007

Reply to the
Attention of ECL-115

Mr. Jim McKenna
Port of Portland & Co-Chairman, Lower Willamette Group
121 NW Everett
Portland, Oregon 97209

Mr. Robert Wyatt
Northwest Natural & Co-Chairman, Lower Willamette Group
220 Northwest Second Avenue
Portland, Oregon 97209

RE: Portland Harbor RI/FS Draft Round 3A Field Sampling Plan Addendum, Stormwater Sampling (Anchor Environmental, L.L.C.)

Dear Messrs. McKenna and Wyatt:

The U.S. Environmental Protection Agency, Region 10 ("EPA") has completed its review of the above referenced Field Sampling Plan (FSP) submitted on November 2, 2007, for the Portland Harbor Superfund Site located in Portland, Oregon. This document was based on the recommendations of the Stormwater Technical Team comprised of representatives of the Environmental Protection Agency, Oregon Department of Environmental Quality and the Lower Willamette Group. Pursuant to Section IX of the AOC, EPA is hereby approving the above referenced FSP for stormwater sampling and directs the Lower Willamette Group to implement it.

If you have any questions regarding this letter, please contact me at (206) 553-6705 or koch.kristine@epa.gov, or have your attorney contact Lori Cora, Assistant Regional Counsel, at (206) 553-1115.

Sincerely,

Kristine Koch
Remedial Project Manager

cc: Lori Cora, EPA – ORC
Chip Humphrey, EPA – OOO
Eric Blischke, EPA – OOO
Carl Stivers, Anchor Environmental, L.L.C.
Greg Ulirsch, ATSDR
Rob Neely, NOAA
Ted Buerger, US Fish and Wildlife Service
Preston Sleeger, Department of Interior
Jim Anderson, DEQ
Kurt Burkholder, Oregon DOJ
Rick Keppler, Oregon Department of Fish and Wildlife
Kathryn Toepel, Oregon Public Health Branch
Jeff Baker, Confederated Tribes of Grand Ronde
Tom Downey, Confederated Tribes of Siletz
Audie Huber, Confederated Tribes of Umatilla
Brian Cunninghame, Confederated Tribes of Warm Springs
Erin Madden, Nez Perce Tribe
Rose Longoria, Confederated Tribes of Yakama Nation
Valerie Lee, Environment International
Keith Pine, Integral Consulting

From: Carl Stivers
Sent: Friday, November 30, 2007 3:27 PM
To: 'Koch.Kristine@epamail.epa.gov'; 'Andy Koulermos'; Amanda Shellenberger; 'Amanda Spencer'; 'Sanders, Dawn'; 'Scheffler, Linda'; 'Laura Jones'; 'mcoover@ensr.aecom.com'; 'LaFranchise, Nicole'; 'TARNOW Karen E'
Cc: Bob Wyatt; Rick Applegate; 'MCCLINCY Matt'; Jessica Pisano; 'Gene Revelas'; 'Christine Hawley'; Jim McKenna; Valerie Oster
Subject: Notes from Stormwater Technical Team Meeting Nov. 27th at 12:30

Stormwater Technical Team –

As discussed at the last meeting, here is a high level summary of action items and highlights:

- We agreed the next meeting should be Dec. 19 from 11 to 1 pm. This would be in person, in Portland, since we will want to project the data on the wall. I will set up a WebEx meeting for those who may need to call in. I will confirm the location soon. **Kristine** – If this time does not work for you, we also set up an alternate time for Dec. 20 (same time of day). Let me know which one works best for you.
- Sulzer – The group agreed that we would proceed with stormwater sampling but NOT sediment traps at Sulzer, due to deployment logistics. Anchor will work on a more detailed description of how the stormwater will be collected and flow will be monitored.
- New Hwy 30 Sample – It was agreed that the sample taken on Oct. 16th at the new Hwy 30 site could be used as a sample, even though sample representing about 4% of the flow from the middle of the storm was not collected.
- Load Calculation Methods – Methods for handling replicates and non-detects were discussed and Integral/Anchor will prepare data following these methods for use at the next call. The next call will work on the next steps in the loading calculation based on these data. It was agreed that this data analysis would concentrate on 4 PCB congeners, As, Pb, 2 PAHs, and TSS for the purposes of deriving methods.
- The Port is going to prepare on a Field Sampling Report similar to the one being prepared by the LWG for the spring sampling at the non-Port stations.
- Anchor to look for a statistician to attend the next meeting.
- Carl was going to look into the groups pace relative to the overall project schedule to make sure we are moving fast enough.

Let me know if I missed anything critical.

Thanks.

Carl

Carl Stivers

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cstivers@anchorenv.com

From: Carl Stivers
Sent: Monday, November 19, 2007 1:12 PM
To: 'Koch.Kristine@epamail.epa.gov'; 'Andy Koulermos'; Amanda Shellenberger; 'Amanda Spencer'; 'Sanders, Dawn'; 'Scheffler, Linda'; 'Laura Jones'; 'mcoover@ensr.aecom.com'; 'LaFranchise, Nicole'; 'TARNOW Karen E'
Cc: Bob Wyatt; Rick Applegate; 'MCCLINCY Matt'; Jessica Pisano; 'Gene Revelas'; 'Christine Hawley'; Jim McKenna; Valerie Oster
Subject: Stormwater Technical Team Meeting Nov. 27th at 12:30 to 4 pm

Stormwater Technical Team –

At our last meeting, we decided to have our next in person meeting on Nov. 27th from 12:30 to 4 pm. I have secured Room 1904 at the offices of Schwabe, Williamson, Wyatt, which is at 1211 SW Fifth Avenue. We will continue our discussions of stormwater loading calculation methods.

In case someone cannot make it, the following call in number is also available:

1-866-866-2244
6761834#

Thanks.

Carl

Carl Stivers
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-----Original Message-----
From: Koch.Kristine@epamail.epa.gov [mailto:Koch.Kristine@epamail.epa.gov]
Sent: Friday, December 07, 2007 1:08 PM
To: Carl Stivers
Cc: Andy Koulermos; Amanda Shellenberger; Amanda Spencer; Christine Hawley; Sanders, Dawn; Gene Revelas; Jim McKenna; Jessica Pisano; Scheffler, Linda; Laura Jones; MCCLINCY Matt; mcoover@ensr.aecom.com; LaFranchise, Nicole; Rick Applegate; Bob Wyatt; TARNOW Karen E; Valerie Oster
Subject: Re: Sulzer Stormwater Installation

I have no objections to the sampling approach.

Kristine Koch
Remedial Project Manager
USEPA, Office of Environmental Cleanup

U. S. Environmental Protection Agency
Region 10
1200 Sixth Avenue, Suite 900, M/S ECL-115
Seattle, Washington 98101-3140

(206)553-6705
(206)553-0124 (fax)
1-800-424-4372 extension 6705 (M-F, 8-4 Pacific Time, only)

"Carl Stivers" <cstivers@anchorenv.com>
12/06/2007 05:00 PM

To: "Amanda Shellenberger" <ashellenberger@anchorenv.com>, Kristine Koch/R10/USEPA/US@EPA, "Andy Koulermos" <akoulermos@newfields.com>, "Amanda Spencer" <aspencer@ashcreekassociates.com>, "Sanders, Dawn" <DAWNS@BES.CI.PORTLAND.OR.US>, "Scheffler, Linda" <LindaSC@BES.CI.PORTLAND.OR.US>, "Laura Jones" <ljones@integral-corp.com>, <mcoover@ensr.aecom.com>, "LaFranchise, Nicole" <Nicole.LaFranchise@portofportland.com>, "TARNOW Karen E" <TARNOW.Karen@deq.state.or.us>

cc: "Bob Wyatt" <rjw@nwnatural.com>, "Rick Applegate" <RICKA@bes.ci.portland.or.us>, "MCCLINCY Matt" <MCCLINCY.Matt@deq.state.or.us>, "Jessica Pisano"

<jpisano@anchorenv.com>, "Gene Revelas"
<grevelas@integral-corp.com>, "Christine Hawley"
<chawley@integral-corp.com>, "Jim McKenna"
<Jim.McKenna@portofportland.com>, "Valerie Oster"
<voster@anchorenv.com>

Subject
Sulzer Stormwater Installation

Stormwater Technical Team –

Just a reminder that we cannot proceed with the installation of the stormwater sampling equipment at Sulzer until we get some feedback from the team that the approach described below by Amanda is acceptable. Our next meeting is on the 19th (although I still need a confirmation from Kristine on that), so I definitely don't want to wait until then to discuss this. So, unfortunately we will have to try to resolve this one via email if at all possible. Please respond, even if it is only to say you have no objections to the approach described below. That way, I can take a vote of sorts.

Thanks much for your prompt response.

Carl

Carl Stivers
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23 South Wenatchee Avenue, Suite 120
Wenatchee, WA 98801
Phone: 509-888-2070
Fax: 509-888-2211
cstivers@anchorenv.com

From: Amanda Shellenberger
Sent: Tuesday, December 04, 2007 10:38 AM
To: Carl Stivers; 'Koch.Kristine@epamail.epa.gov'; 'Andy Koulermos'; 'Amanda Spencer'; 'Sanders, Dawn'; 'Scheffler, Linda'; 'Laura Jones'; 'mcoover@ensr.aecom.com'; 'LaFranchise, Nicole'; 'TARNOW Karen E'
Cc: Bob Wyatt; Rick Applegate; 'MCCLINCY Matt'; Jessica Pisano; 'Gene Revelas'; 'Christine Hawley'; Jim McKenna; Valerie Oster
Subject: RE: Notes from Stormwater Technical Team Meeting Nov. 27th at 12:30

Tech Team –

As requested in the last technical team conference call, here is more information on how we propose to collect composite water samples upstream of the WR-4 outfall.

We propose to install a flow meter and sample pickup tube into the main outfall pipe draining to WR-4. This pipe can be accessed through the 3.5 inch pipe protruding from the bottom of CB-17. By attaching the flow meter and sample pickup tube to a stainless steel rod, we will be able to mount them on the bottom of the outfall pipe. We anticipate using a spring-loaded mounting setup to insert the meter and pickup tube vertically through the small pipe into the outfall pipe, and then turning the meter and tube perpendicularly so that the meter and pickup tube will be on the bottom of the outfall pipe. We'll take pictures of the setup.

The flow meter will allow us to measure stormwater runoff and cooling water discharge. By measuring cooling water discharge during dry weather, we can determine the approximate flow volume relative to the stormwater runoff volume. It should be noted that these volumes will not be exact since the flow meter will not be calibrated. However, the flow meter will do a good job of showing what proportion of discharge from the outfall is cooling water versus stormwater.

We hope to install this sampling setup at Sulzer early next week if there are no objections. Let me know if you will have any questions.

Amanda Shellenberger, P.E.
Anchor Environmental, L.L.C
1423 3rd Avenue, Suite 300
Seattle, WA 98101
Direct Line: (206)903-3371
Office Line: (206)287-9130
Fax: (206)287-9131

From: Scheffler, Linda [mailto:LindaSC@BES.CI.PORTLAND.OR.US]
Sent: Thursday, December 20, 2007 11:41 AM
To: Carl Stivers; 'Koch.Kristine@epamail.epa.gov'; 'Andy Koulermos'; Amanda Shellenberger; 'Amanda Spencer'; Sanders, Dawn; Scheffler, Linda; 'Laura Jones'; 'mcoover@ensr.aecom.com'; 'LaFranchise, Nicole'; 'TARNOW Karen E'
Cc: Bob Wyatt; Rick Applegate; 'MCCLINCY Matt'; Jessica Pisano; 'Gene Revelas'; 'Christine Hawley'; Jim McKenna; Valerie Oster
Subject: Sample Equipment Orientation

Tech Team,
This morning I was looking at some photos that Amanda provided of the weir structure in basin M-2, as well as photos our crews collected of the weir at basin 22B. These flow restrictors were installed by Anchor to help increase the probability of capturing stormwater solids in the sediment traps at these locations. But given the dry-weather flows, the equipment orientations do raise a few questions in terms of data interpretation.

- If the tops of trap bottles are even with or below the level of the weir, then solids accumulation will be biased toward solids affiliated with dry-weather flow. In the case of basin 22B, where there is a known groundwater contaminant plume infiltrating the stormwater conveyance system, this sediment trap sample may not be as representative of stormwater loading as at other locations.

- At the M-2 location, it appears that the sample intake tubing is in front of the weir. Given the size of the pipe and volume of base flow, significant in-pipe storage of base flow could be occurring. The weir could cause increased dilution of the stormwater composite sample during the early portions of the storm.

Are there other locations with dry-weather flow and unique equipment orientations where we may want to view the data differently? Thanks.

Linda

Linda Scheffler
City of Portland
Bureau of Environmental Services
(503) 823-2296

From: Carl Stivers
Sent: Thursday, December 20, 2007 4:52 PM
To: 'Scheffler, Linda'; Amanda Shellenberger; 'Koch.Kristine@epamail.epa.gov'; 'Andy Koulermos'; 'Amanda Spencer'; 'Sanders, Dawn'; 'Laura Jones'; 'mcoover@ensr.aecom.com'; 'LaFranchise, Nicole'; 'TARNOW Karen E'
Cc: Bob Wyatt; Rick Applegate; 'MCCLINCY Matt'; Jessica Pisano; 'Gene Revelas'; 'Christine Hawley'; Jim McKenna; Valerie Oster; 'Lucinda Tear'
Subject: Notes from Stormwater Technical Team Meeting Dec. 19th 11am to 2 pm

Stormwater Technical Team –

Here are the highlights from our last meeting. Note that any agreements noted need to be ratified by the LWG Exec. As always let me know if I missed something. The group agreed to meet again either Jan 9th or 10th from 11 am to 2 pm. **Kristine – please confirm a preferred date** as soon as possible**.**

- Fall sampling status – It was agreed that shorter sediment trap bottles should be deployed at those locations with only trace sediments after 1 month of deployment and that also have flow height issues. (For example, we would not use short bottles in catch basins, because even taller bottles are always inundated and short bottles would make no difference.) It was also agreed that both short and regular sized bottles (2 each) should be redeployed to OF-18 and each bottle type analyzed for Total Organic Carbon, to help check whether shorter bottles collect a sediments differently from standard bottles. The exact new size of short bottle was not determined, but Anchor was given leeway to decide on something with the goal of minimizing the number of variations from standard sized bottles.
- Data reporting – Anchor requested that only one data report be prepared that encompassed both the spring and fall sampling results. The group agreed to this with the understanding that the actual data would be available through database postings as it becomes available post validation.
- Schedule – Various potential pathways to loading estimates were discussed. All permutations discussed require that loading methods decisions be completed by mid-January and that loading estimates need to be available for Fate and Transport modeling by the start of June. Kristine indicated EPA was expecting an approval process similar to approval of the FSP as follows:
    - Group decides on general loading estimate methods by mid-January
    - Anchor/Integral prepare a draft loading methods plan
    - EPA/Stormwater Team review, discuss, and provide input iteratively in period between mid-January and mid-April including LWG Exec. approval step
    - Target EPA approval date of mid-April.
    - Anchor/Integral conduct loading calculations mid-April to mid-June

  [I'd like to add that obviously Anchor/Integral would need some time in this period to create the initial draft (late Jan./early Feb timeframe) and LWG and EPA will need some time to officially approve it (say late March and early April). Thus, the actual Stormwater Team iterative refinement process would need to occur from about mid-February through mid-March.]
  It was also agreed that Carl should work with the City simultaneously in early January determine the mechanics of using the City grid model.
- Loading Methods – The following general approaches were agreed to:
    - All lab and field duplicates will be kept separate in the SCRA database so that widely divergent duplicates can be identified and more closely assessed. Integral will repost the SCRA consistent with this agreement.

- In general, relatively consistent duplicates will be combined (e.g., averaged) before further interpretation of results. However, widely divergent duplicates will be examined to determine if an error or cause can be identified. Also, they will generally be assessed to see if a result is an outlier. Divergent results may be eliminated from further use based on these assessments.
- It was agreed that summing rules (e.g., for total PCBs) are not needed because only individual chemicals will be subject to loading estimates.
- It was agreed that treatment of non-detects for statistical calculations will be based on EPA's Pro UCL program, where sample numbers are sufficient. More simple methods will need to be used for smaller data sets. The critical concept in all cases is to look at the ratio and number of non-detects relative to detects to discern the importance of non-detect handling decisions. The percentage of data points coming from non-detects will always be clearly reported.
- Placement of stations within land use categories was discussed and the following was agreed to:
  - The St. John's Bridge results will be compared to the two fall highway site results to determine whether the bridge is similar to these other sites and should be included in the transportation land use category.
  - OF-22B should be considered a unique site for pesticides
  - An outlier analysis should be done for heavy industrial category sites to see if any of these sites should be considered unique heavy industrial sites for any chemicals.
  - The distributions of heavy industrial category sites and unique heavy industrial sites should be compared. Where two groups have similar distributions, some unique sites for some chemicals might be included in the heavy industrial land use category.
- Note that there was concern that perhaps individual points from unique heavy industrial sites should not given equal weight if they are used in the heavy industrial land use category. It was agreed that more discussion was needed next time on use of individual data points within each category and whether they can be all considered equivalent or not, for a number of reasons.

Thanks.

Carl

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cstivers@anchorenv.com

From: Carl Stivers
Sent: Thursday, December 13, 2007 12:52 PM
To: 'Scheffler, Linda'; Amanda Shellenberger; 'Koch.Kristine@epamail.epa.gov'; 'Andy Koulermos'; 'Amanda Spencer'; 'Sanders, Dawn'; 'Laura Jones'; 'mcoover@ensr.aecom.com';

'LaFranchise, Nicole'; 'TARNOW Karen E'
Cc: Bob Wyatt; Rick Applegate; 'MCCLINCY Matt'; Jessica Pisano; 'Gene Revelas'; 'Christine Hawley'; Jim McKenna; Valerie Oster
Subject: Stormwater Technical Team Meeting Dec. 19th 11am to 2 pm

Stormwater Technical Team –

We will be meeting on Dec. 19th from 11 am to 2 pm at Schwabe (1211 SW Fifth Avenue) to discuss the next parts of the loading calculations.

I urge everyone to attend in person if possible. If not, please use the following conference call number:

1-866-866-2244
6761834#

Also, I have set up a WebEx meeting, which you can access as follows:

You have been invited to join a meeting on the Web, using WebEx MeetMeNow.

Please click the following link to join the meeting:
< https://mwmus.webex.com/mwmus/jm.php?PWD=&MK=942000850 >

MEETING PASSWORD: No password
Date: December 19, 2007
Time: 11:00 am, Pacific Standard Time (GMT -08:00, San Francisco)
Teleconference: No teleconference
Meeting Number: 942 000 850

http://meetmenow.webex.com
We've got to start meeting like this(TM)

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From: Carl Stivers
Sent: Monday, January 14, 2008 12:43 PM
To: 'Koch.Kristine@epamail.epa.gov'; Amanda Shellenberger; 'Sanders, Dawn'; 'Andy Koulermos'; 'Amanda Spencer'; 'mcoover@ensr.aecom.com'; 'Scheffler, Linda'; 'Lucinda Tear'; 'LaFranchise, Nicole'; 'TARNOW Karen E'; 'Laura Jones'
Cc: 'Christine Hawley'; 'Gene Revelas'; Jim McKenna; Jessica Pisano; 'MCCLINCY Matt'; Rick Applegate; Bob Wyatt; Valerie Oster
Subject: Notes from Jan. 10th meeting

Stormwater Technical Team –

We agreed to have our next call on February 7th starting at noon. This will be a conf. call and not an in person meeting. I will send out a call number when we are closer to the date. The purpose of the next meeting will be to make final decisions on the sediment trap samples, which will be collected at the end of the month. Anchor/Integral will send out the most recent information on sediment trap accumulations and total solids content prior to the meeting. Note that the total solids information will be sent out just before the call because that is when it will be available.

It was also agreed that LWG consultants would work on writing up a Loading Calculation Method Plan based on agreements from the last two meetings. Attached are my notes on our agreed to approaches from this meeting. Please let me know if I missed something. Other ideas relevant to the plan that were discussed include:

- Development of a summary diagram or table on study approach and ultimate objectives for the loading rates (this would probably go in the plan).
- Table matrix of supporting data available to understand stormwater concentration data distributions (again would probably be presented in the plan)
- Development of an example GRID model output for runoff volumes needed for the calculations. This will be discussed with the City to refine the output requirements as necessary to fit with the capabilities of the GRID model.

I currently anticipate that a draft of the plan will be available in late February. We discussed mid-February previously, but given all of the data/statistical analyses that will be conducted to understand the data distributions, I am now thinking this could take a little longer.

Thanks.

Carl

Storm Notes Jan 10 2008.doc (4...

Carl Stivers
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cstivers@anchorenv.com

Agreed To Methods or Evaluation Processes for Stormwater Load Calculations

- Agreed that large end of pipe basins are for cross check with land use extrapolated loads only (this includes OF-18, OF-19, and old HWY30)
- Regarding population determination within land use categories:
    - Conduct an outlier analysis first, based on the categorizations agreed to last time
    - Evaluate overlap by chemical between heavy and light industrial categories (potential combining of categories if indicated)
    - Look at variables that might impact data distributions observed to identify reasons for outliers that may indicate a need for removal (or other use) of outliers including:
        - Site drainage size
        - Antecedent storm conditions
        - Impervious surface area
        - Storm sampling coverage
        - Sampling artifacts
        - Groupings of data by site that are unique or different
        - No. of samples in the category
        - Rainfall amount of sampled storm
        - Relationship of TOC to chemical concentrations
        - Relationship of TSS/Rainfall to chemical concentrations
        - Non-stormwater discharges present in sample
        - Amount of baseflow present in sample
- Calculate central tendency for each chemical within each category (or site for unique sites) plus a range of statistics so they are available for future F&T model runs
- Do not use the Spring Sulzer data for anything unless we find out what this outfall drains
- Use study TSS data only for sediment trap loading calculations
    - Use other TSS data from site only as comparison to understand how unusual study TSS data may be
    - Similarly, compare land use City MS4 TSS data to study land use category TSS data
- Pool sediment trap and TSS data within each land use category and calculate loads:
    - Based on a straight TSS values
    - Based on TOC normalized values
    - Using spring data for fall traps where no fall TSS data are available
- Compare average of measured stormwater concentrations to calculated stormwater concentrations from sediment trap/TSS data
    - Are trap calculated concentrations very different from measured stormwater concentrations?
    - If so, use sediment trap loads in F&T model as well as part of sensitivity analysis
    - If not, pick load statistic from stormwater loads per above

- Agreed to monthly runoff calculations of volume for each of F&T model years.

From: Amanda Shellenberger [mailto:ashellenberger@anchorenv.com]
Sent: Monday, February 11, 2008 2:36 PM
To: Carl Stivers; Koch.Kristine@epamail.epa.gov; Sanders, Dawn; Andy Koulermos; Amanda Spencer; mcoover@ensr.aecom.com; Scheffler, Linda; LaFranchise, Nicole; TARNOW Karen E; Laura Jones
Cc: Christine Hawley; Gene Revelas; Jim McKenna; Jessica Pisano; MCCLINCY Matt; Rick Applegate; Bob Wyatt; Valerie Oster
Subject: [Email allowed by Allow List] RE: Feb 7 call Starting at Noon - Stormwater Tech. Team

Stormwater Technical Team -

The Stormwater Technical Team (EPA/DEQ/LWG) discussed the proposed approach for handling stormwater sediment trap samples during our February 7 conference call. Here are the meeting highlights and action items. As always, please let me know if I missed something.

The technical team agreed to the following changes in the LWG proposed analysis prioritization approach:

- Gunderson WR-147and Cascade General WR-161 - Use the mass proposed for PCB's to measure organochlorine pesticides (PCB's were measured last spring)
- OF-22B - Use the mass proposed for PCB's to measure pesticides at the detection limit and use the remaining mass to measure PAH/phthalates (PCB's were measured last spring)
- Hwy 30 "B" - Take enough mass from the amount proposed for PAH/phthalates to measure metals at twice the detection limit. (This would increase the PAH/phthalate detection limit to about 2 times)

The revised prioritization table is attached, with changes shown in yellow.

Other items discussed included:

- Conduct phthalates analysis in stormwater at highway sites if stormwater volume is archived. It was confirmed during the call that there is no archived stormwater available.
- Collect in-line sediments from Arkema.
- Process the OF-18 samples in the following way: (2 Short and 2 Tall bottles were installed in January for comparison purposes)
    - Short January bottles -
        - Measure TS, TOC, and PCB's
    - Tall January bottles -
        - Take aliquot for TS, TOC, and PCB's
        - Composite remainder of sediment with December tall bottles
    - Tall December bottles

- Composite with remainder of January tall bottles and analyze for everything
- Only do grain size after QC samples are obtained

- At other sites where there is extra sediment, use sediment for QC first, then conduct grain size analyses if any sediment remains.

Note that the LWG needs to obtain formal Exec. committee approval for these changes. We will notify the stormwater tech. team if LWG Exec. cannot approve these changes for some reason.

Please let me know if you have any questions, comments, or anything to add. I'd like to send this on to Exec next week for approval if there are no changes.

<<Table 2 - REVISED Sediment Trap Priortization Summary versus detection limits.xls>>

Amanda Shellenberger, P.E.

Anchor Environmental, L.L.C

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Seattle, WA 98101

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Please consider the environment before printing this email.

From: Carl Stivers
Sent: Wednesday, February 06, 2008 5:31 PM
To: Carl Stivers; Koch.Kristine@epamail.epa.gov; Amanda Shellenberger; Sanders, Dawn; Andy Koulermos; Amanda Spencer; mcoover@ensr.aecom.com; Scheffler, Linda; LaFranchise, Nicole; TARNOW Karen E; Laura Jones
Cc: Christine Hawley; Gene Revelas; Jim McKenna; Jessica Pisano; MCCLINCY Matt; Rick Applegate; Bob Wyatt; Valerie Oster
Subject: Feb 7 call Starting at Noon - Stormwater Tech. Team

Stormwater Technical Team -

Our call for tomorrow (Feb 7) starting at 12 pm is still on. Please use the following call in number:

1-866-866-2244

pass code 4265029#

Anchor will be sending out some information on sampling completeness and sediment trap sample masses as soon as we can. Look for this tomorrow morning.

Thanks much.

Carl

Carl Stivers
Anchor Environmental, L.L.C.
23 South Wenatchee Avenue, Suite 120
Wenatchee, WA 98801
Phone: 509-888-2070
Fax: 509-888-2211

cstivers@anchorenv.com

From: Amanda Shellenberger
Sent: Tuesday, February 26, 2008 9:29 AM
To: Amanda Shellenberger; Carl Stivers; 'Koch.Kristine@epamail.epa.gov'; 'Sanders, Dawn'; 'Andy Koulermos'; 'Amanda Spencer'; 'mcoover@ensr.aecom.com'; 'Scheffler, Linda'; 'LaFranchise, Nicole'; 'TARNOW Karen E'; 'Laura Jones'
Cc: 'Christine Hawley'; 'Gene Revelas'; Jim McKenna; Jessica Pisano; 'MCCLINCY Matt'; Rick Applegate; Bob Wyatt; Valerie Oster
Subject: LWG Stormwater - REVISED Sediment Trap Prioritization

Stormwater Tech Team –

I have attached the revised sediment trap prioritization (Revised Table 2 and 3 from our last tech team call) including the sediment collected during the final deployment period. Please reply to all with your agreement or comments within three days. We would like to get this sent to the lab this week if possible.

I added an extra column in Table 2 that explains what changed since last time. In most cases the extra mass just lowered the detection limit of a particular analyte but it some cases we got a bit more sediment and were able analyze a few more things. Changes are shown in red text. I followed the priorities we discussed in the last call.

There are two instances where we decided to take a small amount of mass from the phthalate/PAH analysis and use it to analyze metals.

- At OF-49, this increases the detection limit factor for phthalates/PAH's to 1.8. If we don't analyze metals, we would have a detection limit factor of 1.5 for phthalates/PAH's
- At OF-22C, this increases the detection limit factor for phthalates/PAH's to 1.5. If we don't analyze metals, we would have a detection limit factor of 1.4 for phthalates/PAH's

Also, as discussed last time, we will process the OF-18 samples in the following way: (2 Short and 2 Tall bottles were installed in January for comparison purposes)

- Short January bottles –
  - Measure all analytes (this is different from last time because we now have enough sediment to analyze everything)
- Tall January bottles –
  - Take aliquot for all analytes to compare with short January bottles
  - Composite remainder of sediment with December tall bottles
- Tall December bottles
  - Composite with remainder of January tall bottles and analyze for everything
  - Only do grain size after QC samples are obtained


Table 2 - REVISED 2-26-2008 Se...


Table 3 - REVISED Stormwater O...

Thanks!

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Please consider the environment before printing this email.

Table 2. Sediment Trap Sample Prioritization Summary - Showing Target Detection Limit Factors for LWG Sites and Estimated for T4 Sites*

Outfall(s)	Facility or Location	PCB Congeners	TOC	Percent Solids	Organochlorine pesticides	PAHs and Phthalates	Metals	Herbicides	Grain size	Change since last time
Industrial Locations (6)										
WR-123	Schnitzer International Slip	1	1	1	1	1	1	1		NO CHANGE, already analyzing full suite
WR-96	Arkema									Collected in-line solids, need exec approval to analyze
WR-14	Chevron - Transportation	1	1	1	1	1	1	1		NO CHANGE, already analyzing full suite
WR-161	Portland Shipyard	0	1	1	1	1	1	1.4		Decrease DLF to 1 from 1.6 for PAH/Phthalates, enough mass to measure metals, and herbicides at DLF
WR-142	Gunderson	1.1	1	1						Decrease DLF to 1.1 from 1.7 for PCB's
WR-147/148	Gunderson (former Schnitzer)	0	1	1	1	2				Decrease DLF from 4.1 to 2 for PAH/phthalates
Land Use Locations (5)										
Hwy 30	Hwy 30	1.4	1	1						Decrease DLF from 2.4 to 1.4 for PCB's
Hwy30 "B"	Hwy 30	1	1	1	1	1	1	1		Decrease DLF to 1 for PAH/Phthalates and Metals and enough mass to analyze herbicides
OF-49	City - St. Johns Area	1	1	1	1	1.8	1			Decrease DLF to 1.8 from 4.3 or PAHs/Phthalates, and analyze metals
OF-22B	City - Doane Lake Industrial Area	0	1	1	1	1.5	1			Decrease DLF to 1.5 from 4.2 or PAHs/Phthalates and analyze metals
WR-218	UPRR Albina	1	1	1	1	1	1	1		NO CHANGE, already analyzing full suite
Multiple Land Use Locations (2)										
OF-18	City - Multiple Land Uses	1	1	1	1	1	1	1		NO CHANGE, already analyzing full suite
WR-169	Light Industrial									

*Detection limit factor shows how the target detection limit (DL) will be exceeded with the sample mass remaining. A factor of 1 means the target detection limit will be achieved. A factor of 2 means the actual DL will be two times higher than the target DL.

Chemical detected more than 81% of time in Batch 1 stormwater samples

Chemical detected 61-80% of the time in Batch 1 stormwater samples

Chemical detected 41-60% of the time in Batch 1 stormwater samples

Chemical detected 21-40% of the time in Batch 1 stormwater samples

Chemical detected 0-20% of the time in Batch 1 stormwater samples or not sampled

Sample Name	Facility or Location	Land Use	Total Mass (g)	Total Solids (%)	Total Dry Mass (g)	Wet/Dry	Priority	Analyte	Minimum Sample Size (g)	Aliquot Size (g)	Remaining Mass (g)	Notes
Sediment Trap Samples												
			17.3			Wet	1C	Percent solids	1	1.5	15.8	
						Wet	1B	TOC [1]	0.1	0.1	15.7	
			15.7	46.3	7.3	Dry	1A	PCB congeners [3]	10	7.3	0.0	
S10-H30	Hwy 30	Major Transportation				Dry	2	Organochlorine pesticides [2]	10			DL for PCB congeners increases 1.4x.
						Dry	3	PAHs/Phthalates [4]	20			
						Wet	4	Metals	7			
						Dry	5	Herbicides [5]	20			
			244.9			Wet	1C	Percent solids	1	1.4	243.5	
						Wet	1B	TOC	0.1	0.1	243.4	
			243.4	9.9	24.0	Dry	1A	PCB congeners	10	--	--	
S10-OF22B	City - Doane Lake Industrial Area	Heavy Industrial				Dry	2	Organochlorine pesticides	10	10	14.0	DL for PAHs/Phthalates increases 1.5x.
						Dry	3	PAHs/Phthalates	20	13.0	1.0	
						Wet	4	Metals	7	1		
						Dry	5	Herbicides	20			
			26.6			Wet	1C	Percent solids	1	1.2	25.4	
						Wet	1B	TOC	0.1	0.1	25.3	
			25.3	36.1	9.1	Dry	1A	PCB congeners	10	9.1	0.0	
S10-WR142	Gunderson	Heavy Industrial				Dry	2	Organochlorine pesticides	10			DL for PCB congeners increases 1.1x.
						Dry	3	PAHs/Phthalates	20			
						Wet	4	Metals	7			
						Dry	5	Herbicides	20			
			102.2			Wet	1C	Percent solids	1	1.2	101.0	
						Wet	1B	TOC	0.1	0.1	100.9	
			100.9	33.3	33.6	Dry	1A	PCB congeners	10	10	23.6	
S10-OF49	City - St. Johns Area	Residential				Dry	2	Organochlorine pesticides	10	10	13.6	DL for PAHs/Phthalates increases 1.8x.
						Dry	3	PAHs/Phthalates	20	11.3	2.3	
						Wet	4	Metals	7	2.3		
						Dry	5	Herbicides	20			
			54.6			Wet	1C	Percent solids	1	1.2	53.4	
						Wet	1B	TOC	0.1	0.1	53.3	
			53.3	37.2	19.8	Dry	1A	PCB congeners	10	--	--	
S10-WR147	Gunderson (formerly Schnitzer)	Heavy Industrial				Dry	3	Organochlorine pesticides	10	10	9.8	DL for PAHs/Phthalates increases 2x.
						Dry	2	PAHs/Phthalates	20	9.8	0.0	
						Wet	4	Metals	7			
						Dry	5	Herbicides	20			

Sample Name	Facility or Location	Land Use	Total Mass (g)	Total Solids (%)	Total Dry Mass (g)	Wet/Dry	Priority	Analyte	Minimum Sample Size (g)	Aliquot Size (g)	Remaining Mass (g)	Notes
S10-WR161	Portland Shipyard	Heavy Industrial	128.3			Wet	1C	Percent solids	1	1.4	126.9	
						Wet	1B	TOC	0.1	0.1	126.8	
			126.8	40.8	51.7	Dry	1A	PCB congeners	10	10	41.7	
						Dry	2	PAHs/Phthalates	20	20	21.7	DL for Herbicides increases 4.3x.
						Dry	3	Organochlorine pesticides	10	10	11.7	
						Wet	4	Metals	7	7	4.7	
						Dry	5	Herbicides	20	4.7	0.0	
S10-H30B	Hwy 30	Major Transportation	222.3			Wet	1C	Percent solids	1	1.7	220.6	
						Wet	1B	TOC	0.1	0.1	220.5	
			220.5	50.9	112.2	Dry	1A	PCB congeners	10	10	102.2	Approximately 45g dry wt. (88g wet wt.) remaining. **This sample could be used for lab and/or field QC analyses.**
						Dry	2	Organochlorine pesticides	10	10	92.2	
						Dry	3	PAHs/Phthalates	20	20	72.2	
						Wet	4	Metals	7	7	65.2	
						Dry	5	Herbicides	20	20	**45.2**	
S10-WR218	UPRR Albina	Heavy Industrial	829.6			Wet	1C	Percent solids	1	2.60	827.0	
						Wet	1B	TOC	0.1	0.1	826.9	
			826.9	63.9	528.4	Dry	1A	PCB congeners	10	10	518.4	Approximately 461g dry wt. (721g wet wt.) remaining. **This sample could be used for lab and/or field QC analyses.**
						Dry	2	Organochlorine pesticides	10	10	508.4	
						Dry	3	PAHs/Phthalates	20	20	488.4	
						Wet	4	Metals	7	7	481.4	
						Dry	5	Herbicides	20	20	**461.4**	
S10-WR123	Schnitzer International Slip	Heavy Industrial	549.1			Wet	1C	Percent solids	1	1.5	547.6	
						Wet	1B	TOC	0.1	0.1	547.5	
			547.5	35.9	196.6	Dry	1A	PCB congeners	10	10	186.6	Approximately 129g dry wt. (359g wet wt.) remaining. **This sample could be used for lab and/or field QC analyses.**
						Dry	2	PAHs/Phthalates	20	20	166.6	
						Dry	3	Organochlorine pesticides	10	10	156.6	
						Wet	4	Metals	7	7	149.6	
						Dry	5	Herbicides	20	20	**129.6**	
S10-OF18S	City - Multiple Land Uses	Open Space/Heavy Industrial	204.7			Wet	1C	Percent solids	1	1.9	202.8	
						Wet	1B	TOC	0.1	0.1	202.7	
			202.7	54.1	109.7	Dry	1A	PCB congeners	10	10	99.7	Approximately 42g dry wt. (77g wet wt.) remaining. **This sample could be used for lab and/or field QC analyses.**
						Dry	2	Organochlorine pesticides	10	10	89.7	
						Dry	3	PAHs/Phthalates	20	20	69.7	
						Wet	4	Metals	7	7	62.7	
						Dry	5	Herbicides	20	20	42.7	

Sample Name	Facility or Location	Land Use	Total Mass (g)	Total Solids (%)	Total Dry Mass (g)	Wet/Dry	Priority	Analyte	Minimum Sample Size (g)	Aliquot Size (g)	Remaining Mass (g)	Notes
S10-WR14	Chevron - Transportation	Heavy Industrial	167.3			Wet	1C	Percent solids	1	1.7	165.6	Approximately 26g dry wt. (46g wet wt.) remaining. **This sample could be used for lab and/or field QC analyses.**
						Wet	1B	TOC	0.1	0.1	165.5	
			165.5	56.4	93.3	Dry	1A	PCB congeners	10	10	83.3	
						Dry	2	PAHs/Phthalates	20	20	63.3	
						Dry	3	Organochlorine pesticides	10	10	53.3	
						Wet	4	Metals	7	7	46.3	
						Dry	5	Herbicides	20	20	**26.3**	
S10-OF18T	City - Multiple Land Uses	Open Space/Heavy Industrial	745.4			Wet	1C	Percent solids	1	2.35	743.1	Approximately 363g dry wt. (626g wet wt.) remaining. **This sample could be used for lab and/or field QC analyses.**
						Wet	1B	TOC	0.1	0.1	743.0	
			743.0	57.9	430.2	Dry	1A	PCB congeners	10	10	420.2	
						Dry	2	Organochlorine pesticides	10	10	410.2	
						Dry	3	PAHs/Phthalates	20	20	390.2	
						Wet	4	Metals	7	7	383.2	
						Dry	5	Herbicides	20	20	**363.2**	
S10-OF18 T07	City - Multiple Land Uses	Open Space/Heavy Industrial	3003			Wet	1C	Percent solids	1	1.8	3001.2	Approximately 1727g dry wt. (2887g wet wt.) remaining. **This sample could be used for lab and/or field QC analyses.**
						Wet	1B	TOC	0.1	0.1	3001.1	
			3001.1	59.8	1794.7	Dry	1A	PCB congeners	10	10	1784.7	
						Dry	2	Organochlorine pesticides	10	10	1774.7	
						Dry	3	PAHs/Phthalates	20	20	1754.7	
						Wet	4	Metals	7	7	1747.7	
						Dry	5	Herbicides	20	20	**1727.7**	

Notes:

[1] The absolute minimum amount of sample needed for TOC analysis is 100mg (0.1g); this sample amount will lead to elevated detection limits, but we are expecting detected levels in each sample, therefore elevated DLs will not affect the quality of the data.

[2] 10g dry weight is the minimum amount needed for pesticide analysis. If needed, the final extract volume will be reduced to approximately 1/2 the initial volume to meet project MRLs.

[3] 10g dry weight is the minimum amount needed for PCB congener analysis. It is possible to use less sample mass for this analysis, but the results on reporting limits and quality of results is unknown at this time due to possibility of surrogate crystallization.

[4] 20g dry weight is the minimum amount needed for a co-extraction for PAHs and phthalates. If needed, the final extract volume will be reduced to approximately 1/2 the initial volume to meet project MRLs.

[5] 20g dry weight is the minimum amount needed for herbicide analysis. If needed, the final extract volume will be reduced to approximately 1/3 the initial volume to meet project MRLs.

-- Only percent solids analyses have been conducted to date. Sediment trap samples are currently being archived (frozen) pending further instruction for analysis.

From: Laura Jones [mailto:ljones@integral-corp.com]
Sent: Tuesday, February 26, 2008 11:16 AM
To: Amanda Shellenberger; Carl Stivers; Koch.Kristine@epamail.epa.gov; Sanders, Dawn; Andy Koulermos; Amanda Spencer; mcoover@ensr.aecom.com; Scheffler, Linda; LaFranchise, Nicole; TARNOW Karen E
Cc: Christine Hawley; Gene Revelas; Jim McKenna; Jessica Pisano; MCCLINCY Matt; Rick Applegate; Bob Wyatt; Valerie Oster
Subject: RE: LWG Stormwater - REVISED Sediment Trap Prioritization

Hi – The revised prioritization table is fine with me. I agree with taking a small aliquot from the PAH/phthalate aliquot for metals analysis in outfalls 49 and 22C. Please also note that we will be asking the lab to "create" a field duplicate and will also need 2 additional aliquots for laboratory QC. We will ask the lab to create the field and lab QC samples from the OF-18 T07 sample, since we have abundant sample mass remaining. Please let me know if you have any questions about the field or lab QC samples.

Laura

From: Scheffler, Linda [LindaSC@BES.CI.PORTLAND.OR.US]
Sent: Thursday, February 28, 2008 5:04 PM
To: Amanda Shellenberger; Carl Stivers; Koch.Kristine@epamail.epa.gov; Sanders, Dawn; Andy Koulermos; Amanda Spencer; mcoover@ensr.aecom.com; LaFranchise, Nicole; TARNOW Karen E; Laura Jones
Cc: Christine Hawley; Gene Revelas; Jim McKenna; Jessica Pisano; MCCLINCY Matt; Rick Applegate; Bob Wyatt; Valerie Oster
Subject: RE: LWG Stormwater - REVISED Sediment Trap Prioritization

Follow Up Flag: Follow up
Flag Status: Red

No comments from the City on the changes, other than needing to clarify the location name for Hwy 30. As the first data set collected as Hwy 30 represented a combination of Hwy 30 and the adjacent industrial area, and all field notes etc. likely refer to it as "Hwy 30", this location should be renamed to distinguish it from the earlier data. "Hwy 30 A"?

Good to see that you got a little more volume to work with. Thanks.

Linda

Linda Scheffler
City of Portland
Bureau of Environmental Services
(503) 823-2296

-----Original Message-----
From: Koch.Kristine@epamail.epa.gov [mailto:Koch.Kristine@epamail.epa.gov]
Sent: Monday, March 03, 2008 2:59 PM
To: Amanda Shellenberger
Subject: Re: FW: LWG Stormwater - REVISED Sediment Trap Prioritization

Amanda - I'm so sorry. I was out of the office last Wed - Fri with a sick child. I just looked it over and it looks fine to me, so go ahead and present to Exec.

Kristine Koch
Remedial Project Manager
USEPA, Office of Environmental Cleanup

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From: Valerie Oster [mailto:voster@anchorenv.com]
Sent: Monday, March 10, 2008 11:24 AM
To: Humphrey.Chip@epamail.epa.gov; Blischke.Eric@epamail.epa.gov; Koch.Kristine@epamail.epa.gov
Cc: Bob Wyatt; david.ashton@portofportland.com; wolffg@plu.edu; J Betz; Jim.McKenna@portofportland.com; Patty Dost (Schwabe); Rick Applegate; Valerie Oster; Amanda Shellenberger; Carl Stivers; ashellenberger@anchorenv.com; Amanda Spencer; Carl Stivers; Dave Livesay; G Koschal; Gene Revelas; johnt@windwardenv.com; Snyder, Joan; Kevin Parrett; ljones@integral-corp.com; Mark Lewis; mcoover@ensr.aecom.com; Nancy Musgrove; Sean Gormley; Sheila David; Taku Fuji; voster@anchorenv.com; Keith Pine
Subject: FW: Stormwater Items for EPA review and approval

Chip, Eric, Kristine -

Please see below and attached.

thanks
Valerie

Valerie Thompson Oster

Anchor Environmental, L.L.C

6650 SW Redwood Lane, Suite 333

Portland, OR 97224

Phone: 503-670-1108 x19

Cell: 503-577-0254

Fax: 503-670-1128

From: Amanda Shellenberger
Sent: Friday, March 07, 2008 12:36 PM
To: Valerie Oster
Cc: Carl Stivers
Subject: FW: Stormwater Items - Exec Approval

Chip, Eric, Kristine - See below and attached for three items for your review and approval

Item 1 - Stormwater Sediment Trap Sample Analyses

The EPA/DEQ/LWG Stormwater Technical Team agreed today, with LWG approval, to proceed with the stormwater sediment trap sample analyses as summarized in the attached Table 1. We are seeking EPA approval to proceed with this sample handling approach and instruct the laboratories to proceed with these analyses.

Similar to the spring approach, where a number is indicated in a particular cell of this table, sediment volume will be devoted to the analyte category noted for that station. Where there is no number in a cell of the table, there will be insufficient sample to conduct an analyses for that analyte category for that station. The number value indicates the expected detection limit for that sample above the target detection limit. Thus, a value of "1" indicates the target detection limit will be achieved and a value of "2" indicates a detection limit twice the target detection limit will be achieved. The value zero, indicates the analyte in question will be skipped over for a lower priority analyte, due to the fact that data on that analyte was obtained in the Spring 07 event.

Item 2 - Use of sediment from WR-96 Arkema Outfall

The EPA/DEQ/LWG Stormwater Technical team suggested the use of sediment collected from within the outfall structure at Arkema WR-96 for sediment sample analysis since the sediment trap bottles had no measurable sediment but there was a large amount of sediment accumulated around the bottles. Sediment was collected using a stainless steel spoon and transferred into a glass jar from the outfall near where the sediment traps were installed at WR-96. This sediment is currently archived in the field lab pending EPA approval to send it to the laboratory for analysis.

Item 3 - Completion of Stormwater Sampling

After the completion of Round 3A Upland Stormwater Sampling in spring of

2007, the stormwater technical team discussed data gaps and proposed additional sampling starting in Fall 2007 to fill final important data gaps in composite water samples and sediment traps. The sampling effort for this second round of sampling was detailed in the Round 3A FSP Addendum Stormwater Sampling. The second round of stormwater sampling was completed at the end of January.

FSP Addendum requirements for composite stormwater sampling were met at nine of the ten sites, including one Port of Portland site. At one site, Sulzer WR-4, only two composite sample events were collected, with all required analytes measured twice except for herbicides which was measured once.

FSP Addendum requirements for sediment trap samples called for collecting sediment at 14 sites, and sediment was collected at eleven of these sites. No information was available for the Port of Portland site WR-169. At one site, Sulzer WR-4, it was not feasible to collect sediment. At another site, Arkema WR-96, no sediment was collected in the jars, so sediment was collected from within the catch basin and archived for possible analysis. At the 11 successful sites, sufficient sediment was collected to conduct all analyses at 5 sites. For the remaining six sites, in most cases the majority of the analyses will be conducted using the priority analysis order discussed in the FSP.

On this basis, it is the opinion of the LWG that the objectives of the stormwater sampling program as outlined by the original Spring FSP and Fall FSP addendum have been met and no further stormwater or inline sediment trap sampling needs to be conducted.

Thanks.

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Table 1. Sediment Trap Sample Prioritization Summary - Showing Target Detection Limit Factors*

Outfall(s)	Facility or Location	PCB Congeners	TOC	Percent Solids	Organochlorine pesticides	PAHs and Phthalates	Metals	Herbicides	Grain size
Industrial Locations (6)									
WR-123	Schnitzer International Slip	1	1	1	1	1	1	1	
WR-96	Arkema								
WR-14	Chevron - Transportation	1	1	1	1	1	1	1	
WR-161	Portland Shipyard	0	1	1	1	1	1	4.3	
WR-142	Gunderson	1.1	1	1					
WR-147/148	Gunderson (former Schnitzer)	0	1	1	1	2			
Land Use Locations (5)									
Hwy 30	Hwy 30	1.4	1	1					
Hwy30 "B"	Hwy 30	1	1	1	1	1	1	1	
OF-49	City - St. Johns Area	1	1	1	1	1.8	1		
OF-22B	City - Doane Lake Industrial Area	0	1	1	1	1.5	1		
WR-218	UPRR Albina	1	1	1	1	1	1	1	
Multiple Land Use Locations (2)									
OF-18	City - Multiple Land Uses	1	1	1	1	1	1	1	
WR-169	Light Industrial								

*Detection limit factor shows how the target detection limit (DL) will be exceeded with the sample mass remaining. A factor of 1 means the target detection limit will be achieved. A factor of 2 means the actual DL will be two times higher than the target DL.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
OREGON OPERATIONS OFFICE
805 SW Broadway, Suite 500
Portland, Oregon 97205

March 24, 2008

Mr. Jim McKenna
Port of Portland & Co-Chairman, Lower Willamette Group
121 NW Everett
Portland, Oregon 97209

Mr. Robert Wyatt
Northwest Natural & Co-Chairman, Lower Willamette Group
220 Northwest Second Avenue
Portland, Oregon 97209

Re: Portland Harbor Superfund Site; Administrative Order on Consent for Remedial Investigation and Feasibility Study; Docket No. CERCLA-10-2001-0240
Status of Round 3 Sampling Activities

Dear Messrs. Wyatt and McKenna:

The Lower Willamette Group (LWG) has requested documentation from EPA that Round 3B data collection activities at the Portland Harbor site have been completed. EPA concurs that all Round 3B data collection activities associated with the following approved Field Sampling Plans (FSPs) have been completed:

- Round 3B Comprehensive Sediment and Bioassay FSP (conditionally approved on November 9, 2007);
- The Round 3B FSP for Fish and Invertebrate Tissue and Collocated Surface Sediment (approved on December 3, 2007);
- The Round 3 Groundwater Pathway Assessment, FSP for Stratigraphic Assessment and Transition Zone Water Sampling – Gunderson (approved on October 11, 2007);
- The Round 3A Stormwater FSP Addendum (approved November 6, 2007);
- The Round 3 Lamprey Toxicity FSP Addendum (approved August 17, 2007);

The attached Table 1 summarizes the status of all Round 3A and 3B data collection activities. As indicated in the table, there are three outstanding data collection efforts:

The Round 3B Side Scan Sonar Field Sampling Plan: The side-scan sonar data collection effort is primarily for the purpose of debris identification to support the Portland Harbor feasibility

study. The Side-Scan Sonar FSP was submitted to EPA on January 18, 2008. EPA provided comments on this document on March 13, 2008.

The Round 3B Sediment Mobility Study: A proposal for performing sediment mobility testing was submitted on December 11, 2007. EPA provided comments on this proposal on January 24, 2008. A Sediment Mobility FSP is expected on March 24, 2008.

The Collection of Bird Eggs: EPA believes that osprey eggs may serve as a useful long-term monitoring tool following cleanup activities at the Portland Harbor site. EPA also believes that a unique opportunity exists to partner with work being proposed by the Portland Harbor Natural Resource Trustee Council, the United States Geological Survey (USGS) and the U.S. Fish and Wildlife Service. Egg collection and processing will be coordinated with USGS and USFW and will take advantage of existing permits held by USGS for the collection of eggs. Approximately ten bird eggs will be targeted for collection (six to eight nest sites within Portland Harbor with the remainder reference sites located upstream from Portland Harbor but below Willamette Falls). The work to be performed by the LWG would include egg collection and processing support and chemical analysis of the eggs. Egg tissues would be analyzed for selected chemicals including organochlorine pesticides, polychlorinated biphenyls (PCBs), chlorinated dibenzo-dioxins and furans, mercury and polybrominated diphenyl ethers (PBDEs).

In addition to the above items, EPA and the LWG have not resolved whether lamprey ammocoete tissue analysis is required as part of the water toxicity testing completed in January 2008. Discussion between the EPA and the LWG on this topic is ongoing.

As stated previously by EPA, the data collection needed to support the RI and risk assessment phase of the Portland Harbor RI/FS is essentially complete. Data needs currently being pursued are related to the Portland Harbor FS and the establishment of baseline conditions to support future long-term monitoring efforts. Although EPA does not anticipate any additional data collection to support the RI and baseline risk assessment at this time, the draft RI, baseline risk assessment and/or FS reports may identify additional data requirements that must be addressed to support remedial action decisions at the Portland Harbor site.

If you have any questions, please contact Chip Humphrey at (503) 326-2678 or Eric Blischke (503) 326-4006. All legal inquiries should be directed to Lori Cora at (206) 553-1115.

Sincerely,

Chip Humphrey
Eric Blischke
Remedial Project Managers

cc: Greg Ulirsch, ATSDR
Rob Neely, NOAA
Ted Buerger, US Fish and Wildlife Service
Preston Sleeger, Department of Interior
Jim Anderson, DEQ
Kurt Burkholder, Oregon DOJ
David Farrer, Oregon Environmental Health Assessment Program
Rick Keppler, Oregon Department of Fish and Wildlife
Michael Karnosh, Confederated Tribes of Grand Ronde
Tom Downey, Confederated Tribes of Siletz
Audie Huber, Confederated Tribes of Umatilla
Brian Cunninghame, Confederated Tribes of Warm Springs
Erin Madden, Nez Perce Tribe
Rose Longoria, Confederated Tribes of Yakama Nation

Table 1
Round 3 Data Gap Summary Table
March 24,2008

Data Needs	Round	LWG Proposed Samples	Additional 3B Data Needs Proposed by EPA	Notes and Current Status
Site Wide Data Needs				
Upstream Site Boundary	3A	8 sediment cores and 3 radioisotope cores	Contingent on results of Round 3A.	Sediment samples collected between RM 11 and 12.2 during Round 3B. No additional sampling anticipated.
Downstream Site Boundary	3A	12 grab samples and 7 sediment cores	Additional data collection unlikely.	Sediment samples collected between RM 1 and 2 during Round 3A. No additional sampling anticipated.
Riparian Soil	NA	None proposed	None - upland data gap.	No additional sampling anticipated.
Multnomah Channel	3B	10 sediment samples based on bathymetric survey results	General scope and scale of LWG proposal is acceptable.	Sediment samples collected during Round 3B; no additional sampling anticipated.
Non-AOPC Subsurface Sediments	3B	Contingent on additional data evaluation	10 - 12 sediment cores.	Sediment samples collected throughout study area during round 3B; no additional sampling anticipated.
Upstream - Background	3B	Approximately 20 sediment samples	General scope and scale is acceptable. Finalize sample numbers based on statistical analysis. Supplement with pulp mill site investigation data.	Sediment samples collected during Round 3B; no additional sampling anticipated.
Upstream Surface Water	3A	Transects at RM 16 and 11	Contingent on results of Round 3A and results of fate and transport modeling effort.	Surface water data collected during Round 3A; no additional sampling anticipated.
Upstream Biota	NA	None proposed	Upstream biota not required at this time.	No additional sampling anticipated.
HHRA				
Tissue chemistry	NA	None proposed	Biota tissue required to ensure adequate spatial coverage and full range of contaminant concentrations.	Tissue samples collected throughout study area during round 3B; no additional sampling anticipated.

Table 1
Round 3 Data Gap Summary Table
March 24,2008

Data Needs	Round	LWG Proposed Samples	Additional 3B Data Needs Proposed by EPA	Notes and Current Status
ERA				
Lamprey Ammocoete Tissue	3A	5 ammocoetes and 3 macrothalmia	Contingent on results of Round 3A.	Lamprey tissue collected during Round 3A; no additional sampling anticipated.
Lamprey Ammocoete Toxicity	3A	Range finding and definitive toxicity testing	Definitive toxicity testing proceeding as part of Round 3A.	Water toxicity testing completed; no additional testing anticipated.
Pre-Breeding Sturgeon	3A	15 individual fish	Additional data collection unlikely.	Sturgeon tissue collected during Round 3A; no additional sampling anticipated.
Tissue chemistry	3B	None Proposed	Biota tissue required to ensure adequate spatial coverage and full range of contaminant concentrations.	Tissue samples collected throughout study area during round 3B; no additional sampling anticipated.
Sediment Bioassays	3B	12 Bioassays in upper end of study area	44 bioassays recommended to support ERA.	55 bioassays collected during Round 3B; no additional sampling or testing anticipated.
TPH/PAH Evaluation for Bioavailability	3B	TBD	TBD	Alkylated PAHs included as Round 3B sediment analysis. Further evaluation of pyrogenic/petrogenic sources may be necessary; no additional sampling anticipated.
Bird Eggs	NA	TBD	TBD based on review of USGS osprey egg data.	**Analysis of bird eggs collected by USGS may be necessary as part of baseline monitoring program. Further disucussion required.**

Table 1
Round 3 Data Gap Summary Table
March 24,2008

Data Needs	Round	LWG Proposed Samples	Additional 3B Data Needs Proposed by EPA	Notes and Current Status
Fate and Transport Analysis				
Sediment Trap	3A	12 Sediment Trap locations	Additional data collection unlikely.	Four quarters of sediment trap samples collected during 2007; no additional sampling anticipated.
Stormwater Loading	3A	30 Stormwater sample locations	Additional data collection unlikely as part of Portland Harbor RI/FS. Additional sampling may be conducted as part of source control efforts.	Stormwater sampling completed in 2007 (water fraction). Solid fraction sampling currently underway.
Surface Water Loading	3A	23 Surface Water Samples	TBD based on results of hybrid fate and transport model.	Surface water data collected during Round 3A; no additional sampling anticipated.
TZW Loading	3B	None proposed	Additional data collection unlikely.	TZW sampling pefromed at GASCO. Stratigraphic coring performed offshore of Gunderson. Discsussions ongoing at RPAC. No additional sampling by LWG antiicipated.
Food Web Model				
Surface Water	3A	23 Surface Water Samples	Additional data collection unlikely.	Surface water data collected during Round 3A. No additional surface water data anticipated to support the food web model. See above note regarding the F&T Model.
Tissue chemistry	3B	None Proposed	Biota tissue required to support food web model or for enhanced understanding of bioaccumulative relationships.	Tissue samples collected throughout study area during round 3B; no additional sampling anticipated.

Table 1
Round 3 Data Gap Summary Table
March 24,2008

Data Needs	Round	LWG Proposed Samples	Additional 3B Data Needs Proposed by EPA	Notes and Current Status
Feasibility Study				
Treatability Studies	3B	TBD based on results of treatment technologies literature review	TBD	Based on our review of the literature survey for treatment technologies, EPA has determined that treatability studies are not required.
Debris Identification	3B	Side scan sonar on each AOPC	TBD	*Side scan sonar survey proposed by LWG. FSP is under review.*
Mobility Testing	3B	None proposed	Three mobility tests proposed.	*LWG proposal for mobility testing submitted. EPA has requested that LWG develop a mobility testing FSP.*
TPH/PAH Evaluation for Source ID	3B	TBD	TBD	Alkylated PAHs included as Round 3B sediment analysis. Further evaluation of pyrogenic/petrogenic sources may be necessary; no additional sampling anticipated.
Upstream Tissue Chemistry	NA	None proposed	Upstream biota not required at this time.	No additional sampling anticipated.
Site Wide AOPC				
Sediment chemistry	3B	None proposed	Additional sediment data to ensure adequate site coverage may be required.	Approximately 200 surface sediment samples collected through study area as part of Round 3B; no additional sampling anticipated.
Tissue chemistry	3B	None proposed	Additional tissue chemistry likely required to support food web model or for enhanced understanding of bioaccumulative relationships.	Tissue samples collected throughout study area during round 3B; no additional sampling anticipated.
Surface Water	NA	None proposed	Additional data collection unlikely.	Surface water data collected during Round 3A. No additional surface water data anticipated to support the site-wide AOPC. See above note regarding the F&T Model.
Transition Zone Water	3B	None proposed	Additional data collection unlikely.	TZW sampling pefromed at GASCO. Stratigraphic coring performed offshore of Gunderson. Discsussions ongoing at RPAC. No additional sampling by LWG antiicipated.

Table 1
Round 3 Data Gap Summary Table
March 24,2008

Data Needs	Round	LWG Proposed Samples	Additional 3B Data Needs Proposed by EPA	Notes and Current Status
AOPC Specific Data Needs				
Surface Sediment Chemistry	3B	49 surface grabs and 30 sediment cores (0 - 6" interval)	136 additional surface sediment samples required to ensure adequate spatial coverage.	Approximately 200 surface sediment samples collected as part of Round 3B; no additional sampling anticipated.
Subsurface Sediment Chemistry	3B	30 sediment cores	Additional subsurface sediment likely to determine vertical extent of contamination.	Approximately 100 subsurface sediment samples collected as part of Round 3B; no additional sampling anticipated.
Transition Zone Water	3B	None proposed	Additional TZW required at select facilities	TZW sampling pefromed at GASCO. Stratigraphic coring performed offshore of Gunderson. Discsussions ongoing at RPAC. No additional sampling by LWG antiicipated.
Groundwater Seeps	NA	None proposed	None - upland data gap.	No additional sampling anticipated.
Surface Sediment Toxicity	3B	12 bioassays proposed.	44 additional bioassays recommended to support ERA.	55 bioassays collected during Round 3B; no additional sampling or testing anticipated.

Notes:
Bolded Text: Unresolved. Further discussion required.
Italicized Text: FS data need. Plans for collecting data in 2008 are underway.

APPENDIX BB

Flowlink Data Tables

Figure E-4 WR-96 Arkema

November 27th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/26/2007 2:00:00 PM	0.000				0.00
11/26/2007 2:05:00 PM	0.000				
11/26/2007 2:10:00 PM	0.000				
11/26/2007 2:15:00 PM	0.000				
11/26/2007 2:20:00 PM	0.000				
11/26/2007 2:25:00 PM	0.000				
11/26/2007 2:30:00 PM	0.000				
11/26/2007 2:35:00 PM	0.000				
11/26/2007 2:40:00 PM	0.000				
11/26/2007 2:45:00 PM	0.000				
11/26/2007 2:50:00 PM	0.000				
11/26/2007 2:55:00 PM	0.000				
11/26/2007 3:00:00 PM	0.000				0.00
11/26/2007 3:05:00 PM	0.000				
11/26/2007 3:10:00 PM	0.000				
11/26/2007 3:15:00 PM	0.000				
11/26/2007 3:20:00 PM	0.000				
11/26/2007 3:25:00 PM	0.000				
11/26/2007 3:30:00 PM	0.000				
11/26/2007 3:35:00 PM	0.000				
11/26/2007 3:40:00 PM	0.000				
11/26/2007 3:45:00 PM	0.000				
11/26/2007 3:50:00 PM	0.000				
11/26/2007 3:55:00 PM	0.000				
11/26/2007 4:00:00 PM	0.000				0.10
11/26/2007 4:05:00 PM	0.000				
11/26/2007 4:10:00 PM	0.000				
11/26/2007 4:15:00 PM	0.000				
11/26/2007 4:20:00 PM	0.000				
11/26/2007 4:25:00 PM	0.000				
11/26/2007 4:30:00 PM	0.000				
11/26/2007 4:35:00 PM	0.000				
11/26/2007 4:40:00 PM	0.000				
11/26/2007 4:45:00 PM	0.000				
11/26/2007 4:50:00 PM	0.000				
11/26/2007 4:55:00 PM	0.000				
11/26/2007 5:00:00 PM	0.000				0.10
11/26/2007 5:05:00 PM	0.000				
11/26/2007 5:10:00 PM	0.000				
11/26/2007 5:15:00 PM	0.000				
11/26/2007 5:20:00 PM	0.000				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/26/2007 5:25:00 PM	0.000				
11/26/2007 5:30:00 PM	0.000				
11/26/2007 5:35:00 PM	0.000				
11/26/2007 5:40:00 PM	0.000				
11/26/2007 5:45:00 PM	0.000				
11/26/2007 5:50:00 PM	0.000				
11/26/2007 5:55:00 PM	0.003				
11/26/2007 5:58:00 PM				1	
11/26/2007 6:00:00 PM	0.015				0.08
11/26/2007 6:05:00 PM	0.024				
11/26/2007 6:08:00 PM				1	
11/26/2007 6:10:00 PM	0.029				
11/26/2007 6:15:00 PM	0.036				
11/26/2007 6:18:00 PM				1	
11/26/2007 6:20:00 PM	0.046				
11/26/2007 6:25:00 PM	0.053				
11/26/2007 6:28:00 PM				1	
11/26/2007 6:30:00 PM	0.057				
11/26/2007 6:35:00 PM	0.060				
11/26/2007 6:38:00 PM				1	
11/26/2007 6:40:00 PM	0.061				
11/26/2007 6:45:00 PM	0.065				
11/26/2007 6:48:00 PM				1	
11/26/2007 6:50:00 PM	0.067				
11/26/2007 6:55:00 PM	0.067				
11/26/2007 6:58:00 PM				1	
11/26/2007 7:00:00 PM	0.068				0.01
11/26/2007 7:05:00 PM	0.069				
11/26/2007 7:08:00 PM				1	
11/26/2007 7:10:00 PM	0.068				
11/26/2007 7:15:00 PM	0.069				
11/26/2007 7:18:00 PM				1	
11/26/2007 7:20:00 PM	0.069				
11/26/2007 7:25:00 PM	0.068				
11/26/2007 7:28:00 PM				1	
11/26/2007 7:30:00 PM	0.067				
11/26/2007 7:35:00 PM	0.067				
11/26/2007 7:38:00 PM				2	
11/26/2007 7:40:00 PM	0.067				
11/26/2007 7:45:00 PM	0.067				
11/26/2007 7:48:00 PM				2	
11/26/2007 7:50:00 PM	0.065				
11/26/2007 7:55:00 PM	0.065				
11/26/2007 7:58:00 PM				2	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/26/2007 8:00:00 PM	0.067				0.00
11/26/2007 8:05:00 PM	0.066				
11/26/2007 8:08:00 PM				2	
11/26/2007 8:10:00 PM	0.066				
11/26/2007 8:15:00 PM	0.065				
11/26/2007 8:18:00 PM				2	
11/26/2007 8:20:00 PM	0.064				
11/26/2007 8:25:00 PM	0.064				
11/26/2007 8:28:00 PM				2	
11/26/2007 8:30:00 PM	0.063				
11/26/2007 8:35:00 PM	0.062				
11/26/2007 8:38:00 PM				2	
11/26/2007 8:40:00 PM	0.061				
11/26/2007 8:45:00 PM	0.060				
11/26/2007 8:48:00 PM				2	
11/26/2007 8:50:00 PM	0.059				
11/26/2007 8:55:00 PM	0.059				
11/26/2007 8:58:00 PM				2	
11/26/2007 9:00:00 PM	0.058				0.00
11/26/2007 9:05:00 PM	0.057				
11/26/2007 9:08:00 PM				2	
11/26/2007 9:10:00 PM	0.057				
11/26/2007 9:15:00 PM	0.057				
11/26/2007 9:18:00 PM				3	
11/26/2007 9:20:00 PM	0.057				
11/26/2007 9:25:00 PM	0.057				
11/26/2007 9:28:00 PM				3	
11/26/2007 9:30:00 PM	0.056				
11/26/2007 9:35:00 PM	0.055				
11/26/2007 9:38:00 PM				3	
11/26/2007 9:40:00 PM	0.056				
11/26/2007 9:45:00 PM	0.055				
11/26/2007 9:48:00 PM				3	
11/26/2007 9:50:00 PM	0.056				
11/26/2007 9:55:00 PM	0.055				
11/26/2007 9:58:00 PM				3	
11/26/2007 10:00:00 PM	0.055				0.00
11/26/2007 10:05:00 PM	0.055				
11/26/2007 10:08:00 PM				3	
11/26/2007 10:10:00 PM	0.055				
11/26/2007 10:15:00 PM	0.055				
11/26/2007 10:18:00 PM				3	
11/26/2007 10:20:00 PM	0.053				
11/26/2007 10:25:00 PM	0.053				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/26/2007 10:28:00 PM				3	
11/26/2007 10:30:00 PM	0.053				
11/26/2007 10:35:00 PM	0.053				
11/26/2007 10:38:00 PM				3	
11/26/2007 10:40:00 PM	0.053				
11/26/2007 10:45:00 PM	0.053				
11/26/2007 10:48:00 PM				3	
11/26/2007 10:50:00 PM	0.053				
11/26/2007 10:55:00 PM	0.053				
11/26/2007 10:58:00 PM				4	
11/26/2007 11:00:00 PM	0.053				0.00
11/26/2007 11:05:00 PM	0.053				
11/26/2007 11:08:00 PM				4	
11/26/2007 11:10:00 PM	0.052				
11/26/2007 11:15:00 PM	0.052				
11/26/2007 11:18:00 PM				4	
11/26/2007 11:20:00 PM	0.051				
11/26/2007 11:25:00 PM	0.049				
11/26/2007 11:28:00 PM				4	
11/26/2007 11:30:00 PM	0.049				
11/26/2007 11:35:00 PM	0.049				
11/26/2007 11:38:00 PM				4	
11/26/2007 11:40:00 PM	0.050				
11/26/2007 11:45:00 PM	0.049				
11/26/2007 11:48:00 PM				4	
11/26/2007 11:50:00 PM	0.047				
11/26/2007 11:55:00 PM	0.047				
11/26/2007 11:58:00 PM				4	
11/27/2007 12:00:00 AM	0.045				0.00
11/27/2007 12:05:00 AM	0.045				
11/27/2007 12:08:00 AM				4	
11/27/2007 12:10:00 AM	0.045				
11/27/2007 12:15:00 AM	0.044				
11/27/2007 12:18:00 AM				4	
11/27/2007 12:20:00 AM	0.044				
11/27/2007 12:25:00 AM	0.044				
11/27/2007 12:28:00 AM				4	
11/27/2007 12:30:00 AM	0.043				
11/27/2007 12:35:00 AM	0.042				
11/27/2007 12:38:00 AM				5	
11/27/2007 12:40:00 AM	0.041				
11/27/2007 12:45:00 AM	0.040				
11/27/2007 12:48:00 AM				5	
11/27/2007 12:50:00 AM	0.040				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/27/2007 12:55:00 AM	0.040				
11/27/2007 12:58:00 AM				5	
11/27/2007 1:00:00 AM	0.039				0.00
11/27/2007 1:05:00 AM	0.039				
11/27/2007 1:08:00 AM				5	
11/27/2007 1:10:00 AM	0.039				
11/27/2007 1:15:00 AM	0.039				
11/27/2007 1:18:00 AM				5	
11/27/2007 1:20:00 AM	0.039				
11/27/2007 1:25:00 AM	0.039				
11/27/2007 1:28:00 AM				5	
11/27/2007 1:30:00 AM	0.038				
11/27/2007 1:35:00 AM	0.037				
11/27/2007 1:38:00 AM				5	
11/27/2007 1:40:00 AM	0.037				
11/27/2007 1:45:00 AM	0.037				
11/27/2007 1:48:00 AM				5	
11/27/2007 1:50:00 AM	0.037				
11/27/2007 1:55:00 AM	0.037				
11/27/2007 1:58:00 AM				5	
11/27/2007 2:00:00 AM	0.037				0.00
11/27/2007 2:05:00 AM	0.036				
11/27/2007 2:08:00 AM				5	
11/27/2007 2:10:00 AM	0.035				
11/27/2007 2:15:00 AM	0.033				
11/27/2007 2:18:00 AM				6	
11/27/2007 2:20:00 AM	0.035				
11/27/2007 2:25:00 AM	0.035				
11/27/2007 2:28:00 AM				6	
11/27/2007 2:30:00 AM	0.034				
11/27/2007 2:35:00 AM	0.035				
11/27/2007 2:38:00 AM				6	
11/27/2007 2:40:00 AM	0.037				
11/27/2007 2:45:00 AM	0.037				
11/27/2007 2:48:00 AM				6	
11/27/2007 2:50:00 AM	0.036				
11/27/2007 2:55:00 AM	0.035				
11/27/2007 2:58:00 AM				6	
11/27/2007 3:00:00 AM	0.035				0.00
11/27/2007 3:05:00 AM	0.035				
11/27/2007 3:08:00 AM				6	
11/27/2007 3:10:00 AM	0.035				
11/27/2007 3:15:00 AM	0.033				
11/27/2007 3:18:00 AM				6	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/27/2007 3:20:00 AM	0.033				
11/27/2007 3:25:00 AM	0.033				
11/27/2007 3:28:00 AM				6	
11/27/2007 3:30:00 AM	0.033				
11/27/2007 3:35:00 AM	0.033				
11/27/2007 3:38:00 AM				6	
11/27/2007 3:40:00 AM	0.035				
11/27/2007 3:45:00 AM	0.035				
11/27/2007 3:48:00 AM				6	
11/27/2007 3:50:00 AM	0.033				
11/27/2007 3:55:00 AM	0.033				
11/27/2007 3:58:00 AM				7	
11/27/2007 4:00:00 AM	0.033				0.00
11/27/2007 4:05:00 AM	0.035				
11/27/2007 4:08:00 AM				7	
11/27/2007 4:10:00 AM	0.036				
11/27/2007 4:15:00 AM	0.035				
11/27/2007 4:18:00 AM				7	
11/27/2007 4:20:00 AM	0.035				
11/27/2007 4:25:00 AM	0.033				
11/27/2007 4:28:00 AM				7	
11/27/2007 4:30:00 AM	0.035				
11/27/2007 4:35:00 AM	0.035				
11/27/2007 4:38:00 AM				7	
11/27/2007 4:40:00 AM	0.035				
11/27/2007 4:45:00 AM	0.035				
11/27/2007 4:48:00 AM				7	
11/27/2007 4:50:00 AM	0.035				
11/27/2007 4:55:00 AM	0.035				
11/27/2007 4:58:00 AM				7	
11/27/2007 5:00:00 AM	0.033				0.00
11/27/2007 5:05:00 AM	0.033				
11/27/2007 5:08:00 AM				7	
11/27/2007 5:10:00 AM	0.032				
11/27/2007 5:15:00 AM	0.033				
11/27/2007 5:18:00 AM				7	
11/27/2007 5:20:00 AM	0.033				
11/27/2007 5:25:00 AM	0.033				
11/27/2007 5:28:00 AM				7	
11/27/2007 5:30:00 AM	0.033				
11/27/2007 5:35:00 AM	0.033				
11/27/2007 5:40:00 AM	0.032				
11/27/2007 5:45:00 AM	0.032				
11/27/2007 5:50:00 AM	0.032				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/27/2007 5:55:00 AM	0.032				
11/27/2007 6:00:00 AM	0.033				0.01
11/27/2007 6:05:00 AM	0.033				
11/27/2007 6:10:00 AM	0.035				
11/27/2007 6:15:00 AM	0.033				
11/27/2007 6:20:00 AM	0.033				
11/27/2007 6:25:00 AM	0.033				
11/27/2007 6:30:00 AM	0.033				
11/27/2007 6:35:00 AM	0.033				
11/27/2007 6:40:00 AM	0.033				
11/27/2007 6:45:00 AM	0.031				
11/27/2007 6:50:00 AM	0.030				
11/27/2007 6:55:00 AM	0.031				
11/27/2007 7:00:00 AM	0.030				0.00
11/27/2007 7:05:00 AM	0.030				
11/27/2007 7:10:00 AM	0.030				
11/27/2007 7:15:00 AM	0.030				
11/27/2007 7:20:00 AM	0.030				
11/27/2007 7:25:00 AM	0.032				
11/27/2007 7:30:00 AM	0.032				
11/27/2007 7:35:00 AM	0.030				
11/27/2007 7:40:00 AM	0.030				
11/27/2007 7:45:00 AM	0.030				
11/27/2007 7:50:00 AM	0.032				
11/27/2007 7:55:00 AM	0.032				
11/27/2007 8:00:00 AM	0.030				0.01
11/27/2007 8:05:00 AM	0.030				
11/27/2007 8:10:00 AM	0.030				
11/27/2007 8:15:00 AM	0.029				
11/27/2007 8:20:00 AM	0.029				
11/27/2007 8:25:00 AM	0.029				
11/27/2007 8:30:00 AM	0.029				
11/27/2007 8:35:00 AM	0.028				
11/27/2007 9:00:00 AM					0.00

Figure H-4 WR-4 Sulzer Pump

January 11th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/9/2008 3:00:00 PM	0.235	0.93	59.13		0.00
1/9/2008 3:05:00 PM	0.234	1.02	63.55		
1/9/2008 3:10:00 PM	0.205	0.91	47.22		
1/9/2008 3:15:00 PM	0.204	0.91	47.01		
1/9/2008 3:20:00 PM	0.201	1.04	52.61		
1/9/2008 3:25:00 PM	0.194	0.93	44.76		
1/9/2008 3:30:00 PM	0.198	0.93	45.96		
1/9/2008 3:35:00 PM	0.196	1.55	75.68		
1/9/2008 3:40:00 PM	0.198	1.55	76.77		
1/9/2008 3:45:00 PM	0.195	1.30	62.96		
1/9/2008 3:50:00 PM	0.204	0.86	44.79		
1/9/2008 3:55:00 PM	0.204	0.91	47.01		
1/9/2008 4:00:00 PM	0.198	1.11	54.73		0.01
1/9/2008 4:05:00 PM	0.213	1.09	59.69		
1/9/2008 4:10:00 PM	0.213	1.06	58.31		
1/9/2008 4:15:00 PM	0.193	0.92	43.50		
1/9/2008 4:20:00 PM	0.196	0.91	44.43		
1/9/2008 4:25:00 PM	0.196	1.12	54.31		
1/9/2008 4:30:00 PM	0.196	1.12	54.31		
1/9/2008 4:35:00 PM	0.193	0.85	40.61		
1/9/2008 4:40:00 PM	0.196	0.98	47.85		
1/9/2008 4:45:00 PM	0.207	0.91	48.09		
1/9/2008 4:50:00 PM	0.202	-1.57	-80.17		
1/9/2008 4:55:00 PM	0.206	0.97	50.84		
1/9/2008 5:00:00 PM	0.203	0.97	49.80		0.01
1/9/2008 5:05:00 PM	0.209	1.14	60.66		
1/9/2008 5:10:00 PM	0.209	1.06	56.52		
1/9/2008 5:15:00 PM	0.204	1.06	54.76		
1/9/2008 5:20:00 PM	0.205	1.13	58.64		
1/9/2008 5:25:00 PM	0.206	1.03	53.56		
1/9/2008 5:30:00 PM	0.212	1.03	56.01		
1/9/2008 5:35:00 PM	0.200	1.43	72.01		
1/9/2008 5:40:00 PM	0.196	1.17	57.13		
1/9/2008 5:45:00 PM	0.201	1.33	67.44		
1/9/2008 5:50:00 PM	0.204	1.33	68.70		
1/9/2008 5:55:00 PM	0.197	0.79	38.76		
1/9/2008 6:00:00 PM	0.216	-0.01	-0.56		0.03
1/9/2008 6:05:00 PM	0.222	1.46	85.10		
1/9/2008 6:10:00 PM	0.178	1.46	61.90		
1/9/2008 6:15:00 PM	0.066	1.46	14.50		
1/9/2008 6:20:00 PM	0.066	1.46	14.50		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/9/2008 6:25:00 PM	0.066	1.46	14.50		
1/9/2008 6:30:00 PM	0.066	1.46	14.50		
1/9/2008 6:35:00 PM	0.066	1.46	14.50		
1/9/2008 6:40:00 PM	0.115	0.81	18.15		
1/9/2008 6:45:00 PM	0.101	0.86	16.14		
1/9/2008 6:50:00 PM	0.103	0.90	17.21		
1/9/2008 6:55:00 PM	0.104	0.81	15.67		
1/9/2008 7:00:00 PM	0.102	0.96	18.14		0.04
1/9/2008 7:05:00 PM	0.100	0.89	16.27		
1/9/2008 7:10:00 PM	0.102	1.20	22.68		
1/9/2008 7:15:00 PM	0.102	0.87	16.36		
1/9/2008 7:20:00 PM	0.100	1.17	21.49		
1/9/2008 7:25:00 PM	0.101	0.90	16.85		
1/9/2008 7:30:00 PM	0.096	1.16	20.03		
1/9/2008 7:35:00 PM	0.097	0.86	15.04		
1/9/2008 7:40:00 PM	0.097	1.10	19.24		
1/9/2008 7:45:00 PM	0.097	0.87	15.45		
1/9/2008 7:50:00 PM	0.099	0.95	17.19		
1/9/2008 7:55:00 PM	0.100	0.93	17.08		
1/9/2008 8:00:00 PM	0.096	1.26	21.70		0.03
1/9/2008 8:05:00 PM	0.092	0.95	15.39		
1/9/2008 8:10:00 PM	0.093	1.20	19.72		
1/9/2008 8:15:00 PM	0.091	1.20	19.31		
1/9/2008 8:20:00 PM	0.089	1.33	20.53		
1/9/2008 8:25:00 PM	0.088	1.20	18.27		
1/9/2008 8:30:00 PM	0.088	0.92	13.89		
1/9/2008 8:35:00 PM	0.091	1.12	17.95		
1/9/2008 8:40:00 PM	0.096	1.01	17.40		
1/9/2008 8:45:00 PM	0.097	0.93	16.26		
1/9/2008 8:50:00 PM	0.098	0.92	16.38		
1/9/2008 8:55:00 PM	0.097	1.48	25.88		
1/9/2008 9:00:00 PM	0.094	1.59	26.65		0.05
1/9/2008 9:05:00 PM	0.091	1.66	26.51		
1/9/2008 9:10:00 PM	0.091	1.58	25.19		
1/9/2008 9:15:00 PM	0.091	1.58	25.05		
1/9/2008 9:20:00 PM	0.090	1.58	24.65		
1/9/2008 9:25:00 PM	0.090	1.58	24.79		
1/9/2008 9:30:00 PM	0.094	1.58	26.67		
1/9/2008 9:35:00 PM	0.095	0.98	16.80		
1/9/2008 9:40:00 PM	0.099	0.87	15.67	1	
1/9/2008 9:45:00 PM	0.100	0.94	17.35		
1/9/2008 9:50:00 PM	0.105	1.35	26.42		
1/9/2008 9:54:00 PM				1	
1/9/2008 9:55:00 PM	0.108	1.54	31.74		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/9/2008 10:00:00 PM	0.107	1.49	30.03		0.03
1/9/2008 10:05:00 PM	0.102	1.49	28.02		
1/9/2008 10:09:00 PM				1	
1/9/2008 10:10:00 PM	0.101	1.63	30.22		
1/9/2008 10:15:00 PM	0.099	1.68	30.17		
1/9/2008 10:20:00 PM	0.096	1.68	28.85		
1/9/2008 10:24:00 PM				1	
1/9/2008 10:25:00 PM	0.091	1.68	26.70		
1/9/2008 10:30:00 PM	0.087	1.68	25.16		
1/9/2008 10:35:00 PM	0.094	4.68	78.60		
1/9/2008 10:39:00 PM				1	
1/9/2008 10:40:00 PM	0.093	5.03	82.67		
1/9/2008 10:45:00 PM	0.085	4.62	66.33		
1/9/2008 10:50:00 PM	0.089	1.99	30.88		
1/9/2008 10:54:00 PM				1	
1/9/2008 10:55:00 PM	0.097	1.90	33.22		
1/9/2008 11:00:00 PM	0.100	1.77	32.72		0.05
1/9/2008 11:05:00 PM	0.104	1.70	33.04		
1/9/2008 11:09:00 PM				1	
1/9/2008 11:10:00 PM	0.106	1.52	30.50		
1/9/2008 11:15:00 PM	0.108	1.37	28.11		
1/9/2008 11:20:00 PM	0.112	1.53	32.95		
1/9/2008 11:24:00 PM				1	
1/9/2008 11:25:00 PM	0.113	1.36	29.68		
1/9/2008 11:30:00 PM	0.112	1.43	30.69		
1/9/2008 11:35:00 PM	0.113	1.31	28.70		
1/9/2008 11:39:00 PM				1	
1/9/2008 11:40:00 PM	0.111	1.88	40.31		
1/9/2008 11:45:00 PM	0.111	1.88	40.31		
1/9/2008 11:50:00 PM	0.110	1.70	35.98		
1/9/2008 11:54:00 PM				1	
1/9/2008 11:55:00 PM	0.110	1.79	37.55		
1/10/2008 12:00:00 AM	0.108	1.97	40.25		0.03
1/10/2008 12:05:00 AM	0.106	1.60	32.11		
1/10/2008 12:09:00 AM				2	
1/10/2008 12:10:00 AM	0.107	1.48	29.91		
1/10/2008 12:15:00 AM	0.108	1.50	30.64		
1/10/2008 12:20:00 AM	0.105	1.50	29.56		
1/10/2008 12:24:00 AM				2	
1/10/2008 12:25:00 AM	0.107	1.57	31.79		
1/10/2008 12:30:00 AM	0.106	1.57	31.22		
1/10/2008 12:35:00 AM	0.097	1.81	31.65		
1/10/2008 12:39:00 AM				2	
1/10/2008 12:40:00 AM	0.097	1.81	31.81		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 12:45:00 AM	0.102	1.81	34.04		
1/10/2008 12:50:00 AM	0.109	5.04	105.27		
1/10/2008 12:54:00 AM				2	
1/10/2008 12:55:00 AM	0.106	5.07	100.81		
1/10/2008 1:00:00 AM	0.100	5.07	93.55		0.01
1/10/2008 1:05:00 AM	0.099	5.07	91.76		
1/10/2008 1:09:00 AM				2	
1/10/2008 1:10:00 AM	0.104	5.07	98.53		
1/10/2008 1:15:00 AM	0.102	2.76	52.40		
1/10/2008 1:20:00 AM	0.099	2.76	49.95		
1/10/2008 1:24:00 AM				2	
1/10/2008 1:25:00 AM	0.100	1.69	31.18		
1/10/2008 1:30:00 AM	0.105	1.69	33.45		
1/10/2008 1:35:00 AM	0.108	1.56	31.87		
1/10/2008 1:39:00 AM				2	
1/10/2008 1:40:00 AM	0.110	1.58	33.44		
1/10/2008 1:45:00 AM	0.111	1.58	33.73		
1/10/2008 1:50:00 AM	0.111	1.89	40.52		
1/10/2008 1:54:00 AM				2	
1/10/2008 1:55:00 AM	0.111	1.47	31.38		
1/10/2008 2:00:00 AM	0.110	1.49	31.40		0.00
1/10/2008 2:05:00 AM	0.110	1.63	34.50		
1/10/2008 2:09:00 AM				2	
1/10/2008 2:10:00 AM	0.111	1.77	37.95		
1/10/2008 2:15:00 AM	0.111	1.84	39.56		
1/10/2008 2:20:00 AM	0.107	1.70	34.32		
1/10/2008 2:24:00 AM				2	
1/10/2008 2:25:00 AM	0.106	1.42	28.49		
1/10/2008 2:30:00 AM	0.108	0.94	19.48		
1/10/2008 2:35:00 AM	0.109	1.63	34.05		
1/10/2008 2:39:00 AM				3	
1/10/2008 2:40:00 AM	0.104	1.63	31.68		
1/10/2008 2:45:00 AM	0.100	1.01	18.46		
1/10/2008 2:50:00 AM	0.095	1.34	22.85		
1/10/2008 2:54:00 AM				3	
1/10/2008 2:55:00 AM	0.095	1.55	26.62		
1/10/2008 3:00:00 AM	0.096	1.56	27.01		0.00
1/10/2008 3:05:00 AM	0.099	1.46	26.21		
1/10/2008 3:09:00 AM				3	
1/10/2008 3:10:00 AM	0.098	1.60	28.68		
1/10/2008 3:15:00 AM	0.099	1.10	19.91		
1/10/2008 3:20:00 AM	0.097	2.05	35.93		
1/10/2008 3:24:00 AM				3	
1/10/2008 3:25:00 AM	0.097	1.33	23.43		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 3:30:00 AM	0.096	1.36	23.60		
1/10/2008 3:35:00 AM	0.098	1.34	24.07		
1/10/2008 3:39:00 AM				3	
1/10/2008 3:40:00 AM	0.098	1.45	25.68		
1/10/2008 3:45:00 AM	0.097	1.67	29.35		
1/10/2008 3:50:00 AM	0.102	1.12	21.07		
1/10/2008 3:54:00 AM				3	
1/10/2008 3:55:00 AM	0.101	1.41	26.14		
1/10/2008 4:00:00 AM	0.100	1.49	27.29		0.01
1/10/2008 4:05:00 AM	0.100	1.47	26.90		
1/10/2008 4:09:00 AM				3	
1/10/2008 4:10:00 AM	0.101	1.61	29.80		
1/10/2008 4:15:00 AM	0.101	1.23	22.93		
1/10/2008 4:20:00 AM	0.102	1.31	24.87		
1/10/2008 4:24:00 AM				3	
1/10/2008 4:25:00 AM	0.102	1.41	26.61		
1/10/2008 4:30:00 AM	0.101	1.38	25.59		
1/10/2008 4:35:00 AM	0.102	1.41	26.64		
1/10/2008 4:39:00 AM				3	
1/10/2008 4:40:00 AM	0.101	1.34	25.08		
1/10/2008 4:45:00 AM	0.103	1.56	29.94		
1/10/2008 4:50:00 AM	0.100	1.50	27.73		
1/10/2008 4:54:00 AM				3	
1/10/2008 4:55:00 AM	0.101	1.44	26.70		
1/10/2008 5:00:00 AM	0.104	1.47	28.51		0.07
1/10/2008 5:05:00 AM	0.102	1.59	30.28		
1/10/2008 5:09:00 AM				4	
1/10/2008 5:10:00 AM	0.104	1.26	24.33		
1/10/2008 5:15:00 AM	0.102	1.76	33.31		
1/10/2008 5:20:00 AM	0.102	1.42	26.78		
1/10/2008 5:24:00 AM				4	
1/10/2008 5:25:00 AM	0.101	1.64	30.41		
1/10/2008 5:30:00 AM	0.104	1.47	28.44		
1/10/2008 5:35:00 AM	0.100	1.41	26.07		
1/10/2008 5:39:00 AM				4	
1/10/2008 5:40:00 AM	0.100	1.44	26.37		
1/10/2008 5:45:00 AM	0.102	1.32	24.91		
1/10/2008 5:50:00 AM	0.102	1.58	30.00		
1/10/2008 5:54:00 AM				4	
1/10/2008 5:55:00 AM	0.103	1.30	25.09		
1/10/2008 6:00:00 AM	0.102	1.49	28.08		0.01
1/10/2008 6:05:00 AM	0.103	1.66	31.96		
1/10/2008 6:09:00 AM				4	
1/10/2008 6:10:00 AM	0.103	1.36	26.03		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 6:15:00 AM	0.107	1.26	25.40		
1/10/2008 6:20:00 AM	0.119	1.26	29.74		
1/10/2008 6:24:00 AM				4	
1/10/2008 6:25:00 AM	0.108	1.26	25.74		
1/10/2008 6:30:00 AM	0.106	2.05	41.14		
1/10/2008 6:35:00 AM	0.107	1.22	24.70		
1/10/2008 6:39:00 AM				4	
1/10/2008 6:40:00 AM	0.103	1.88	36.20		
1/10/2008 6:45:00 AM	0.112	1.75	37.85		
1/10/2008 6:50:00 AM	0.115	1.75	39.15		
1/10/2008 6:54:00 AM				4	
1/10/2008 6:55:00 AM	0.119	1.75	41.64		
1/10/2008 7:00:00 AM	0.112	1.69	36.39		0.01
1/10/2008 7:05:00 AM	0.106	1.41	28.04		
1/10/2008 7:09:00 AM				4	
1/10/2008 7:10:00 AM	0.103	1.33	25.43		
1/10/2008 7:15:00 AM	0.103	1.33	25.43		
1/10/2008 7:20:00 AM	0.100	1.29	23.80		
1/10/2008 7:24:00 AM				4	
1/10/2008 7:25:00 AM	0.100	1.13	20.65		
1/10/2008 7:30:00 AM	0.100	1.56	28.51		
1/10/2008 7:35:00 AM	0.102	1.19	22.49		
1/10/2008 7:39:00 AM				5	
1/10/2008 7:40:00 AM	0.108	1.76	36.06		
1/10/2008 7:45:00 AM	0.108	1.48	30.24		
1/10/2008 7:50:00 AM	0.103	1.75	33.54		
1/10/2008 7:54:00 AM				5	
1/10/2008 7:55:00 AM	0.100	1.57	28.97		
1/10/2008 8:00:00 AM	0.100	1.37	25.04		0.00
1/10/2008 8:05:00 AM	0.099	1.45	26.24		
1/10/2008 8:09:00 AM				5	
1/10/2008 8:10:00 AM	0.102	1.37	25.92		
1/10/2008 8:15:00 AM	0.104	1.79	34.68		
1/10/2008 8:20:00 AM	0.104	1.60	30.95		
1/10/2008 8:24:00 AM				5	
1/10/2008 8:25:00 AM	0.102	1.50	28.48		
1/10/2008 8:30:00 AM	0.105	1.56	30.60		
1/10/2008 8:35:00 AM	0.104	1.36	26.31		
1/10/2008 8:39:00 AM				5	
1/10/2008 8:40:00 AM	0.104	1.52	29.50		
1/10/2008 8:45:00 AM	0.105	1.52	30.19		
1/10/2008 8:50:00 AM	0.105	1.71	33.54		
1/10/2008 8:54:00 AM				5	
1/10/2008 8:55:00 AM	0.104	1.21	23.41		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 9:00:00 AM	0.103	1.26	24.36		0.00
1/10/2008 9:05:00 AM	0.104	0.96	18.66		
1/10/2008 9:09:00 AM				5	
1/10/2008 9:10:00 AM	0.101	1.04	19.47		
1/10/2008 9:15:00 AM	0.100	1.58	28.96		
1/10/2008 9:20:00 AM	0.104	1.64	31.93		
1/10/2008 9:24:00 AM				5	
1/10/2008 9:25:00 AM	0.104	1.37	26.40		
1/10/2008 9:30:00 AM	0.105	1.64	32.17		
1/10/2008 9:35:00 AM	0.105	1.53	30.01		
1/10/2008 9:39:00 AM				5	
1/10/2008 9:40:00 AM	0.105	1.62	32.13		
1/10/2008 9:45:00 AM	0.105	1.90	37.44		
1/10/2008 9:50:00 AM	0.104	1.97	38.11		
1/10/2008 9:54:00 AM				5	
1/10/2008 9:55:00 AM	0.102	1.68	31.80		
1/10/2008 10:00:00 AM	0.102	1.68	31.65		0.01
1/10/2008 10:05:00 AM	0.102	1.42	26.76		
1/10/2008 10:09:00 AM				6	
1/10/2008 10:10:00 AM	0.102	1.26	23.87		
1/10/2008 10:15:00 AM	0.103	1.56	29.84		
1/10/2008 10:20:00 AM	0.102	1.44	27.12		
1/10/2008 10:24:00 AM				6	
1/10/2008 10:25:00 AM	0.103	1.27	24.39		
1/10/2008 10:30:00 AM	0.102	1.53	29.05		
1/10/2008 10:35:00 AM	0.104	1.49	28.82		
1/10/2008 10:39:00 AM				6	
1/10/2008 10:40:00 AM	0.105	1.00	19.61		
1/10/2008 10:45:00 AM	0.104	1.38	26.79		
1/10/2008 10:50:00 AM	0.105	1.80	35.30		
1/10/2008 10:54:00 AM				6	
1/10/2008 10:55:00 AM	0.104	1.07	20.79		
1/10/2008 11:00:00 AM	0.104	1.62	31.48		0.00
1/10/2008 11:05:00 AM	0.104	1.28	24.97		
1/10/2008 11:09:00 AM				6	
1/10/2008 11:10:00 AM	0.105	1.25	24.52		
1/10/2008 11:15:00 AM	0.102	1.30	24.64		
1/10/2008 11:20:00 AM	0.102	0.97	18.42		
1/10/2008 11:24:00 AM				6	
1/10/2008 11:25:00 AM	0.103	1.16	22.43		
1/10/2008 11:30:00 AM	0.103	1.35	25.99		
1/10/2008 11:35:00 AM	0.103	1.53	29.32		
1/10/2008 11:39:00 AM				6	
1/10/2008 11:40:00 AM	0.102	1.49	28.16		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 11:45:00 AM	0.105	1.36	26.70		
1/10/2008 11:50:00 AM	0.104	1.22	23.65		
1/10/2008 11:54:00 AM				6	
1/10/2008 11:55:00 AM	0.107	1.35	27.27		
1/10/2008 12:00:00 PM	0.107	1.64	33.21		0.02
1/10/2008 12:05:00 PM	0.105	0.88	17.40		
1/10/2008 12:09:00 PM				6	
1/10/2008 12:10:00 PM	0.109	1.29	27.05		
1/10/2008 12:15:00 PM	0.107	-0.59	-11.99		
1/10/2008 12:20:00 PM	0.102	1.49	28.29		
1/10/2008 12:24:00 PM				6	
1/10/2008 12:25:00 PM	0.105	1.13	22.32		
1/10/2008 12:30:00 PM	0.108	1.09	22.37		
1/10/2008 12:35:00 PM	0.101	1.20	22.19		
1/10/2008 12:39:00 PM				7	
1/10/2008 12:40:00 PM	0.100	1.51	27.92		
1/10/2008 12:45:00 PM	0.101	1.05	19.75		
1/10/2008 12:50:00 PM	0.103	1.43	27.53		
1/10/2008 12:54:00 PM				7	
1/10/2008 12:55:00 PM	0.105	1.17	22.95		
1/10/2008 1:00:00 PM	0.103	1.31	25.22		0.03
1/10/2008 1:05:00 PM	0.102	1.46	27.62		
1/10/2008 1:09:00 PM				7	
1/10/2008 1:10:00 PM	0.102	1.44	27.28		
1/10/2008 1:15:00 PM	0.104	1.08	20.89		
1/10/2008 1:20:00 PM	0.104	1.61	31.24		
1/10/2008 1:24:00 PM				7	
1/10/2008 1:25:00 PM	0.103	1.19	22.90		
1/10/2008 1:30:00 PM	0.102	1.37	26.01		
1/10/2008 1:35:00 PM	0.103	1.11	21.27		
1/10/2008 1:39:00 PM				7	
1/10/2008 1:40:00 PM	0.104	1.59	30.85		
1/10/2008 1:45:00 PM	0.105	1.42	28.11		
1/10/2008 1:50:00 PM	0.105	1.60	31.59		
1/10/2008 1:54:00 PM				7	
1/10/2008 1:55:00 PM	0.104	1.54	29.79		
1/10/2008 2:00:00 PM	0.106	1.28	25.68		0.00
1/10/2008 2:05:00 PM	0.110	0.92	19.47		
1/10/2008 2:09:00 PM				7	
1/10/2008 2:10:00 PM	0.113	0.98	21.38		
1/10/2008 2:15:00 PM	0.108	1.16	23.91		
1/10/2008 2:20:00 PM	0.106	1.08	21.48		
1/10/2008 2:24:00 PM				7	
1/10/2008 2:25:00 PM	0.108	0.89	18.24		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 2:30:00 PM	0.115	0.89	19.80		
1/10/2008 2:35:00 PM	0.111	1.43	30.66		
1/10/2008 2:39:00 PM				7	
1/10/2008 2:40:00 PM	0.109	0.95	19.78		
1/10/2008 2:45:00 PM	0.108	0.96	19.61		
1/10/2008 2:50:00 PM	0.106	1.20	23.96		
1/10/2008 2:54:00 PM				7	
1/10/2008 2:55:00 PM	0.106	1.10	21.93		
1/10/2008 3:00:00 PM	0.106	1.15	22.83		0.00
1/10/2008 3:05:00 PM	0.107	0.86	17.41		
1/10/2008 3:10:00 PM	0.106	1.44	28.83		
1/10/2008 3:15:00 PM	0.110	1.04	21.71		
1/10/2008 3:20:00 PM	0.109	1.13	23.60		
1/10/2008 3:25:00 PM	0.109	1.31	27.30		
1/10/2008 3:30:00 PM	0.108	1.17	24.06		
1/10/2008 3:35:00 PM	0.108	1.42	29.27		
1/10/2008 3:40:00 PM	0.108	1.44	29.55		
1/10/2008 3:45:00 PM	0.109	1.49	30.85		
1/10/2008 3:50:00 PM	0.108	1.12	23.09		
1/10/2008 3:55:00 PM	0.107	0.98	19.84		
1/10/2008 4:00:00 PM	0.108	1.27	25.95		0.00

Figure H-5 WR-4 Sulzer Pump

January 15th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/14/2008 12:00:00 PM	0.115				0.00
1/14/2008 12:05:00 PM	0.115	1.47	33.03		
1/14/2008 12:10:00 PM	0.115	1.64	37.15		
1/14/2008 12:15:00 PM	0.116	1.92	43.93		
1/14/2008 12:20:00 PM	0.116	1.41	32.19		
1/14/2008 12:25:00 PM	0.116	1.67	38.15		
1/14/2008 12:30:00 PM	0.116	1.60	36.55		
1/14/2008 12:35:00 PM	0.115	1.76	39.99		
1/14/2008 12:40:00 PM	0.116	1.47	33.58		
1/14/2008 12:45:00 PM	0.116	1.65	37.62		
1/14/2008 12:50:00 PM	0.119	1.44	33.92		
1/14/2008 12:55:00 PM	0.120	1.74	41.83		
1/14/2008 1:00:00 PM	0.118	1.69	39.41		0.00
1/14/2008 1:05:00 PM	0.116	1.56	35.57		
1/14/2008 1:10:00 PM	0.116	1.62	37.12		
1/14/2008 1:15:00 PM	0.116	1.62	37.27		
1/14/2008 1:20:00 PM	0.117	1.59	36.92		
1/14/2008 1:25:00 PM	0.116	1.56	35.70		
1/14/2008 1:30:00 PM	0.116	1.60	36.70		
1/14/2008 1:35:00 PM	0.115	1.43	32.33		
1/14/2008 1:40:00 PM	0.118	1.52	35.44		
1/14/2008 1:45:00 PM	0.119	1.67	39.34		
1/14/2008 1:50:00 PM	0.116	1.74	39.91		
1/14/2008 1:55:00 PM	0.117	1.65	38.16		
1/14/2008 2:00:00 PM	0.117	1.47	34.00		0.09
1/14/2008 2:05:00 PM	0.115	1.73	38.77		
1/14/2008 2:10:00 PM	0.115	1.69	37.70		
1/14/2008 2:15:00 PM	0.114	1.47	32.82		
1/14/2008 2:20:00 PM	0.114	1.55	34.53		
1/14/2008 2:25:00 PM	0.115	1.40	31.57		
1/14/2008 2:30:00 PM	0.114	1.32	29.29		
1/14/2008 2:35:00 PM	0.115	1.75	39.76		
1/14/2008 2:40:00 PM	0.116	1.79	40.79		
1/14/2008 2:45:00 PM	0.116	1.62	37.01		
1/14/2008 2:50:00 PM	0.117	1.62	37.47		
1/14/2008 2:55:00 PM	0.117	1.55	35.99		
1/14/2008 3:00:00 PM	0.117	1.52	35.30		0.17
1/14/2008 3:05:00 PM	0.118	1.52	35.66		
1/14/2008 3:10:00 PM	0.122	1.49	36.72		
1/14/2008 3:15:00 PM	0.119	1.50	35.76		
1/14/2008 3:20:00 PM	0.120	1.67	39.89		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/14/2008 3:25:00 PM	0.120	1.26	30.27		
1/14/2008 3:30:00 PM	0.126	1.26	32.34		
1/14/2008 3:35:00 PM	0.129	1.26	33.45		
1/14/2008 3:40:00 PM	0.118	1.26	29.31		
1/14/2008 3:45:00 PM	0.122	1.94	47.46		
1/14/2008 3:50:00 PM	0.137	1.69	49.37		
1/14/2008 3:55:00 PM	0.141	1.95	59.24		
1/14/2008 4:00:00 PM	0.201	3.42	173.27		0.05
1/14/2008 4:05:00 PM	0.283	2.88	236.76		
1/14/2008 4:10:00 PM	0.286	2.43	202.73		
1/14/2008 4:12:00 PM				1	
1/14/2008 4:15:00 PM	0.336	2.86	297.88		
1/14/2008 4:20:00 PM	0.283	4.08	334.82		
1/14/2008 4:21:00 PM				1	
1/14/2008 4:25:00 PM	0.250	4.32	296.82		
1/14/2008 4:30:00 PM	0.345	2.87	309.94		
1/14/2008 4:31:00 PM				1	
1/14/2008 4:35:00 PM	0.404	2.32	309.84		
1/14/2008 4:40:00 PM	0.488	2.32	396.27		
1/14/2008 4:41:00 PM				1	
1/14/2008 4:45:00 PM	0.422	3.73	527.67		
1/14/2008 4:50:00 PM	0.269	4.96	378.16		
1/14/2008 4:51:00 PM				1	
1/14/2008 4:55:00 PM	0.365	3.17	369.33		
1/14/2008 5:00:00 PM	0.372	3.51	420.16		0.00
1/14/2008 5:01:00 PM				1	
1/14/2008 5:05:00 PM	0.289	4.53	383.46		
1/14/2008 5:10:00 PM	0.243	4.72	311.98		
1/14/2008 5:11:00 PM				1	
1/14/2008 5:15:00 PM	0.213	5.13	282.35		
1/14/2008 5:20:00 PM	0.157	5.39	191.12		
1/14/2008 5:25:00 PM	0.134	5.04	141.55		
1/14/2008 5:30:00 PM	0.119	5.04	119.84		
1/14/2008 5:35:00 PM	0.113	5.04	110.81		
1/14/2008 5:40:00 PM	0.104	5.04	97.89		
1/14/2008 5:45:00 PM	0.107	5.04	101.99		
1/14/2008 5:50:00 PM	0.107	1.71	34.47		
1/14/2008 5:55:00 PM	0.108	1.79	37.00		
1/14/2008 6:00:00 PM	0.108	1.55	31.81		0.00
1/14/2008 6:05:00 PM	0.110	1.59	33.54		
1/14/2008 6:10:00 PM	0.111	1.68	36.02		
1/14/2008 6:15:00 PM	0.111	1.59	34.09		
1/14/2008 6:20:00 PM	0.113	1.26	27.60		
1/14/2008 6:25:00 PM	0.110	1.60	33.97		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/14/2008 6:30:00 PM	0.112	1.66	35.90		
1/14/2008 6:35:00 PM	0.114	1.72	38.39		
1/14/2008 6:40:00 PM	0.115	1.62	36.70		
1/14/2008 6:45:00 PM	0.113	1.56	34.09		
1/14/2008 6:50:00 PM	0.113	1.66	36.10		
1/14/2008 6:55:00 PM	0.114	1.64	36.32		
1/14/2008 7:00:00 PM	0.114	1.57	34.83		0.01
1/14/2008 7:05:00 PM	0.115	1.64	36.69		
1/14/2008 7:10:00 PM	0.115	1.47	33.23		
1/14/2008 7:15:00 PM	0.116	1.76	40.04		
1/14/2008 7:20:00 PM	0.114	1.46	32.28		
1/14/2008 7:25:00 PM	0.115	1.79	40.62		
1/14/2008 7:30:00 PM	0.113	1.35	29.70		
1/14/2008 7:35:00 PM	0.115	1.60	36.36		
1/14/2008 7:40:00 PM	0.115	1.62	36.31		
1/14/2008 7:45:00 PM	0.117	1.45	33.46		
1/14/2008 7:50:00 PM	0.116	1.59	36.47		
1/14/2008 7:55:00 PM	0.115	1.58	35.68		
1/14/2008 8:00:00 PM	0.116	1.66	37.83		0.02
1/14/2008 8:05:00 PM	0.116	1.94	44.02		
1/14/2008 8:10:00 PM	0.116	1.59	36.10		
1/14/2008 8:15:00 PM	0.115	1.62	36.77		
1/14/2008 8:20:00 PM	0.112	1.62	34.95		
1/14/2008 8:25:00 PM	0.111	1.56	33.34		
1/14/2008 8:30:00 PM	0.113	1.36	29.79		
1/14/2008 8:35:00 PM	0.113	1.36	29.67		
1/14/2008 8:40:00 PM	0.112	1.36	29.18		
1/14/2008 8:45:00 PM	0.114	1.59	35.28		
1/14/2008 8:50:00 PM	0.114	1.07	23.95		
1/14/2008 8:55:00 PM	0.116	1.58	36.24		
1/14/2008 9:00:00 PM	0.113	1.02	22.44		0.00
1/14/2008 9:05:00 PM	0.115	1.02	22.82		
1/14/2008 9:10:00 PM	0.108	1.35	27.60		
1/14/2008 9:15:00 PM	0.114	1.26	28.07		
1/14/2008 9:20:00 PM	0.115	1.42	31.70		
1/14/2008 9:25:00 PM	0.113	1.33	28.95		
1/14/2008 9:30:00 PM	0.113	1.13	24.69		
1/14/2008 9:35:00 PM	0.111	1.11	23.80		
1/14/2008 9:40:00 PM	0.110	1.59	33.36		
1/14/2008 9:45:00 PM	0.108	1.49	30.71		
1/14/2008 9:50:00 PM	0.110	1.49	31.26		
1/14/2008 9:55:00 PM	0.112	1.31	28.33		
1/14/2008 10:00:00 PM	0.113	1.04	22.69		0.00

Figure H-6 WR-4 Sulzer Pump

January 30th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/28/2008 9:00:00 PM	0.064				0.00
1/28/2008 9:05:00 PM	0.063				
1/28/2008 9:10:00 PM	0.064				
1/28/2008 9:15:00 PM	0.064				
1/28/2008 9:20:00 PM	0.065				
1/28/2008 9:25:00 PM	0.065				
1/28/2008 9:30:00 PM	0.065				
1/28/2008 9:35:00 PM	0.066				
1/28/2008 9:40:00 PM	0.066				
1/28/2008 9:45:00 PM	0.066				
1/28/2008 9:50:00 PM	0.066				
1/28/2008 9:55:00 PM	0.066				
1/28/2008 10:00:00 PM	0.066				0.01
1/28/2008 10:05:00 PM	0.065				
1/28/2008 10:10:00 PM	0.066				
1/28/2008 10:15:00 PM	0.066				
1/28/2008 10:20:00 PM	0.066				
1/28/2008 10:25:00 PM	0.066				
1/28/2008 10:30:00 PM	0.066				
1/28/2008 10:35:00 PM	0.066				
1/28/2008 10:40:00 PM	0.065				
1/28/2008 10:45:00 PM	0.066				
1/28/2008 10:50:00 PM	0.066				
1/28/2008 10:55:00 PM	0.067				
1/28/2008 11:00:00 PM	0.067				0.00
1/28/2008 11:05:00 PM	0.067				
1/28/2008 11:10:00 PM	0.069				
1/28/2008 11:15:00 PM	0.068				
1/28/2008 11:20:00 PM	0.067				
1/28/2008 11:25:00 PM	0.069				
1/28/2008 11:30:00 PM	0.068				
1/28/2008 11:35:00 PM	0.068				
1/28/2008 11:40:00 PM	0.069				
1/28/2008 11:45:00 PM	0.068				
1/28/2008 11:50:00 PM	0.068				
1/28/2008 11:55:00 PM	0.069				
1/29/2008 12:00:00 AM	0.069				0.02
1/29/2008 12:05:00 AM	0.067				
1/29/2008 12:10:00 AM	0.068				
1/29/2008 12:15:00 AM	0.068				
1/29/2008 12:20:00 AM	0.066				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 12:25:00 AM	0.067				
1/29/2008 12:30:00 AM	0.067				
1/29/2008 12:35:00 AM	0.067				
1/29/2008 12:40:00 AM	0.067				
1/29/2008 12:45:00 AM	0.066				
1/29/2008 12:50:00 AM	0.067				
1/29/2008 12:55:00 AM	0.067				
1/29/2008 1:00:00 AM	0.066				0.02
1/29/2008 1:05:00 AM	0.066				
1/29/2008 1:10:00 AM	0.067				
1/29/2008 1:15:00 AM	0.067				
1/29/2008 1:20:00 AM	0.068				
1/29/2008 1:25:00 AM	0.067				
1/29/2008 1:30:00 AM	0.066				
1/29/2008 1:35:00 AM	0.068				
1/29/2008 1:40:00 AM	0.068				
1/29/2008 1:45:00 AM	0.067				
1/29/2008 1:50:00 AM	0.069				
1/29/2008 1:55:00 AM	0.069				
1/29/2008 2:00:00 AM	0.072				0.04
1/29/2008 2:05:00 AM	0.071				
1/29/2008 2:10:00 AM	0.070				
1/29/2008 2:15:00 AM	0.070				
1/29/2008 2:20:00 AM	0.068				
1/29/2008 2:25:00 AM	0.068				
1/29/2008 2:30:00 AM	0.067				
1/29/2008 2:35:00 AM	0.067				
1/29/2008 2:40:00 AM	0.067				
1/29/2008 2:45:00 AM	0.069				
1/29/2008 2:50:00 AM	0.069				
1/29/2008 2:55:00 AM	0.069				
1/29/2008 3:00:00 AM	0.069				0.04
1/29/2008 3:05:00 AM	0.068				
1/29/2008 3:10:00 AM	0.069				
1/29/2008 3:15:00 AM	0.071				
1/29/2008 3:20:00 AM	0.070				
1/29/2008 3:25:00 AM	0.071				
1/29/2008 3:30:00 AM	0.071				
1/29/2008 3:35:00 AM	0.070				
1/29/2008 3:40:00 AM	0.068				
1/29/2008 3:45:00 AM	0.067				
1/29/2008 3:50:00 AM	0.069				
1/29/2008 3:55:00 AM	0.072				
1/29/2008 4:00:00 AM	0.072				0.06

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 4:05:00 AM	0.071				
1/29/2008 4:10:00 AM	0.072				
1/29/2008 4:15:00 AM	0.071				
1/29/2008 4:20:00 AM	0.071				
1/29/2008 4:25:00 AM	0.073				
1/29/2008 4:30:00 AM	0.072				
1/29/2008 4:35:00 AM	0.073				
1/29/2008 4:40:00 AM	0.072				
1/29/2008 4:45:00 AM	0.071				
1/29/2008 4:50:00 AM	0.072				
1/29/2008 4:55:00 AM	0.074				
1/29/2008 5:00:00 AM	0.073				0.05
1/29/2008 5:05:00 AM	0.073				
1/29/2008 5:10:00 AM	0.076				
1/29/2008 5:15:00 AM	0.075				
1/29/2008 5:20:00 AM	0.074				
1/29/2008 5:25:00 AM	0.073				
1/29/2008 5:30:00 AM	0.071				
1/29/2008 5:35:00 AM	0.071				
1/29/2008 5:40:00 AM	0.069				
1/29/2008 5:45:00 AM	0.072				
1/29/2008 5:50:00 AM	0.075				
1/29/2008 5:55:00 AM	0.078				
1/29/2008 6:00:00 AM	0.078				0.07
1/29/2008 6:04:00 AM				1	
1/29/2008 6:05:00 AM	0.083				
1/29/2008 6:10:00 AM	0.094	4.62	77.14		
1/29/2008 6:15:00 AM	0.094	4.64	78.32		
1/29/2008 6:19:00 AM				1	
1/29/2008 6:20:00 AM	0.094	4.72	78.46		
1/29/2008 6:25:00 AM	0.096	4.84	83.29		
1/29/2008 6:30:00 AM	0.094	4.84	81.62		
1/29/2008 6:34:00 AM				1	
1/29/2008 6:35:00 AM	0.089	4.84	75.04		
1/29/2008 6:40:00 AM	0.091	4.27	67.71		
1/29/2008 6:45:00 AM	0.085	4.27	61.31		
1/29/2008 6:46:00 AM				1	
1/29/2008 6:50:00 AM	0.086	4.13	60.32		
1/29/2008 6:52:00 AM				1	
1/29/2008 6:55:00 AM	0.081	4.13	55.94		
1/29/2008 7:00:00 AM	0.079	4.13	53.96		0.01
1/29/2008 7:05:00 AM	0.077	4.13	51.35		
1/29/2008 7:10:00 AM	0.075	4.13	50.06		
1/29/2008 7:15:00 AM	0.072	4.13	46.88		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 7:20:00 AM	0.068	4.13	42.53		
1/29/2008 7:25:00 AM	0.069	4.13	44.07		
1/29/2008 7:29:00 AM				1	
1/29/2008 7:30:00 AM	0.081	4.78	64.75		
1/29/2008 7:35:00 AM	0.124	5.37	135.08		
1/29/2008 7:40:00 AM	0.266	3.01	226.61		
1/29/2008 7:44:00 AM				1	
1/29/2008 7:45:00 AM	0.209	4.92	263.21		
1/29/2008 7:50:00 AM	0.124	5.48	138.25		
1/29/2008 7:53:00 AM				1	
1/29/2008 7:55:00 AM	0.094	5.27	88.96		
1/29/2008 7:57:00 AM				1	
1/29/2008 8:00:00 AM	0.090	3.10	48.45		0.02
1/29/2008 8:01:00 AM				1	
1/29/2008 8:03:00 AM				2	
1/29/2008 8:05:00 AM	0.084	3.10	44.33		
1/29/2008 8:10:00 AM	0.079	3.10	40.57		
1/29/2008 8:15:00 AM	0.074	3.10	36.67		
1/29/2008 8:20:00 AM	0.076	3.10	38.36		
1/29/2008 8:25:00 AM	0.073	3.10	35.95		
1/29/2008 8:30:00 AM	0.075	3.10	37.39		
1/29/2008 8:35:00 AM	0.076	3.10	38.36		
1/29/2008 8:40:00 AM	0.074	3.10	36.67		
1/29/2008 8:45:00 AM	0.071	3.10	34.30		
1/29/2008 8:50:00 AM	0.073	3.10	35.48		
1/29/2008 8:55:00 AM	0.072	3.10	35.01		
1/29/2008 9:00:00 AM	0.071	3.10	34.30		0.00
1/29/2008 9:05:00 AM	0.073	3.10	35.48		
1/29/2008 9:10:00 AM	0.069	3.10	32.67		
1/29/2008 9:15:00 AM	0.071	3.10	34.06		
1/29/2008 9:20:00 AM	0.068	3.10	32.21		
1/29/2008 9:25:00 AM	0.070	3.10	33.60		
1/29/2008 9:30:00 AM	0.069	3.10	33.13		
1/29/2008 9:35:00 AM	0.071	3.10	34.30		
1/29/2008 9:40:00 AM	0.072	3.10	34.77		
1/29/2008 9:45:00 AM	0.078	1.60	20.40		
1/29/2008 9:46:00 AM				2	
1/29/2008 9:50:00 AM	0.082	1.60	21.80		
1/29/2008 9:55:00 AM	0.078	1.60	20.27		
1/29/2008 10:00:00 AM	0.076	1.60	19.52		0.00
1/29/2008 10:05:00 AM	0.075	1.60	19.39		
1/29/2008 10:09:00 AM				2	
1/29/2008 10:10:00 AM	0.081	1.60	21.67		
1/29/2008 10:15:00 AM	0.079	1.60	20.90		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 10:20:00 AM	0.074	1.60	18.90		
1/29/2008 10:25:00 AM	0.072	1.60	18.16		
1/29/2008 10:30:00 AM	0.070	1.60	17.31		
1/29/2008 10:35:00 AM	0.072	1.60	18.04		
1/29/2008 10:40:00 AM	0.070	1.60	17.43		
1/29/2008 10:45:00 AM	0.070	1.60	17.43		
1/29/2008 10:50:00 AM	0.080	1.60	21.03		
1/29/2008 10:55:00 AM	0.078	1.60	20.27		
1/29/2008 11:00:00 AM	0.079	1.60	20.65		0.00
1/29/2008 11:05:00 AM	0.077	1.60	20.02		
1/29/2008 11:10:00 AM	0.075	1.60	19.14		
1/29/2008 11:15:00 AM	0.072	1.60	18.04		
1/29/2008 11:20:00 AM	0.071	1.60	17.67		
1/29/2008 11:25:00 AM	0.072	1.60	17.92		
1/29/2008 11:30:00 AM	0.072	1.60	17.92		
1/29/2008 11:31:00 AM				2	
1/29/2008 11:35:00 AM	0.087	1.68	25.00		
1/29/2008 11:40:00 AM	0.073	1.68	19.62		
1/29/2008 11:45:00 AM	0.072	1.68	18.97		
1/29/2008 11:50:00 AM	0.073	1.68	19.23		
1/29/2008 11:55:00 AM	0.072	1.68	19.10		
1/29/2008 12:00:00 PM	0.073	1.68	19.49		0.01
1/29/2008 12:05:00 PM	0.073	1.68	19.62		
1/29/2008 12:10:00 PM	0.072	1.68	18.97		
1/29/2008 12:15:00 PM	0.073	1.68	19.23		
1/29/2008 12:20:00 PM	0.073	1.68	19.62		
1/29/2008 12:25:00 PM	0.073	1.68	19.62		
1/29/2008 12:30:00 PM	0.073	1.68	19.62		
1/29/2008 12:35:00 PM	0.072	1.68	18.97		
1/29/2008 12:40:00 PM	0.073	1.68	19.62		
1/29/2008 12:45:00 PM	0.073	1.68	19.23		
1/29/2008 12:50:00 PM	0.073	1.68	19.23		
1/29/2008 12:55:00 PM	0.073	1.68	19.62		
1/29/2008 1:00:00 PM	0.073	1.68	19.49		0.03
1/29/2008 1:05:00 PM	0.073	1.68	19.23		
1/29/2008 1:10:00 PM	0.075	1.68	20.14		
1/29/2008 1:15:00 PM	0.079	1.68	21.72		
1/29/2008 1:20:00 PM	0.077	1.68	21.06		
1/29/2008 1:25:00 PM	0.076	1.68	20.53		
1/29/2008 1:30:00 PM	0.076	1.68	20.79		
1/29/2008 1:35:00 PM	0.075	1.68	20.40		
1/29/2008 1:40:00 PM	0.075	1.68	20.27		
1/29/2008 1:45:00 PM	0.075	1.68	20.27		
1/29/2008 1:50:00 PM	0.075	1.68	20.27		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 1:55:00 PM	0.076	1.68	20.53		
1/29/2008 2:00:00 PM	0.075	1.68	20.14		0.04
1/29/2008 2:05:00 PM	0.075	1.68	20.40		
1/29/2008 2:10:00 PM	0.075	1.68	20.14		
1/29/2008 2:15:00 PM	0.077	1.68	20.92		
1/29/2008 2:20:00 PM	0.076	1.68	20.79		
1/29/2008 2:25:00 PM	0.077	1.68	20.92		
1/29/2008 2:30:00 PM	0.077	1.68	20.92		
1/29/2008 2:35:00 PM	0.078	1.68	21.32		
1/29/2008 2:40:00 PM	0.078	1.68	21.59		
1/29/2008 2:45:00 PM	0.078	1.68	21.32		
1/29/2008 2:50:00 PM	0.078	1.68	21.59		
1/29/2008 2:55:00 PM	0.078	1.68	21.59		
1/29/2008 3:00:00 PM	0.080	1.68	22.26		0.05
1/29/2008 3:01:00 PM				2	
1/29/2008 3:05:00 PM	0.096	1.68	29.14		
1/29/2008 3:10:00 PM	0.110	4.99	105.15		
1/29/2008 3:12:00 PM				2	
1/29/2008 3:15:00 PM	0.148	4.58	148.98		
1/29/2008 3:20:00 PM	0.157	4.14	146.85		
1/29/2008 3:25:00 PM	0.135	4.76	136.16		
1/29/2008 3:27:00 PM				2	
1/29/2008 3:30:00 PM	0.113	4.76	104.27		
1/29/2008 3:35:00 PM	0.103	1.95	37.37		
1/29/2008 3:40:00 PM	0.091	2.79	44.40		
1/29/2008 3:42:00 PM				2	
1/29/2008 3:45:00 PM	0.084	1.75	24.77		
1/29/2008 3:50:00 PM	0.081	1.78	23.97		
1/29/2008 3:55:00 PM	0.080	1.78	23.54		
1/29/2008 4:00:00 PM	0.078	1.78	22.83		0.09
1/29/2008 4:05:00 PM	0.077	1.78	22.13		
1/29/2008 4:10:00 PM	0.077	1.78	22.13		
1/29/2008 4:15:00 PM	0.077	1.78	22.27		
1/29/2008 4:20:00 PM	0.078	1.78	22.83		
1/29/2008 4:21:00 PM				2	
1/29/2008 4:25:00 PM	0.102	3.35	62.91		
1/29/2008 4:30:00 PM	0.108	5.28	108.41		
1/29/2008 4:35:00 PM	0.124	5.16	130.15		
1/29/2008 4:36:00 PM				2	
1/29/2008 4:40:00 PM	0.108	4.89	99.90		
1/29/2008 4:45:00 PM	0.102	4.89	91.97		
1/29/2008 4:50:00 PM	0.093	4.89	80.03		
1/29/2008 4:51:00 PM				3	
1/29/2008 4:55:00 PM	0.085	1.52	21.82		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 5:00:00 PM	0.080	1.52	20.22		0.01
1/29/2008 5:05:00 PM	0.080	1.52	19.98		
1/29/2008 5:10:00 PM	0.078	1.52	19.50		
1/29/2008 5:15:00 PM	0.078	1.52	19.26		
1/29/2008 5:20:00 PM	0.078	1.52	19.50		
1/29/2008 5:24:00 PM				3	
1/29/2008 5:25:00 PM	0.083	1.52	21.08		
1/29/2008 5:30:00 PM	0.091	1.52	24.23		
1/29/2008 5:35:00 PM	0.089	1.52	23.59		
1/29/2008 5:37:00 PM				3	
1/29/2008 5:40:00 PM	0.116	5.01	114.45		
1/29/2008 5:45:00 PM	0.362	2.55	293.19		
1/29/2008 5:50:00 PM	0.218	4.96	281.41		
1/29/2008 5:52:00 PM				3	
1/29/2008 5:55:00 PM	0.127	5.63	146.43		
1/29/2008 6:00:00 PM	0.105	5.28	104.10		0.00
1/29/2008 6:05:00 PM	0.092	5.28	86.01		
1/29/2008 6:07:00 PM				3	
1/29/2008 6:10:00 PM	0.087	2.12	31.76		
1/29/2008 6:15:00 PM	0.080	2.12	28.20		
1/29/2008 6:20:00 PM	0.077	2.12	26.52		
1/29/2008 6:25:00 PM	0.078	2.12	27.19		
1/29/2008 6:30:00 PM	0.078	2.12	26.86		
1/29/2008 6:35:00 PM	0.077	2.12	26.52		
1/29/2008 6:40:00 PM	0.078	2.12	26.86		
1/29/2008 6:45:00 PM	0.077	2.12	26.52		
1/29/2008 6:50:00 PM	0.073	2.12	24.55		
1/29/2008 6:55:00 PM	0.073	2.12	24.22		
1/29/2008 7:00:00 PM	0.074	2.12	24.87		0.00
1/29/2008 7:05:00 PM	0.074	2.12	25.04		
1/29/2008 7:10:00 PM	0.075	2.12	25.37		
1/29/2008 7:15:00 PM	0.075	2.12	25.53		
1/29/2008 7:20:00 PM	0.076	2.12	26.19		
1/29/2008 7:25:00 PM	0.077	2.12	26.36		
1/29/2008 7:30:00 PM	0.077	2.12	26.36		
1/29/2008 7:35:00 PM	0.077	2.12	26.52		
1/29/2008 7:40:00 PM	0.076	2.12	25.86		
1/29/2008 7:45:00 PM	0.075	2.12	25.53		
1/29/2008 7:50:00 PM	0.075	2.12	25.69		
1/29/2008 7:55:00 PM	0.074	2.12	25.04		
1/29/2008 8:00:00 PM	0.075	2.12	25.37		0.00
1/29/2008 8:05:00 PM	0.075	2.12	25.37		
1/29/2008 8:10:00 PM	0.074	2.12	24.87		
1/29/2008 8:15:00 PM	0.074	2.12	25.04		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 8:20:00 PM	0.075	2.12	25.37		
1/29/2008 8:25:00 PM	0.075	2.12	25.37		
1/29/2008 8:30:00 PM	0.075	2.12	25.37		
1/29/2008 8:35:00 PM	0.075	2.12	25.53		
1/29/2008 8:40:00 PM	0.075	2.12	25.53		
1/29/2008 8:45:00 PM	0.075	2.12	25.53		
1/29/2008 8:50:00 PM	0.074	2.12	25.04		
1/29/2008 8:55:00 PM	0.074	2.12	25.04		
1/29/2008 9:00:00 PM	0.074	2.12	25.04		0.00
1/29/2008 9:05:00 PM	0.074	2.12	25.04		
1/29/2008 9:10:00 PM	0.074	2.12	25.04		
1/29/2008 9:15:00 PM	0.074	2.12	24.87		
1/29/2008 9:20:00 PM	0.075	2.12	25.37		
1/29/2008 9:25:00 PM	0.075	2.12	25.53		
1/29/2008 9:30:00 PM	0.075	2.12	25.53		
1/29/2008 9:35:00 PM	0.075	2.12	25.53		
1/29/2008 9:40:00 PM	0.075	2.12	25.69		
1/29/2008 9:45:00 PM	0.075	2.12	25.37		
1/29/2008 9:50:00 PM	0.075	2.12	25.69		
1/29/2008 9:55:00 PM	0.075	2.12	25.53		
1/29/2008 10:00:00 PM	0.074	2.12	24.87		0.00
1/29/2008 10:05:00 PM	0.074	2.12	25.04		
1/29/2008 10:10:00 PM	0.073	2.12	24.55		
1/29/2008 10:15:00 PM	0.073	2.12	24.55		
1/29/2008 10:20:00 PM	0.073	2.12	24.71		
1/29/2008 10:25:00 PM	0.074	2.12	25.04		
1/29/2008 10:30:00 PM	0.074	2.12	25.04		
1/29/2008 10:35:00 PM	0.075	2.12	25.37		
1/29/2008 10:40:00 PM	0.073	2.12	24.71		
1/29/2008 10:45:00 PM	0.074	2.12	25.04		
1/29/2008 10:50:00 PM	0.074	2.12	25.04		
1/29/2008 10:55:00 PM	0.076	2.12	25.86		
1/29/2008 11:00:00 PM	0.076	2.12	25.86		0.00
1/29/2008 11:05:00 PM	0.076	2.12	26.19		
1/29/2008 11:10:00 PM	0.076	2.12	26.19		
1/29/2008 11:15:00 PM	0.075	2.12	25.37		
1/29/2008 11:20:00 PM	0.075	2.12	25.53		
1/29/2008 11:25:00 PM	0.075	2.12	25.53		
1/29/2008 11:30:00 PM	0.076	2.12	26.19		
1/29/2008 11:35:00 PM	0.075	2.12	25.69		
1/29/2008 11:40:00 PM	0.076	2.12	25.86		
1/29/2008 11:45:00 PM	0.077	2.12	26.36		
1/29/2008 11:50:00 PM	0.075	2.12	25.53		
1/29/2008 11:55:00 PM	0.076	2.12	26.19		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/30/2008 12:00:00 AM	0.075	2.12	25.69		0.00
1/30/2008 12:05:00 AM	0.075	2.12	25.69		
1/30/2008 12:10:00 AM	0.076	2.12	26.19		
1/30/2008 12:15:00 AM	0.076	2.12	26.19		
1/30/2008 12:20:00 AM	0.075	2.12	25.69		
1/30/2008 12:25:00 AM	0.076	2.12	26.19		
1/30/2008 12:30:00 AM	0.076	2.12	25.86		
1/30/2008 12:35:00 AM	0.077	2.12	26.36		
1/30/2008 12:40:00 AM	0.076	2.12	26.19		
1/30/2008 12:45:00 AM	0.076	2.12	26.19		
1/30/2008 12:50:00 AM	0.076	2.12	26.19		
1/30/2008 12:55:00 AM	0.077	2.12	26.52		
1/30/2008 1:00:00 AM	0.077	2.12	26.52		0.00
1/30/2008 1:05:00 AM	0.077	2.12	26.36		
1/30/2008 1:10:00 AM	0.076	2.12	25.86		
1/30/2008 1:15:00 AM	0.075	2.12	25.53		
1/30/2008 1:20:00 AM	0.075	2.12	25.69		
1/30/2008 1:25:00 AM	0.075	2.12	25.37		
1/30/2008 1:30:00 AM	0.075	2.12	25.69		
1/30/2008 1:35:00 AM	0.075	2.12	25.37		
1/30/2008 1:40:00 AM	0.076	2.12	26.19		
1/30/2008 1:45:00 AM	0.077	2.12	26.36		
1/30/2008 1:50:00 AM	0.076	2.12	25.86		
1/30/2008 1:55:00 AM	0.075	2.12	25.69		
1/30/2008 2:00:00 AM	0.076	2.12	25.86		0.04
1/30/2008 2:05:00 AM	0.077	2.12	26.36		
1/30/2008 2:10:00 AM	0.077	2.12	26.36		
1/30/2008 2:15:00 AM	0.076	2.12	25.86		
1/30/2008 2:20:00 AM	0.075	2.12	25.69		
1/30/2008 2:25:00 AM	0.074	2.12	25.04		
1/30/2008 2:30:00 AM	0.076	2.12	26.19		
1/30/2008 2:35:00 AM	0.076	2.12	25.86		
1/30/2008 2:40:00 AM	0.076	2.12	25.86		
1/30/2008 2:45:00 AM	0.075	2.12	25.69		
1/30/2008 2:50:00 AM	0.076	2.12	25.86		
1/30/2008 2:55:00 AM	0.075	2.12	25.53		
1/30/2008 3:00:00 AM	0.075	2.12	25.69		0.06
1/30/2008 3:05:00 AM	0.075	2.12	25.69		
1/30/2008 3:10:00 AM	0.074	2.12	25.04		
1/30/2008 3:15:00 AM	0.074	2.12	25.04		
1/30/2008 3:20:00 AM	0.075	2.12	25.37		
1/30/2008 3:25:00 AM	0.074	2.12	24.87		
1/30/2008 3:30:00 AM	0.077	2.12	26.36		
1/30/2008 3:31:00 AM				3	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/30/2008 3:35:00 AM	0.088	1.75	26.35		
1/30/2008 3:40:00 AM	0.085	1.86	26.71		
1/30/2008 3:45:00 AM	0.080	1.61	21.16		
1/30/2008 3:50:00 AM	0.073	1.61	18.64		
1/30/2008 3:55:00 AM	0.075	1.61	19.26		
1/30/2008 4:00:00 AM	0.074	1.61	19.01		0.06
1/30/2008 4:05:00 AM	0.075	1.61	19.26		
1/30/2008 4:10:00 AM	0.077	1.61	20.14		
1/30/2008 4:15:00 AM	0.080	1.61	21.16		
1/30/2008 4:16:00 AM				3	
1/30/2008 4:18:00 AM				3	
1/30/2008 4:20:00 AM	0.089	1.68	26.07		
1/30/2008 4:22:00 AM				3	
1/30/2008 4:25:00 AM	0.092	1.68	27.35		
1/30/2008 4:30:00 AM	0.096	2.24	38.87		
1/30/2008 4:35:00 AM	0.097	1.54	26.98		
1/30/2008 4:37:00 AM				3	
1/30/2008 4:40:00 AM	0.095	1.54	26.31		
1/30/2008 4:45:00 AM	0.109	1.54	31.78		
1/30/2008 4:50:00 AM	0.113	5.23	114.08		
1/30/2008 4:52:00 AM				4	
1/30/2008 4:55:00 AM	0.118	5.02	117.12		
1/30/2008 5:00:00 AM	0.105	5.02	99.43		0.02
1/30/2008 5:05:00 AM	0.094	1.80	30.38		
1/30/2008 5:07:00 AM				4	
1/30/2008 5:10:00 AM	0.086	1.80	26.29		
1/30/2008 5:11:00 AM				4	
1/30/2008 5:15:00 AM	0.087	1.80	26.73		
1/30/2008 5:20:00 AM	0.095	1.80	30.85		
1/30/2008 5:25:00 AM	0.092	5.00	81.40		
1/30/2008 5:26:00 AM				4	
1/30/2008 5:28:00 AM				4	
1/30/2008 5:30:00 AM	0.087	5.00	75.09		
1/30/2008 5:31:00 AM				4	
1/30/2008 5:35:00 AM	0.090	5.00	78.44		
1/30/2008 5:40:00 AM	0.088	5.00	75.92		
1/30/2008 5:45:00 AM	0.098	4.77	85.50		
1/30/2008 5:46:00 AM				4	
1/30/2008 5:50:00 AM	0.110	5.25	111.07		
1/30/2008 5:55:00 AM	0.121	5.35	129.81		
1/30/2008 6:00:00 AM	0.134	5.53	155.54		0.02
1/30/2008 6:01:00 AM				4	
1/30/2008 6:05:00 AM	0.137	5.43	158.47		
1/30/2008 6:10:00 AM	0.122	5.10	124.77		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/30/2008 6:15:00 AM	0.107	5.09	103.12		
1/30/2008 6:16:00 AM				4	
1/30/2008 6:20:00 AM	0.102	5.09	96.24		
1/30/2008 6:25:00 AM	0.094	5.09	85.53		
1/30/2008 6:30:00 AM	0.086	1.88	27.38		
1/30/2008 6:35:00 AM	0.079	1.55	20.25		
1/30/2008 6:40:00 AM	0.078	1.55	19.76		
1/30/2008 6:45:00 AM	0.080	1.55	20.37		
1/30/2008 6:50:00 AM	0.082	1.55	21.12		
1/30/2008 6:55:00 AM	0.080	1.55	20.37		
1/30/2008 7:00:00 AM	0.076	1.55	18.91		0.00
1/30/2008 7:05:00 AM	0.078	1.55	19.76		
1/30/2008 7:10:00 AM	0.078	1.55	19.64		
1/30/2008 7:12:00 AM				4	
1/30/2008 7:14:00 AM				5	
1/30/2008 7:15:00 AM	0.085	2.17	31.26		
1/30/2008 7:18:00 AM				5	
1/30/2008 7:20:00 AM	0.083	1.76	24.69		
1/30/2008 7:25:00 AM	0.080	1.76	23.42		
1/30/2008 7:30:00 AM	0.078	1.76	22.44		
1/30/2008 7:35:00 AM	0.079	1.76	22.99		
1/30/2008 7:40:00 AM	0.076	1.76	21.74		
1/30/2008 7:45:00 AM	0.073	1.76	20.51		
1/30/2008 7:50:00 AM	0.076	1.76	21.47		
1/30/2008 7:55:00 AM	0.076	1.76	21.47		
1/30/2008 8:00:00 AM	0.075	1.76	21.06		0.02
1/30/2008 8:05:00 AM	0.076	1.76	21.47		
1/30/2008 8:10:00 AM	0.076	1.76	21.74		
1/30/2008 8:15:00 AM	0.075	1.76	21.33		
1/30/2008 8:20:00 AM	0.076	1.76	21.74		
1/30/2008 8:25:00 AM	0.075	1.76	21.19		
1/30/2008 8:30:00 AM	0.076	1.76	21.74		
1/30/2008 8:35:00 AM	0.075	1.76	21.19		
1/30/2008 8:40:00 AM	0.075	1.76	21.19		
1/30/2008 8:45:00 AM	0.076	1.76	21.47		
1/30/2008 8:50:00 AM	0.078	1.76	22.44		
1/30/2008 8:55:00 AM	0.076	1.76	21.47		
1/30/2008 9:00:00 AM	0.076	1.76	21.74		0.00
1/30/2008 9:05:00 AM	0.079	1.76	22.71		
1/30/2008 9:10:00 AM	0.080	1.76	23.13		
1/30/2008 9:15:00 AM	0.078	1.76	22.30		
1/30/2008 9:20:00 AM	0.075	1.76	21.19		
1/30/2008 9:25:00 AM	0.075	1.76	21.19		
1/30/2008 9:30:00 AM	0.075	1.76	21.19		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/30/2008 9:35:00 AM	0.074	1.76	20.65		
1/30/2008 9:40:00 AM	0.074	1.76	20.79		
1/30/2008 9:45:00 AM	0.075	1.76	21.06		
1/30/2008 9:50:00 AM	0.075	1.76	21.33		
1/30/2008 9:55:00 AM	0.076	1.76	21.47		
1/30/2008 10:00:00 AM	0.076	1.76	21.47		0.00
1/30/2008 10:04:00 AM				5	
1/30/2008 10:05:00 AM	0.080	1.17	15.47		
1/30/2008 10:08:00 AM				5	
1/30/2008 10:10:00 AM	0.083	1.48	20.65		
1/30/2008 10:15:00 AM	0.079	1.56	20.13		
1/30/2008 10:20:00 AM	0.078	1.56	20.01		
1/30/2008 10:25:00 AM	0.073	1.56	18.18		
1/30/2008 10:30:00 AM	0.074	1.56	18.30		
1/30/2008 10:35:00 AM	0.074	1.56	18.42		
1/30/2008 10:40:00 AM	0.071	1.56	17.23		
1/30/2008 10:45:00 AM	0.073	1.56	18.18		
1/30/2008 10:50:00 AM	0.073	1.56	17.83		
1/30/2008 10:55:00 AM	0.073	1.56	18.18		
1/30/2008 11:00:00 AM					0.00

Figure I-4 WR-142 Gunderson

November 16th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/15/2007 3:00:00 PM	0.003				0.00
11/15/2007 3:05:00 PM	0.005				
11/15/2007 3:10:00 PM	0.002				
11/15/2007 3:15:00 PM	0.003				
11/15/2007 3:20:00 PM	0.002				
11/15/2007 3:25:00 PM	0.002				
11/15/2007 3:30:00 PM	0.002				
11/15/2007 3:35:00 PM	0.003				
11/15/2007 3:40:00 PM	0.003				
11/15/2007 3:45:00 PM	0.003				
11/15/2007 3:50:00 PM	0.002				
11/15/2007 3:55:00 PM	0.002				
11/15/2007 4:00:00 PM	0.003				0.00
11/15/2007 4:05:00 PM	0.002				
11/15/2007 4:10:00 PM	0.002				
11/15/2007 4:15:00 PM	0.002				
11/15/2007 4:20:00 PM	0.002				
11/15/2007 4:25:00 PM	0.002				
11/15/2007 4:30:00 PM	0.002				
11/15/2007 4:35:00 PM	0.002				
11/15/2007 4:40:00 PM	0.002				
11/15/2007 4:45:00 PM	0.002				
11/15/2007 4:50:00 PM	0.002				
11/15/2007 4:55:00 PM	0.002				
11/15/2007 5:00:00 PM	0.002				0.02
11/15/2007 5:05:00 PM	0.002				
11/15/2007 5:10:00 PM	0.002				
11/15/2007 5:15:00 PM	0.002				
11/15/2007 5:20:00 PM	0.002				
11/15/2007 5:25:00 PM	0.007				
11/15/2007 5:30:00 PM	0.002				
11/15/2007 5:35:00 PM	0.002				
11/15/2007 5:40:00 PM	0.000				
11/15/2007 5:45:00 PM	0.000				
11/15/2007 5:50:00 PM	0.002				
11/15/2007 5:55:00 PM	0.000				
11/15/2007 6:00:00 PM	0.000				0.04
11/15/2007 6:05:00 PM	0.000				
11/15/2007 6:10:00 PM	0.000				
11/15/2007 6:15:00 PM	0.002				
11/15/2007 6:20:00 PM	0.000				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/15/2007 6:25:00 PM	0.000				
11/15/2007 6:30:00 PM	0.000				
11/15/2007 6:35:00 PM	0.000				
11/15/2007 6:40:00 PM	0.000				
11/15/2007 6:45:00 PM	0.000				
11/15/2007 6:50:00 PM	0.002				
11/15/2007 6:55:00 PM	0.008				
11/15/2007 7:00:00 PM	0.010			1	0.00
11/15/2007 7:05:00 PM	0.008				
11/15/2007 7:10:00 PM	0.007				
11/15/2007 7:15:00 PM	0.010			1	
11/15/2007 7:20:00 PM	0.029			1	
11/15/2007 7:25:00 PM	0.029				
11/15/2007 7:30:00 PM	0.025			1	
11/15/2007 7:35:00 PM	0.022				
11/15/2007 7:40:00 PM	0.018			1	
11/15/2007 7:45:00 PM	0.017				
11/15/2007 7:50:00 PM	0.015			1	
11/15/2007 7:55:00 PM	0.012				
11/15/2007 8:00:00 PM	0.010			1	0.00
11/15/2007 8:05:00 PM	0.010				
11/15/2007 8:10:00 PM	0.008			1	
11/15/2007 8:15:00 PM	0.008				
11/15/2007 8:20:00 PM	0.008				
11/15/2007 8:25:00 PM	0.007				
11/15/2007 8:30:00 PM	0.007				
11/15/2007 8:35:00 PM	0.005				
11/15/2007 8:40:00 PM	0.003				
11/15/2007 8:45:00 PM	0.003				
11/15/2007 8:50:00 PM	0.002				
11/15/2007 8:55:00 PM	0.012			1	
11/15/2007 9:00:00 PM	0.010				0.01
11/15/2007 9:05:00 PM	0.010			1	
11/15/2007 9:10:00 PM	0.008				
11/15/2007 9:15:00 PM	0.007				
11/15/2007 9:20:00 PM	0.007				
11/15/2007 9:25:00 PM	0.007				
11/15/2007 9:30:00 PM	0.005				
11/15/2007 9:35:00 PM	0.007				
11/15/2007 9:40:00 PM	0.003				
11/15/2007 9:45:00 PM	0.005				
11/15/2007 9:50:00 PM	0.003				
11/15/2007 9:55:00 PM	0.003				
11/15/2007 10:00:00 PM	0.005				0.00

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/15/2007 10:05:00 PM	0.003				
11/15/2007 10:10:00 PM	0.003				
11/15/2007 10:15:00 PM	0.003				
11/15/2007 10:20:00 PM	0.002				
11/15/2007 10:25:00 PM	0.003				
11/15/2007 10:30:00 PM	0.002				
11/15/2007 10:35:00 PM	0.002				
11/15/2007 10:40:00 PM	0.002				
11/15/2007 10:45:00 PM	0.002				
11/15/2007 10:50:00 PM	0.002				
11/15/2007 10:55:00 PM	0.002				
11/15/2007 11:00:00 PM	0.000				0.00
11/15/2007 11:05:00 PM	0.000				
11/15/2007 11:10:00 PM	0.000				
11/15/2007 11:15:00 PM	0.000				
11/15/2007 11:20:00 PM	0.000				
11/15/2007 11:25:00 PM	0.000				
11/15/2007 11:30:00 PM	0.000				
11/15/2007 11:35:00 PM	0.000				
11/15/2007 11:40:00 PM	0.000				
11/15/2007 11:45:00 PM	0.000				
11/15/2007 11:50:00 PM	0.000				
11/15/2007 11:55:00 PM	0.000				
11/16/2007 12:00:00 AM	0.000				0.00
11/16/2007 12:05:00 AM	0.000				
11/16/2007 12:10:00 AM	0.000				
11/16/2007 12:15:00 AM	0.000				
11/16/2007 12:20:00 AM	0.000				
11/16/2007 12:25:00 AM	0.000				
11/16/2007 12:30:00 AM	0.000				
11/16/2007 12:35:00 AM	0.000				
11/16/2007 12:40:00 AM	0.000				
11/16/2007 12:45:00 AM	0.000				
11/16/2007 12:50:00 AM	0.000				
11/16/2007 12:55:00 AM	0.000				
11/16/2007 1:00:00 AM	0.000				0.04
11/16/2007 1:05:00 AM	0.000				
11/16/2007 1:10:00 AM	0.000				
11/16/2007 1:15:00 AM	0.000				
11/16/2007 1:20:00 AM	0.000				
11/16/2007 1:25:00 AM	0.000				
11/16/2007 1:30:00 AM	0.000				
11/16/2007 1:35:00 AM	0.000				
11/16/2007 1:40:00 AM	0.000				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 1:45:00 AM	0.000				
11/16/2007 1:50:00 AM	0.000				
11/16/2007 1:55:00 AM	0.000				
11/16/2007 2:00:00 AM	0.000				0.04
11/16/2007 2:05:00 AM	0.000				
11/16/2007 2:10:00 AM	0.000				
11/16/2007 2:15:00 AM	0.000				
11/16/2007 2:20:00 AM	0.000				
11/16/2007 2:25:00 AM	0.000				
11/16/2007 2:30:00 AM	0.000				
11/16/2007 2:35:00 AM	0.003				
11/16/2007 2:40:00 AM	0.023			2	
11/16/2007 2:45:00 AM	0.025			2	
11/16/2007 2:50:00 AM	0.022				
11/16/2007 2:55:00 AM	0.023			2	
11/16/2007 3:00:00 AM	0.015				0.04
11/16/2007 3:05:00 AM	0.013			2	
11/16/2007 3:10:00 AM	0.010				
11/16/2007 3:15:00 AM	0.015			2	
11/16/2007 3:20:00 AM	0.017				
11/16/2007 3:25:00 AM	0.017			2	
11/16/2007 3:30:00 AM	0.017				
11/16/2007 3:35:00 AM	0.015			2	
11/16/2007 3:40:00 AM	0.013				
11/16/2007 3:45:00 AM	0.015			2	
11/16/2007 3:50:00 AM	0.015				
11/16/2007 3:55:00 AM	0.017			2	
11/16/2007 4:00:00 AM	0.017				0.00
11/16/2007 4:05:00 AM	0.015			2	
11/16/2007 4:10:00 AM	0.017				
11/16/2007 4:15:00 AM	0.017			3	
11/16/2007 4:20:00 AM	0.018				
11/16/2007 4:25:00 AM	0.022			3	
11/16/2007 4:30:00 AM	0.022				
11/16/2007 4:35:00 AM	0.020			3	
11/16/2007 4:40:00 AM	0.017				
11/16/2007 4:45:00 AM	0.017			3	
11/16/2007 4:50:00 AM	0.020				
11/16/2007 4:55:00 AM	0.018			3	
11/16/2007 5:00:00 AM	0.018				0.00
11/16/2007 5:05:00 AM	0.017			3	
11/16/2007 5:10:00 AM	0.015				
11/16/2007 5:15:00 AM	0.015			3	
11/16/2007 5:20:00 AM	0.015				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 5:25:00 AM	0.015			3	
11/16/2007 5:30:00 AM	0.013				
11/16/2007 5:35:00 AM	0.013			3	
11/16/2007 5:40:00 AM	0.013				
11/16/2007 5:45:00 AM	0.012			3	
11/16/2007 5:50:00 AM	0.010				
11/16/2007 5:55:00 AM	0.008			4	
11/16/2007 6:00:00 AM	0.008				0.03
11/16/2007 6:05:00 AM	0.008				
11/16/2007 6:10:00 AM	0.007				
11/16/2007 6:15:00 AM	0.007				
11/16/2007 6:20:00 AM	0.005				
11/16/2007 6:25:00 AM	0.005				
11/16/2007 6:30:00 AM	0.003				
11/16/2007 6:35:00 AM	0.003				
11/16/2007 6:40:00 AM	0.003				
11/16/2007 6:45:00 AM	0.002				
11/16/2007 6:50:00 AM	0.002				
11/16/2007 6:55:00 AM	0.002				
11/16/2007 7:00:00 AM	0.002				0.08
11/16/2007 7:05:00 AM	0.002				
11/16/2007 7:10:00 AM	0.002				
11/16/2007 7:15:00 AM	0.002				
11/16/2007 7:20:00 AM	0.005				
11/16/2007 7:25:00 AM	0.007				
11/16/2007 7:30:00 AM	0.008				
11/16/2007 7:35:00 AM	0.008				
11/16/2007 7:40:00 AM	0.010			4	
11/16/2007 7:45:00 AM	0.008				
11/16/2007 7:50:00 AM	0.010			4	
11/16/2007 7:55:00 AM	0.008			4	
11/16/2007 8:00:00 AM	0.012			4	0.08
11/16/2007 8:05:00 AM	0.015				
11/16/2007 8:10:00 AM	0.017			4	
11/16/2007 8:15:00 AM	0.015				
11/16/2007 8:20:00 AM	0.015			4	
11/16/2007 8:25:00 AM	0.013				
11/16/2007 8:30:00 AM	0.013			4	
11/16/2007 8:35:00 AM	0.013				
11/16/2007 8:40:00 AM	0.013			4	
11/16/2007 8:45:00 AM	0.029				
11/16/2007 8:50:00 AM	0.030			4	
11/16/2007 8:55:00 AM	0.043				
11/16/2007 9:00:00 AM	0.057			5	0.08

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 9:05:00 AM	0.057				
11/16/2007 9:10:00 AM	0.060			5	
11/16/2007 9:15:00 AM	0.057				
11/16/2007 9:20:00 AM	0.053			5	
11/16/2007 9:25:00 AM	0.055				
11/16/2007 9:30:00 AM	0.052			5	
11/16/2007 9:35:00 AM	0.045				
11/16/2007 9:40:00 AM	0.040			5	
11/16/2007 9:45:00 AM	0.043				
11/16/2007 9:50:00 AM	0.040			5	
11/16/2007 9:55:00 AM	0.038				
11/16/2007 10:00:00 AM	0.032			5	0.02
11/16/2007 10:05:00 AM	0.032				
11/16/2007 10:10:00 AM	0.038			5	
11/16/2007 10:15:00 AM	0.062				
11/16/2007 10:20:00 AM	0.058			5	
11/16/2007 10:25:00 AM	0.053				
11/16/2007 10:30:00 AM	0.045			5	
11/16/2007 10:35:00 AM	0.035				
11/16/2007 10:40:00 AM	0.030			6	
11/16/2007 10:45:00 AM	0.030				
11/16/2007 10:50:00 AM	0.030			6	
11/16/2007 10:55:00 AM	0.030				
11/16/2007 11:00:00 AM	0.030			6	0.04
11/16/2007 11:05:00 AM	0.029				
11/16/2007 11:10:00 AM	0.027			6	
11/16/2007 11:15:00 AM	0.027				
11/16/2007 11:20:00 AM	0.025			6	
11/16/2007 11:25:00 AM	0.023				
11/16/2007 11:30:00 AM	0.023			6	
11/16/2007 11:35:00 AM	0.025				
11/16/2007 11:40:00 AM	0.025			6	
11/16/2007 11:45:00 AM	0.025				
11/16/2007 11:50:00 AM	0.023			6	
11/16/2007 11:55:00 AM	0.022				
11/16/2007 12:00:00 PM	0.022			6	0.01
11/16/2007 12:05:00 PM	0.023				
11/16/2007 12:10:00 PM	0.023			6	
11/16/2007 12:15:00 PM	0.025				
11/16/2007 12:20:00 PM	0.025			7	
11/16/2007 12:25:00 PM	0.025				
11/16/2007 12:30:00 PM	0.023			7	
11/16/2007 12:35:00 PM	0.023				
11/16/2007 12:40:00 PM	0.022			7	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 12:45:00 PM	0.022				
11/16/2007 12:50:00 PM	0.022			7	
11/16/2007 12:55:00 PM	0.022				
11/16/2007 1:00:00 PM	0.022			7	0.08
11/16/2007 1:05:00 PM	0.023				
11/16/2007 1:10:00 PM	0.023			7	
11/16/2007 1:15:00 PM	0.023				
11/16/2007 1:20:00 PM	0.023			7	
11/16/2007 1:25:00 PM	0.022				
11/16/2007 1:30:00 PM	0.022			7	
11/16/2007 1:35:00 PM	0.022				
11/16/2007 1:40:00 PM	0.022			7	
11/16/2007 1:45:00 PM	0.022				
11/16/2007 1:50:00 PM	0.022			7	
11/16/2007 1:55:00 PM	0.022				
11/16/2007 2:00:00 PM	0.022				0.07
11/16/2007 2:05:00 PM	0.022				
11/16/2007 2:10:00 PM	0.022				
11/16/2007 2:15:00 PM	0.023				
11/16/2007 2:20:00 PM	0.025				
11/16/2007 2:25:00 PM	0.029				
11/16/2007 2:30:00 PM	0.029				
11/16/2007 2:35:00 PM	0.030				
11/16/2007 2:40:00 PM	0.030				
11/16/2007 2:45:00 PM	0.032				
11/16/2007 2:50:00 PM	0.032				
11/16/2007 2:55:00 PM	0.033				
11/16/2007 3:00:00 PM	0.035				0.04
11/16/2007 3:05:00 PM	0.038				
11/16/2007 3:10:00 PM	0.040				
11/16/2007 3:15:00 PM	0.050				
11/16/2007 3:20:00 PM	0.053				
11/16/2007 3:25:00 PM	0.053				
11/16/2007 3:30:00 PM	0.049				
11/16/2007 3:35:00 PM	0.042				
11/16/2007 3:40:00 PM	0.037				
11/16/2007 3:45:00 PM	0.033				
11/16/2007 3:50:00 PM	0.033				
11/16/2007 3:55:00 PM	0.033				
11/16/2007 4:00:00 PM	0.032				0.03
11/16/2007 4:05:00 PM	0.032				
11/16/2007 4:10:00 PM	0.032				
11/16/2007 4:15:00 PM	0.030				
11/16/2007 4:20:00 PM	0.030				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 4:25:00 PM	0.029				
11/16/2007 4:30:00 PM	0.027				
11/16/2007 4:35:00 PM	0.027				
11/16/2007 4:40:00 PM	0.027				
11/16/2007 4:45:00 PM	0.027				
11/16/2007 4:50:00 PM	0.029				
11/16/2007 4:55:00 PM	0.027				
11/16/2007 5:00:00 PM	0.027				0.03
11/16/2007 5:05:00 PM	0.025				
11/16/2007 5:10:00 PM	0.025				
11/16/2007 5:15:00 PM	0.025				
11/16/2007 5:20:00 PM	0.023				
11/16/2007 5:25:00 PM	0.023				
11/16/2007 5:30:00 PM	0.022				
11/16/2007 5:35:00 PM	0.022				
11/16/2007 5:40:00 PM	0.022				
11/16/2007 5:45:00 PM	0.022				
11/16/2007 5:50:00 PM	0.022				
11/16/2007 5:55:00 PM	0.022				
11/16/2007 6:00:00 PM	0.022				0.00
11/16/2007 6:05:00 PM	0.022				
11/16/2007 6:10:00 PM	0.022				
11/16/2007 6:15:00 PM	0.020				
11/16/2007 6:20:00 PM	0.020				
11/16/2007 6:25:00 PM	0.020				
11/16/2007 6:30:00 PM	0.018				
11/16/2007 6:35:00 PM	0.018				
11/16/2007 6:40:00 PM	0.018				
11/16/2007 6:45:00 PM	0.020				
11/16/2007 6:50:00 PM	0.020				
11/16/2007 6:55:00 PM	0.018				
11/16/2007 7:00:00 PM	0.018				0.01
11/16/2007 7:05:00 PM	0.018				
11/16/2007 7:10:00 PM	0.027				
11/16/2007 7:15:00 PM	0.020				
11/16/2007 7:20:00 PM	0.017				
11/16/2007 7:25:00 PM	0.018				
11/16/2007 7:30:00 PM	0.018				
11/16/2007 7:35:00 PM	0.017				
11/16/2007 7:40:00 PM	0.017				
11/16/2007 7:45:00 PM	0.015				
11/16/2007 7:50:00 PM	0.015				
11/16/2007 7:55:00 PM	0.015				
11/16/2007 8:00:00 PM	0.015				0.01

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 8:05:00 PM	0.013				
11/16/2007 8:10:00 PM	0.013				
11/16/2007 8:15:00 PM	0.013				
11/16/2007 8:20:00 PM	0.013				
11/16/2007 8:25:00 PM	0.013				
11/16/2007 8:30:00 PM	0.013				
11/16/2007 8:35:00 PM	0.013				
11/16/2007 8:40:00 PM	0.013				
11/16/2007 8:45:00 PM	0.013				
11/16/2007 8:50:00 PM	0.012				
11/16/2007 8:55:00 PM	0.012				
11/16/2007 9:00:00 PM	0.012				0.00
11/16/2007 9:05:00 PM	0.012				
11/16/2007 9:10:00 PM	0.012				
11/16/2007 9:15:00 PM	0.012				
11/16/2007 9:20:00 PM	0.012				
11/16/2007 9:25:00 PM	0.012				
11/16/2007 9:30:00 PM	0.010				
11/16/2007 9:35:00 PM	0.010				
11/16/2007 9:40:00 PM	0.008				
11/16/2007 9:45:00 PM	0.008				
11/16/2007 9:50:00 PM	0.007				
11/16/2007 9:55:00 PM	0.007				
11/16/2007 10:00:00 PM	0.007				0.00
11/16/2007 10:05:00 PM	0.007				
11/16/2007 10:10:00 PM	0.007				
11/16/2007 10:15:00 PM	0.007				
11/16/2007 10:20:00 PM	0.007				
11/16/2007 10:25:00 PM	0.007				
11/16/2007 10:30:00 PM	0.007				
11/16/2007 10:35:00 PM	0.007				
11/16/2007 10:40:00 PM	0.005				
11/16/2007 10:45:00 PM	0.005				
11/16/2007 10:50:00 PM	0.005				
11/16/2007 10:55:00 PM	0.005				
11/16/2007 11:00:00 PM	0.005				0.00
11/16/2007 11:05:00 PM	0.003				
11/16/2007 11:10:00 PM	0.003				
11/16/2007 11:15:00 PM	0.005				
11/16/2007 11:20:00 PM	0.003				
11/16/2007 11:25:00 PM	0.003				
11/16/2007 11:30:00 PM	0.003				
11/16/2007 11:35:00 PM	0.003				
11/16/2007 11:40:00 PM	0.003				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 11:45:00 PM	0.002				
11/16/2007 11:50:00 PM	0.002				
11/16/2007 11:55:00 PM	0.002				
11/17/2007 12:00:00 AM	0.002				0.00
11/17/2007 12:05:00 AM	0.002				
11/17/2007 12:10:00 AM	0.002				
11/17/2007 12:15:00 AM	0.000				
11/17/2007 12:20:00 AM	0.000				
11/17/2007 12:25:00 AM	0.000				
11/17/2007 12:30:00 AM	0.000				
11/17/2007 12:35:00 AM	0.000				
11/17/2007 12:40:00 AM	0.000				
11/17/2007 12:45:00 AM	0.000				
11/17/2007 12:50:00 AM	0.000				
11/17/2007 12:55:00 AM	0.000				
11/17/2007 1:00:00 AM	0.000				0.03

Figure I-5 WR-142 Gunderson

November 27th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/26/2007 3:00:00 PM	0.000				0.00
11/26/2007 3:05:00 PM	0.000				
11/26/2007 3:10:00 PM	0.000				
11/26/2007 3:15:00 PM	0.000				
11/26/2007 3:20:00 PM	0.000				
11/26/2007 3:25:00 PM	0.000				
11/26/2007 3:30:00 PM	0.000				
11/26/2007 3:35:00 PM	0.000				
11/26/2007 3:40:00 PM	0.000				
11/26/2007 3:45:00 PM	0.000				
11/26/2007 3:50:00 PM	0.000				
11/26/2007 3:55:00 PM	0.000				
11/26/2007 4:00:00 PM	0.000				0.10
11/26/2007 4:05:00 PM	0.000				
11/26/2007 4:10:00 PM	0.000				
11/26/2007 4:15:00 PM	0.000				
11/26/2007 4:20:00 PM	0.000				
11/26/2007 4:25:00 PM	0.000				
11/26/2007 4:30:00 PM	0.000				
11/26/2007 4:35:00 PM	0.000				
11/26/2007 4:40:00 PM	0.000				
11/26/2007 4:45:00 PM	0.000				
11/26/2007 4:50:00 PM	0.000				
11/26/2007 4:55:00 PM	0.000				
11/26/2007 5:00:00 PM	0.000				0.13
11/26/2007 5:05:00 PM	0.000				
11/26/2007 5:10:00 PM	0.000				
11/26/2007 5:15:00 PM	0.000				
11/26/2007 5:20:00 PM	0.000				
11/26/2007 5:25:00 PM	0.000				
11/26/2007 5:30:00 PM	0.000				
11/26/2007 5:35:00 PM	0.000				
11/26/2007 5:40:00 PM	0.000				
11/26/2007 5:45:00 PM	0.000				
11/26/2007 5:50:00 PM	0.000				
11/26/2007 5:55:00 PM	0.000				
11/26/2007 6:00:00 PM	0.010			1	0.08
11/26/2007 6:05:00 PM	0.010			1	
11/26/2007 6:10:00 PM	0.010			1	
11/26/2007 6:15:00 PM	0.010			1	
11/26/2007 6:20:00 PM	0.010			1	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/26/2007 6:25:00 PM	0.008			1	
11/26/2007 6:30:00 PM	0.005				
11/26/2007 6:35:00 PM	0.005				
11/26/2007 6:40:00 PM	0.005				
11/26/2007 6:45:00 PM	0.010			1	
11/26/2007 6:50:00 PM	0.017			1	
11/26/2007 6:55:00 PM	0.017			1	
11/26/2007 7:00:00 PM	0.015			1	0.01
11/26/2007 7:05:00 PM	0.013			2	
11/26/2007 7:10:00 PM	0.013			2	
11/26/2007 7:15:00 PM	0.010			2	
11/26/2007 7:20:00 PM	0.003			2	
11/26/2007 7:25:00 PM	0.003				
11/26/2007 7:30:00 PM	0.003				
11/26/2007 7:35:00 PM	0.005				
11/26/2007 7:40:00 PM	0.005				
11/26/2007 7:45:00 PM	0.003				
11/26/2007 7:50:00 PM	0.005				
11/26/2007 7:55:00 PM	0.007				
11/26/2007 8:00:00 PM	0.007				0.00
11/26/2007 8:05:00 PM	0.005				
11/26/2007 8:10:00 PM	0.000				
11/26/2007 8:15:00 PM	0.000				
11/26/2007 8:20:00 PM	0.000				
11/26/2007 8:25:00 PM	0.000				
11/26/2007 8:30:00 PM	0.000				
11/26/2007 8:35:00 PM	0.000				
11/26/2007 8:40:00 PM	0.000				
11/26/2007 8:45:00 PM	0.000				
11/26/2007 8:50:00 PM	0.000				
11/26/2007 8:55:00 PM	0.000				
11/26/2007 9:00:00 PM	0.000				0.00
11/26/2007 9:05:00 PM	0.000				
11/26/2007 9:10:00 PM	0.000				
11/26/2007 9:15:00 PM	0.000				
11/26/2007 9:20:00 PM	0.000				
11/26/2007 9:25:00 PM	0.000				
11/26/2007 9:30:00 PM	0.000				
11/26/2007 9:35:00 PM	0.000				
11/26/2007 9:40:00 PM	0.000				
11/26/2007 9:45:00 PM	0.000				
11/26/2007 9:50:00 PM	0.000				
11/26/2007 9:55:00 PM	0.000				
11/26/2007 10:00:00 PM	0.000				0.00

Figure I-6 WR-142 Gunderson

November 29th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/28/2007 11:00:00 AM	0.000				0.00
11/28/2007 11:05:00 AM	0.000				
11/28/2007 11:10:00 AM	0.000				
11/28/2007 11:15:00 AM	0.000				
11/28/2007 11:20:00 AM	0.000				
11/28/2007 11:25:00 AM	0.000				
11/28/2007 11:30:00 AM	0.000				
11/28/2007 11:35:00 AM	0.000				
11/28/2007 11:40:00 AM	0.000				
11/28/2007 11:45:00 AM	0.000				
11/28/2007 11:50:00 AM	0.000				
11/28/2007 11:55:00 AM	0.000				
11/28/2007 12:00:00 PM	0.000				0.00
11/28/2007 12:05:00 PM	0.000				
11/28/2007 12:10:00 PM	0.000				
11/28/2007 12:15:00 PM	0.000				
11/28/2007 12:20:00 PM	0.000				
11/28/2007 12:25:00 PM	0.000				
11/28/2007 12:30:00 PM	0.000				
11/28/2007 12:35:00 PM	0.000				
11/28/2007 12:40:00 PM	0.000				
11/28/2007 12:45:00 PM	0.000				
11/28/2007 12:50:00 PM	0.000				
11/28/2007 12:55:00 PM	0.000				
11/28/2007 1:00:00 PM	0.000				0.08
11/28/2007 1:05:00 PM	0.000				
11/28/2007 1:10:00 PM	0.000				
11/28/2007 1:15:00 PM	0.000				
11/28/2007 1:20:00 PM	0.000				
11/28/2007 1:25:00 PM	0.000				
11/28/2007 1:30:00 PM	0.000				
11/28/2007 1:35:00 PM	0.000				
11/28/2007 1:40:00 PM	0.000				
11/28/2007 1:45:00 PM	0.000				
11/28/2007 1:50:00 PM	0.000				
11/28/2007 1:55:00 PM	0.000				
11/28/2007 2:00:00 PM	0.000				0.05
11/28/2007 2:05:00 PM	0.000				
11/28/2007 2:10:00 PM	0.000				
11/28/2007 2:15:00 PM	0.000				
11/28/2007 2:20:00 PM	0.000				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/28/2007 2:25:00 PM	0.000				
11/28/2007 2:30:00 PM	0.000				
11/28/2007 2:35:00 PM	0.000				
11/28/2007 2:40:00 PM	0.000				
11/28/2007 2:45:00 PM	0.000				
11/28/2007 2:50:00 PM	0.000				
11/28/2007 2:55:00 PM	0.000				
11/28/2007 3:00:00 PM	0.007				0.02
11/28/2007 3:05:00 PM	0.007				
11/28/2007 3:10:00 PM	0.007				
11/28/2007 3:15:00 PM	0.007				
11/28/2007 3:20:00 PM	0.007				
11/28/2007 3:25:00 PM	0.007				
11/28/2007 3:30:00 PM	0.007				
11/28/2007 3:35:00 PM	0.007				
11/28/2007 3:40:00 PM	0.007				
11/28/2007 3:45:00 PM	0.007				
11/28/2007 3:50:00 PM	0.007				
11/28/2007 3:55:00 PM	0.005				
11/28/2007 4:00:00 PM	0.005				0.03
11/28/2007 4:05:00 PM	0.003				
11/28/2007 4:10:00 PM	0.002				
11/28/2007 4:15:00 PM	0.002				
11/28/2007 4:20:00 PM	0.000				
11/28/2007 4:25:00 PM	0.000				
11/28/2007 4:30:00 PM	0.000				
11/28/2007 4:35:00 PM	0.000				
11/28/2007 4:40:00 PM	0.000				
11/28/2007 4:45:00 PM	0.000				
11/28/2007 4:50:00 PM	0.000				
11/28/2007 4:55:00 PM	0.000				
11/28/2007 5:00:00 PM	0.000				0.09
11/28/2007 5:05:00 PM	0.000				
11/28/2007 5:10:00 PM	0.000				
11/28/2007 5:15:00 PM	0.000				
11/28/2007 5:20:00 PM	0.000				
11/28/2007 5:25:00 PM	0.000				
11/28/2007 5:30:00 PM	0.000				
11/28/2007 5:35:00 PM	0.000				
11/28/2007 5:40:00 PM	0.000				
11/28/2007 5:45:00 PM	0.000				
11/28/2007 5:50:00 PM	0.000				
11/28/2007 5:55:00 PM	0.000				
11/28/2007 6:00:00 PM	0.000				0.08

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/28/2007 6:05:00 PM	0.003				
11/28/2007 6:10:00 PM	0.005				
11/28/2007 6:15:00 PM	0.005				
11/28/2007 6:20:00 PM	0.005				
11/28/2007 6:25:00 PM	0.005				
11/28/2007 6:30:00 PM	0.005				
11/28/2007 6:35:00 PM	0.005				
11/28/2007 6:40:00 PM	0.010			1	
11/28/2007 6:45:00 PM	0.013				
11/28/2007 6:47:00 PM				1	
11/28/2007 6:50:00 PM	0.010				
11/28/2007 6:54:00 PM				1	
11/28/2007 6:55:00 PM	0.017				
11/28/2007 7:00:00 PM	0.017				0.04
11/28/2007 7:01:00 PM				1	
11/28/2007 7:05:00 PM	0.015				
11/28/2007 7:08:00 PM				1	
11/28/2007 7:10:00 PM	0.015				
11/28/2007 7:15:00 PM	0.013			1	
11/28/2007 7:20:00 PM	0.012				
11/28/2007 7:22:00 PM				1	
11/28/2007 7:25:00 PM	0.008				
11/28/2007 7:30:00 PM	0.008				
11/28/2007 7:35:00 PM	0.010			1	
11/28/2007 7:39:00 PM				1	
11/28/2007 7:40:00 PM	0.013				
11/28/2007 7:45:00 PM	0.015				
11/28/2007 7:46:00 PM				1	
11/28/2007 7:50:00 PM	0.015				
11/28/2007 7:53:00 PM				2	
11/28/2007 7:55:00 PM	0.012				
11/28/2007 8:00:00 PM	0.008			2	0.03
11/28/2007 8:05:00 PM	0.008				
11/28/2007 8:10:00 PM	0.007				
11/28/2007 8:15:00 PM	0.005				
11/28/2007 8:20:00 PM	0.005				
11/28/2007 8:25:00 PM	0.007				
11/28/2007 8:30:00 PM	0.007				
11/28/2007 8:35:00 PM	0.007				
11/28/2007 8:40:00 PM	0.005				
11/28/2007 8:45:00 PM	0.003				
11/28/2007 8:50:00 PM	0.002				
11/28/2007 8:55:00 PM	0.002				
11/28/2007 9:00:00 PM	0.002				0.00

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/28/2007 9:05:00 PM	0.000				
11/28/2007 9:10:00 PM	0.000				
11/28/2007 9:15:00 PM	0.000				
11/28/2007 9:20:00 PM	0.000				
11/28/2007 9:25:00 PM	0.000				
11/28/2007 9:30:00 PM	0.000				
11/28/2007 9:35:00 PM	0.000				
11/28/2007 9:40:00 PM	0.000				
11/28/2007 9:45:00 PM	0.000				
11/28/2007 9:50:00 PM	0.002				
11/28/2007 9:55:00 PM	0.000				
11/28/2007 10:00:00 PM	0.000				0.00
11/28/2007 10:05:00 PM	0.000				
11/28/2007 10:10:00 PM	0.000				
11/28/2007 10:15:00 PM	0.000				
11/28/2007 10:20:00 PM	0.000				
11/28/2007 10:25:00 PM	0.000				
11/28/2007 10:30:00 PM	0.000				
11/28/2007 10:35:00 PM	0.000				
11/28/2007 10:40:00 PM	0.000				
11/28/2007 10:45:00 PM	0.000				
11/28/2007 10:50:00 PM	0.000				
11/28/2007 10:55:00 PM	0.000				
11/28/2007 11:00:00 PM	0.000				0.00
11/28/2007 11:05:00 PM	0.000				
11/28/2007 11:10:00 PM	0.000				
11/28/2007 11:15:00 PM	0.000				
11/28/2007 11:20:00 PM	0.000				
11/28/2007 11:25:00 PM	0.000				
11/28/2007 11:30:00 PM	0.000				
11/28/2007 11:35:00 PM	0.000				
11/28/2007 11:40:00 PM	0.000				
11/28/2007 11:45:00 PM	0.000				
11/28/2007 11:50:00 PM	0.000				
11/28/2007 11:55:00 PM	0.000				
11/29/2007 12:00:00 AM	0.000				0.00

Figure I-7 WR-142 Gunderson

January 9th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/7/2008 8:00:00 PM	0.000				0.00
1/7/2008 8:05:00 PM	0.000				
1/7/2008 8:10:00 PM	0.000				
1/7/2008 8:15:00 PM	0.000				
1/7/2008 8:20:00 PM	0.000				
1/7/2008 8:25:00 PM	0.000				
1/7/2008 8:30:00 PM	0.000				
1/7/2008 8:35:00 PM	0.000				
1/7/2008 8:40:00 PM	0.000				
1/7/2008 8:45:00 PM	0.000				
1/7/2008 8:50:00 PM	0.000				
1/7/2008 8:55:00 PM	0.000				
1/7/2008 9:00:00 PM	0.000				0.02
1/7/2008 9:05:00 PM	0.000				
1/7/2008 9:10:00 PM	0.000				
1/7/2008 9:15:00 PM	0.000				
1/7/2008 9:20:00 PM	0.000				
1/7/2008 9:25:00 PM	0.000				
1/7/2008 9:30:00 PM	0.000				
1/7/2008 9:35:00 PM	0.000				
1/7/2008 9:40:00 PM	0.000				
1/7/2008 9:45:00 PM	0.000				
1/7/2008 9:50:00 PM	0.000				
1/7/2008 9:55:00 PM	0.000				
1/7/2008 10:00:00 PM	0.000				0.04
1/7/2008 10:05:00 PM	0.000				
1/7/2008 10:10:00 PM	0.000				
1/7/2008 10:15:00 PM	0.000				
1/7/2008 10:20:00 PM	0.000				
1/7/2008 10:25:00 PM	0.000				
1/7/2008 10:30:00 PM	0.000				
1/7/2008 10:35:00 PM	0.000				
1/7/2008 10:40:00 PM	0.000				
1/7/2008 10:45:00 PM	0.000				
1/7/2008 10:50:00 PM	0.000				
1/7/2008 10:55:00 PM	0.000				
1/7/2008 11:00:00 PM	0.000				0.05
1/7/2008 11:05:00 PM	0.000				
1/7/2008 11:10:00 PM	0.000				
1/7/2008 11:15:00 PM	0.000				
1/7/2008 11:20:00 PM	0.000				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/7/2008 11:25:00 PM	0.000				
1/7/2008 11:30:00 PM	0.000				
1/7/2008 11:35:00 PM	0.000				
1/7/2008 11:40:00 PM	0.000				
1/7/2008 11:45:00 PM	0.000				
1/7/2008 11:50:00 PM	0.000				
1/7/2008 11:55:00 PM	0.000				
1/8/2008 12:00:00 AM	0.000				0.08
1/8/2008 12:05:00 AM	0.000				
1/8/2008 12:10:00 AM	0.000				
1/8/2008 12:15:00 AM	0.000				
1/8/2008 12:20:00 AM	0.000				
1/8/2008 12:25:00 AM	0.000				
1/8/2008 12:30:00 AM	0.000				
1/8/2008 12:35:00 AM	0.000				
1/8/2008 12:40:00 AM	0.000				
1/8/2008 12:45:00 AM	0.000				
1/8/2008 12:50:00 AM	0.000				
1/8/2008 12:55:00 AM	0.000				
1/8/2008 1:00:00 AM	0.000				0.05
1/8/2008 1:05:00 AM	0.000				
1/8/2008 1:10:00 AM	0.000				
1/8/2008 1:15:00 AM	0.000				
1/8/2008 1:20:00 AM	0.000				
1/8/2008 1:25:00 AM	0.000				
1/8/2008 1:30:00 AM	0.000				
1/8/2008 1:35:00 AM	0.000				
1/8/2008 1:40:00 AM	0.000				
1/8/2008 1:45:00 AM	0.000				
1/8/2008 1:50:00 AM	0.000				
1/8/2008 1:55:00 AM	0.000				
1/8/2008 2:00:00 AM	0.000				0.06
1/8/2008 2:05:00 AM	0.000				
1/8/2008 2:10:00 AM	0.000				
1/8/2008 2:15:00 AM	0.000				
1/8/2008 2:20:00 AM	0.000				
1/8/2008 2:25:00 AM	0.000				
1/8/2008 2:30:00 AM	0.000				
1/8/2008 2:35:00 AM	0.000				
1/8/2008 2:40:00 AM	0.000				
1/8/2008 2:45:00 AM	0.000				
1/8/2008 2:50:00 AM	0.000				
1/8/2008 2:55:00 AM	0.000				
1/8/2008 3:00:00 AM	0.000				0.04

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/8/2008 3:05:00 AM	0.000				
1/8/2008 3:10:00 AM	0.000				
1/8/2008 3:15:00 AM	0.000				
1/8/2008 3:20:00 AM	0.000				
1/8/2008 3:25:00 AM	0.000				
1/8/2008 3:30:00 AM	0.000				
1/8/2008 3:35:00 AM	0.000				
1/8/2008 3:40:00 AM	0.000				
1/8/2008 3:45:00 AM	0.000				
1/8/2008 3:50:00 AM	0.000				
1/8/2008 3:55:00 AM	0.000				
1/8/2008 4:00:00 AM	0.000				0.06
1/8/2008 4:05:00 AM	0.000				
1/8/2008 4:10:00 AM	0.000				
1/8/2008 4:15:00 AM	0.000				
1/8/2008 4:20:00 AM	0.000				
1/8/2008 4:25:00 AM	0.000				
1/8/2008 4:30:00 AM	0.000				
1/8/2008 4:35:00 AM	0.000				
1/8/2008 4:40:00 AM	0.000				
1/8/2008 4:45:00 AM	0.000				
1/8/2008 4:50:00 AM	0.000				
1/8/2008 4:55:00 AM	0.000				
1/8/2008 5:00:00 AM	0.000				0.02
1/8/2008 5:05:00 AM	0.000				
1/8/2008 5:10:00 AM	0.000				
1/8/2008 5:15:00 AM	0.000				
1/8/2008 5:20:00 AM	0.000				
1/8/2008 5:25:00 AM	0.000				
1/8/2008 5:30:00 AM	0.000				
1/8/2008 5:35:00 AM	0.000				
1/8/2008 5:40:00 AM	0.000				
1/8/2008 5:45:00 AM	0.000				
1/8/2008 5:50:00 AM	0.000				
1/8/2008 5:55:00 AM	0.000				
1/8/2008 6:00:00 AM	0.000				0.04
1/8/2008 6:05:00 AM	0.000				
1/8/2008 6:10:00 AM	0.000				
1/8/2008 6:15:00 AM	0.000				
1/8/2008 6:20:00 AM	0.000				
1/8/2008 6:25:00 AM	0.000				
1/8/2008 6:30:00 AM	0.000				
1/8/2008 6:35:00 AM	0.000				
1/8/2008 6:40:00 AM	0.000				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/8/2008 6:45:00 AM	0.000				
1/8/2008 6:50:00 AM	0.000				
1/8/2008 6:55:00 AM	0.000				
1/8/2008 7:00:00 AM	0.000				0.03
1/8/2008 7:05:00 AM	0.000				
1/8/2008 7:10:00 AM	0.000				
1/8/2008 7:15:00 AM	0.000				
1/8/2008 7:20:00 AM	0.000				
1/8/2008 7:25:00 AM	0.000				
1/8/2008 7:30:00 AM	0.000				
1/8/2008 7:35:00 AM	0.000				
1/8/2008 7:40:00 AM	0.000				
1/8/2008 7:45:00 AM	0.000				
1/8/2008 7:50:00 AM	0.000				
1/8/2008 7:55:00 AM	0.000				
1/8/2008 8:00:00 AM	0.000				0.04
1/8/2008 8:05:00 AM	0.000				
1/8/2008 8:10:00 AM	0.000				
1/8/2008 8:15:00 AM	0.000				
1/8/2008 8:20:00 AM	0.000				
1/8/2008 8:25:00 AM	0.000				
1/8/2008 8:30:00 AM	0.000				
1/8/2008 8:35:00 AM	0.000				
1/8/2008 8:40:00 AM	0.000				
1/8/2008 8:45:00 AM	0.000				
1/8/2008 8:50:00 AM	0.000				
1/8/2008 8:55:00 AM	0.000				
1/8/2008 9:00:00 AM	0.000				0.04
1/8/2008 9:05:00 AM	0.000				
1/8/2008 9:10:00 AM	0.000				
1/8/2008 9:15:00 AM	0.000				
1/8/2008 9:20:00 AM	0.000				
1/8/2008 9:25:00 AM	0.000				
1/8/2008 9:30:00 AM	0.000				
1/8/2008 9:35:00 AM	0.000				
1/8/2008 9:40:00 AM	0.000				
1/8/2008 9:45:00 AM	0.000				
1/8/2008 9:50:00 AM	0.000				
1/8/2008 9:55:00 AM	0.000				
1/8/2008 10:00:00 AM	0.000				0.04
1/8/2008 10:05:00 AM	0.000				
1/8/2008 10:10:00 AM	0.000				
1/8/2008 10:15:00 AM	0.000				
1/8/2008 10:20:00 AM	0.000				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/8/2008 10:25:00 AM	0.000				
1/8/2008 10:30:00 AM	0.000				
1/8/2008 10:35:00 AM	0.000				
1/8/2008 10:40:00 AM	0.000				
1/8/2008 10:45:00 AM	0.000				
1/8/2008 10:50:00 AM	0.000				
1/8/2008 10:55:00 AM	0.000				
1/8/2008 11:00:00 AM	0.000				0.01
1/8/2008 11:05:00 AM	0.000				
1/8/2008 11:10:00 AM	0.000				
1/8/2008 11:15:00 AM	0.000				
1/8/2008 11:20:00 AM	0.000				
1/8/2008 11:25:00 AM	0.000				
1/8/2008 11:30:00 AM	0.000				
1/8/2008 11:35:00 AM	0.000				
1/8/2008 11:40:00 AM	0.000				
1/8/2008 11:45:00 AM	0.000				
1/8/2008 11:50:00 AM	0.000				
1/8/2008 11:55:00 AM	0.000				
1/8/2008 12:00:00 PM	0.000				0.03
1/8/2008 12:05:00 PM	0.000				
1/8/2008 12:10:00 PM	0.000				
1/8/2008 12:15:00 PM	0.000				
1/8/2008 12:20:00 PM	0.000				
1/8/2008 12:25:00 PM	0.000				
1/8/2008 12:30:00 PM	0.000				
1/8/2008 12:35:00 PM	0.000				
1/8/2008 12:40:00 PM	0.000				
1/8/2008 12:45:00 PM	0.000				
1/8/2008 12:50:00 PM	0.000				
1/8/2008 12:55:00 PM	0.000				
1/8/2008 1:00:00 PM	0.000				0.07
1/8/2008 1:05:00 PM	0.000				
1/8/2008 1:10:00 PM	0.000				
1/8/2008 1:15:00 PM	0.000				
1/8/2008 1:20:00 PM	0.000				
1/8/2008 1:25:00 PM	0.000				
1/8/2008 1:30:00 PM	0.000				
1/8/2008 1:35:00 PM	0.000				
1/8/2008 1:40:00 PM	0.000				
1/8/2008 1:45:00 PM	0.000				
1/8/2008 1:50:00 PM	0.000				
1/8/2008 1:55:00 PM	0.000				
1/8/2008 2:00:00 PM	0.000				0.15

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/8/2008 2:05:00 PM	0.000				
1/8/2008 2:10:00 PM	0.000				
1/8/2008 2:15:00 PM	0.000				
1/8/2008 2:20:00 PM	0.000				
1/8/2008 2:25:00 PM	0.000				
1/8/2008 2:30:00 PM	0.000				
1/8/2008 2:35:00 PM	0.000				
1/8/2008 2:40:00 PM	0.002				
1/8/2008 2:45:00 PM	0.002				
1/8/2008 2:50:00 PM	0.002				
1/8/2008 2:55:00 PM	0.003				
1/8/2008 3:00:00 PM	0.005			1	0.02
1/8/2008 3:03:00 PM				1	
1/8/2008 3:05:00 PM	0.003				
1/8/2008 3:10:00 PM	0.002				
1/8/2008 3:15:00 PM	0.003				
1/8/2008 3:20:00 PM	0.003				
1/8/2008 3:25:00 PM	0.005			1	
1/8/2008 3:26:00 PM				1	
1/8/2008 3:29:00 PM				1	
1/8/2008 3:30:00 PM	0.008				
1/8/2008 3:32:00 PM				1	
1/8/2008 3:35:00 PM	0.015			1	
1/8/2008 3:38:00 PM				1	
1/8/2008 3:40:00 PM	0.018				
1/8/2008 3:41:00 PM				1	
1/8/2008 3:44:00 PM				1	
1/8/2008 3:45:00 PM	0.020				
1/8/2008 3:47:00 PM				2	
1/8/2008 3:50:00 PM	0.022			2	
1/8/2008 3:53:00 PM				2	
1/8/2008 3:55:00 PM	0.022				
1/8/2008 3:56:00 PM				2	
1/8/2008 3:59:00 PM				2	
1/8/2008 4:00:00 PM	0.020				0.00
1/8/2008 4:02:00 PM				2	
1/8/2008 4:05:00 PM	0.018			2	
1/8/2008 4:08:00 PM				2	
1/8/2008 4:10:00 PM	0.012				
1/8/2008 4:11:00 PM				2	
1/8/2008 4:14:00 PM				2	
1/8/2008 4:15:00 PM	0.008				
1/8/2008 4:17:00 PM				3	
1/8/2008 4:20:00 PM	0.007			3	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/8/2008 4:23:00 PM				3	
1/8/2008 4:25:00 PM	0.007				
1/8/2008 4:26:00 PM				3	
1/8/2008 4:29:00 PM				3	
1/8/2008 4:30:00 PM	0.005				
1/8/2008 4:32:00 PM				3	
1/8/2008 4:35:00 PM	0.003			3	
1/8/2008 4:40:00 PM	0.003				
1/8/2008 4:45:00 PM	0.003				
1/8/2008 4:50:00 PM	0.003				
1/8/2008 4:55:00 PM	0.005			3	
1/8/2008 4:58:00 PM				3	
1/8/2008 5:00:00 PM	0.005				0.00
1/8/2008 5:01:00 PM				3	
1/8/2008 5:04:00 PM				4	
1/8/2008 5:05:00 PM	0.005				
1/8/2008 5:07:00 PM				4	
1/8/2008 5:10:00 PM	0.005			4	
1/8/2008 5:13:00 PM				4	
1/8/2008 5:15:00 PM	0.005				
1/8/2008 5:16:00 PM				4	
1/8/2008 5:19:00 PM				4	
1/8/2008 5:20:00 PM	0.003				
1/8/2008 5:25:00 PM	0.005			4	
1/8/2008 5:27:00 PM				4	
1/8/2008 5:30:00 PM	0.005			4	
1/8/2008 5:33:00 PM				4	
1/8/2008 5:35:00 PM	0.005				
1/8/2008 5:36:00 PM				5	
1/8/2008 5:39:00 PM				5	
1/8/2008 5:40:00 PM	0.003				
1/8/2008 5:45:00 PM	0.007			5	
1/8/2008 5:47:00 PM				5	
1/8/2008 5:50:00 PM	0.005			5	
1/8/2008 5:53:00 PM				5	
1/8/2008 5:55:00 PM	0.005				
1/8/2008 5:56:00 PM				5	
1/8/2008 5:59:00 PM				5	
1/8/2008 6:00:00 PM	0.000				0.04
1/8/2008 6:05:00 PM	0.000				
1/8/2008 6:10:00 PM	0.000				
1/8/2008 6:15:00 PM	0.000				
1/8/2008 6:20:00 PM	0.000				
1/8/2008 6:25:00 PM	0.000				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/8/2008 6:30:00 PM	0.000				
1/8/2008 6:35:00 PM	0.000				
1/8/2008 6:40:00 PM	0.000				
1/8/2008 6:45:00 PM	0.000				
1/8/2008 6:50:00 PM	0.000				
1/8/2008 6:55:00 PM	0.000				
1/8/2008 7:00:00 PM	0.000				0.00

Figure L-4 OF-49 City

November 16th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/15/2007 8:00:00 PM	0.000				0.00
11/15/2007 8:05:00 PM	0.000				
11/15/2007 8:10:00 PM	0.000				
11/15/2007 8:15:00 PM	0.000				
11/15/2007 8:20:00 PM	0.000				
11/15/2007 8:25:00 PM	0.000				
11/15/2007 8:30:00 PM	0.000				
11/15/2007 8:35:00 PM	0.000				
11/15/2007 8:40:00 PM	0.000				
11/15/2007 8:45:00 PM	0.000				
11/15/2007 8:50:00 PM	0.000				
11/15/2007 8:55:00 PM	0.000				
11/15/2007 9:00:00 PM	0.000				0.01
11/15/2007 9:05:00 PM	0.000				
11/15/2007 9:10:00 PM	0.000				
11/15/2007 9:15:00 PM	0.000				
11/15/2007 9:20:00 PM	0.000				
11/15/2007 9:25:00 PM	0.000				
11/15/2007 9:30:00 PM	0.000				
11/15/2007 9:35:00 PM	0.000				
11/15/2007 9:40:00 PM	0.000				
11/15/2007 9:45:00 PM	0.000				
11/15/2007 9:50:00 PM	0.000				
11/15/2007 9:55:00 PM	0.000				
11/15/2007 10:00:00 PM	0.000				0.00
11/15/2007 10:05:00 PM	0.000				
11/15/2007 10:10:00 PM	0.000				
11/15/2007 10:15:00 PM	0.000				
11/15/2007 10:20:00 PM	0.000				
11/15/2007 10:25:00 PM	0.000				
11/15/2007 10:30:00 PM	0.000				
11/15/2007 10:35:00 PM	0.000				
11/15/2007 10:40:00 PM	0.000				
11/15/2007 10:45:00 PM	0.000				
11/15/2007 10:50:00 PM	0.000				
11/15/2007 10:55:00 PM	0.000				
11/15/2007 11:00:00 PM	0.000				0.00
11/15/2007 11:05:00 PM	0.000				
11/15/2007 11:10:00 PM	0.000				
11/15/2007 11:15:00 PM	0.000				
11/15/2007 11:20:00 PM	0.000				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/15/2007 11:25:00 PM	0.000				
11/15/2007 11:30:00 PM	0.000				
11/15/2007 11:35:00 PM	0.000				
11/15/2007 11:40:00 PM	0.000				
11/15/2007 11:45:00 PM	0.000				
11/15/2007 11:50:00 PM	0.000				
11/15/2007 11:55:00 PM	0.000				
11/16/2007 12:00:00 AM	0.000				0.01
11/16/2007 12:05:00 AM	0.000				
11/16/2007 12:10:00 AM	0.000				
11/16/2007 12:15:00 AM	0.000				
11/16/2007 12:20:00 AM	0.000				
11/16/2007 12:25:00 AM	0.000				
11/16/2007 12:30:00 AM	0.000				
11/16/2007 12:35:00 AM	0.000				
11/16/2007 12:40:00 AM	0.000				
11/16/2007 12:45:00 AM	0.000				
11/16/2007 12:50:00 AM	0.000				
11/16/2007 12:55:00 AM	0.000				
11/16/2007 1:00:00 AM	0.000				0.10
11/16/2007 1:05:00 AM	0.000				
11/16/2007 1:10:00 AM	0.000				
11/16/2007 1:15:00 AM	0.000				
11/16/2007 1:20:00 AM	0.000				
11/16/2007 1:25:00 AM	0.000				
11/16/2007 1:30:00 AM	0.000				
11/16/2007 1:35:00 AM	0.000				
11/16/2007 1:40:00 AM	0.000				
11/16/2007 1:45:00 AM	0.000				
11/16/2007 1:50:00 AM	0.000				
11/16/2007 1:55:00 AM	0.000				
11/16/2007 2:00:00 AM	0.000				0.04
11/16/2007 2:05:00 AM	0.000				
11/16/2007 2:10:00 AM	0.000				
11/16/2007 2:15:00 AM	0.000				
11/16/2007 2:20:00 AM	0.000				
11/16/2007 2:25:00 AM	0.000				
11/16/2007 2:30:00 AM	0.008				
11/16/2007 2:35:00 AM	0.026				
11/16/2007 2:40:00 AM	0.029				
11/16/2007 2:45:00 AM	0.014				
11/16/2007 2:50:00 AM	0.006				
11/16/2007 2:55:00 AM	0.001				
11/16/2007 3:00:00 AM	0.000				0.06

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 3:05:00 AM	0.000				
11/16/2007 3:10:00 AM	0.000				
11/16/2007 3:15:00 AM	0.008				
11/16/2007 3:20:00 AM	0.006				
11/16/2007 3:25:00 AM	0.001				
11/16/2007 3:30:00 AM	0.000				
11/16/2007 3:35:00 AM	0.000				
11/16/2007 3:40:00 AM	0.000				
11/16/2007 3:45:00 AM	0.000				
11/16/2007 3:50:00 AM	0.000				
11/16/2007 3:55:00 AM	0.000				
11/16/2007 4:00:00 AM	0.000				0.02
11/16/2007 4:05:00 AM	0.000				
11/16/2007 4:10:00 AM	0.000				
11/16/2007 4:15:00 AM	0.004				
11/16/2007 4:20:00 AM	0.009				
11/16/2007 4:25:00 AM	0.013				
11/16/2007 4:30:00 AM	0.016				
11/16/2007 4:35:00 AM	0.008				
11/16/2007 4:40:00 AM	0.004				
11/16/2007 4:45:00 AM	0.003				
11/16/2007 4:50:00 AM	0.000				
11/16/2007 4:55:00 AM	0.000				
11/16/2007 5:00:00 AM	0.000				0.01
11/16/2007 5:05:00 AM	0.000				
11/16/2007 5:10:00 AM	0.000				
11/16/2007 5:15:00 AM	0.000				
11/16/2007 5:20:00 AM	0.031				
11/16/2007 5:25:00 AM	0.048				
11/16/2007 5:30:00 AM	0.049				
11/16/2007 5:35:00 AM	0.058				
11/16/2007 5:40:00 AM	0.059				
11/16/2007 5:45:00 AM	0.059				
11/16/2007 5:50:00 AM	0.060				
11/16/2007 5:55:00 AM	0.061				
11/16/2007 5:59:00 AM				1	
11/16/2007 6:00:00 AM	0.071				0.03
11/16/2007 6:05:00 AM	0.081				
11/16/2007 6:06:00 AM				1	
11/16/2007 6:10:00 AM	0.089	0.19	3.63		
11/16/2007 6:13:00 AM				1	
11/16/2007 6:15:00 AM	0.084	0.23	4.01		
11/16/2007 6:18:00 AM				1	
11/16/2007 6:20:00 AM	0.079	0.23	3.71		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 6:25:00 AM	0.074	0.23	3.37		
11/16/2007 6:30:00 AM	0.061	0.23	2.51		
11/16/2007 6:35:00 AM	0.055	0.23	2.18		
11/16/2007 6:40:00 AM	0.047	0.23	1.70		
11/16/2007 6:45:00 AM	0.043	0.23	1.51		
11/16/2007 6:50:00 AM	0.041	0.23	1.39		
11/16/2007 6:55:00 AM	0.040	0.23	1.34		
11/16/2007 7:00:00 AM	0.049	0.23	1.80		0.08
11/16/2007 7:05:00 AM	0.039	0.23	1.27		
11/16/2007 7:10:00 AM	0.034	0.23	1.06		
11/16/2007 7:15:00 AM	0.031	0.23	0.91		
11/16/2007 7:20:00 AM	0.027	0.23	0.75		
11/16/2007 7:25:00 AM	0.023	0.23	0.57		
11/16/2007 7:30:00 AM	0.018	0.23	0.42		
11/16/2007 7:35:00 AM	0.015	0.23	0.31		
11/16/2007 7:40:00 AM	0.011	0.23	0.19		
11/16/2007 7:45:00 AM	0.008	0.23	0.12		
11/16/2007 7:50:00 AM	0.006	0.23	0.08		
11/16/2007 7:55:00 AM	0.004	0.23	0.04		
11/16/2007 8:00:00 AM	0.006	0.23	0.08		0.08
11/16/2007 8:05:00 AM	0.011	0.23	0.19		
11/16/2007 8:10:00 AM	0.013	0.23	0.26		
11/16/2007 8:15:00 AM	0.014	0.23	0.28		
11/16/2007 8:20:00 AM	0.010	0.23	0.16		
11/16/2007 8:25:00 AM	0.007	0.23	0.09		
11/16/2007 8:30:00 AM	0.006	0.23	0.07		
11/16/2007 8:35:00 AM	0.005	0.23	0.06		
11/16/2007 8:40:00 AM	0.003	0.23	0.03		
11/16/2007 8:45:00 AM	0.006	0.23	0.07		
11/16/2007 8:50:00 AM	0.012	0.23	0.22		
11/16/2007 8:55:00 AM	0.028	0.23	0.77		
11/16/2007 9:00:00 AM	0.027	0.23	0.75		0.03
11/16/2007 9:05:00 AM	0.031	0.23	0.91		
11/16/2007 9:10:00 AM	0.052	0.23	1.99		
11/16/2007 9:15:00 AM	0.064	0.23	2.71		
11/16/2007 9:16:00 AM				1	
11/16/2007 9:19:00 AM				1	
11/16/2007 9:20:00 AM	0.093	-0.75	-15.40		
11/16/2007 9:25:00 AM	0.128	-0.81	-26.57		
11/16/2007 9:26:00 AM				1	
11/16/2007 9:30:00 AM	0.159	-1.13	-50.86		
11/16/2007 9:33:00 AM				1	
11/16/2007 9:35:00 AM	0.180	-1.29	-69.45		
11/16/2007 9:40:00 AM	0.198	-1.61	-99.81	1	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 9:45:00 AM	0.210	-1.97	-133.24		
11/16/2007 9:47:00 AM				1	
11/16/2007 9:50:00 AM	0.221	-2.04	-148.73		
11/16/2007 9:54:00 AM				2	
11/16/2007 9:55:00 AM	0.225	-2.19	-162.73		
11/16/2007 10:00:00 AM	0.226	-2.10	-157.88		0.03
11/16/2007 10:01:00 AM				2	
11/16/2007 10:05:00 AM	0.224	-2.32	-171.69		
11/16/2007 10:08:00 AM				2	
11/16/2007 10:10:00 AM	0.221	-2.17	-157.65		
11/16/2007 10:15:00 AM	0.223	-2.10	-154.75	2	
11/16/2007 10:20:00 AM	0.219	-1.98	-142.28		
11/16/2007 10:22:00 AM				2	
11/16/2007 10:25:00 AM	0.217	-2.17	-153.47		
11/16/2007 10:29:00 AM				2	
11/16/2007 10:30:00 AM	0.213	-2.08	-143.70		
11/16/2007 10:35:00 AM	0.206	-1.84	-121.27		
11/16/2007 10:36:00 AM				2	
11/16/2007 10:40:00 AM	0.200	-1.91	-120.38		
11/16/2007 10:43:00 AM				2	
11/16/2007 10:45:00 AM	0.197	-1.86	-114.08		
11/16/2007 10:50:00 AM	0.190	-1.88	-109.92	2	
11/16/2007 10:55:00 AM	0.184	-1.78	-99.51		
11/16/2007 10:57:00 AM				2	
11/16/2007 11:00:00 AM	0.181	-1.72	-93.40		0.04
11/16/2007 11:04:00 AM				3	
11/16/2007 11:05:00 AM	0.175	-1.58	-81.88		
11/16/2007 11:10:00 AM	0.173	-1.34	-68.27		
11/16/2007 11:11:00 AM				3	
11/16/2007 11:15:00 AM	0.166	-1.33	-63.46		
11/16/2007 11:18:00 AM				3	
11/16/2007 11:20:00 AM	0.157	-1.06	-46.86		
11/16/2007 11:25:00 AM	0.150	-0.97	-39.97	3	
11/16/2007 11:30:00 AM	0.144	-0.91	-35.27		
11/16/2007 11:32:00 AM				3	
11/16/2007 11:35:00 AM	0.137	-0.84	-30.68		
11/16/2007 11:39:00 AM				3	
11/16/2007 11:40:00 AM	0.130	-0.78	-26.16		
11/16/2007 11:45:00 AM	0.126	-0.84	-26.93		
11/16/2007 11:46:00 AM				3	
11/16/2007 11:50:00 AM	0.122	-0.83	-25.36		
11/16/2007 11:53:00 AM				3	
11/16/2007 11:55:00 AM	0.117	-0.83	-23.96		
11/16/2007 12:00:00 PM	0.113	-0.47	-12.82	3	0.02

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 12:05:00 PM	0.110	-0.47	-12.27		
11/16/2007 12:07:00 PM				3	
11/16/2007 12:10:00 PM	0.105	-0.38	-9.32		
11/16/2007 12:14:00 PM				4	
11/16/2007 12:15:00 PM	0.103	-0.38	-8.97		
11/16/2007 12:20:00 PM	0.099	-0.38	-8.51		
11/16/2007 12:21:00 PM				4	
11/16/2007 12:25:00 PM	0.096	-0.38	-8.14		
11/16/2007 12:28:00 PM				4	
11/16/2007 12:30:00 PM	0.093	-0.20	-4.05		
11/16/2007 12:35:00 PM	0.090	-0.20	-3.86	4	
11/16/2007 12:40:00 PM	0.087	0.13	2.40		
11/16/2007 12:42:00 PM				4	
11/16/2007 12:45:00 PM	0.086	0.13	2.35		
11/16/2007 12:49:00 PM				4	
11/16/2007 12:50:00 PM	0.087	0.22	4.06		
11/16/2007 12:55:00 PM	0.088	0.22	4.15		
11/16/2007 12:56:00 PM				4	
11/16/2007 1:00:00 PM	0.090	0.22	4.24		0.05
11/16/2007 1:03:00 PM				4	
11/16/2007 1:05:00 PM	0.092	0.22	4.38		
11/16/2007 1:10:00 PM	0.092	0.22	4.41	4	
11/16/2007 1:15:00 PM	0.093	0.22	4.45		
11/16/2007 1:17:00 PM				4	
11/16/2007 1:20:00 PM	0.094	0.22	4.57		
11/16/2007 1:24:00 PM				5	
11/16/2007 1:25:00 PM	0.094	0.22	4.59		
11/16/2007 1:30:00 PM	0.095	-0.23	-4.85		
11/16/2007 1:31:00 PM				5	
11/16/2007 1:35:00 PM	0.096	-0.23	-4.95		
11/16/2007 1:38:00 PM				5	
11/16/2007 1:40:00 PM	0.098	-0.23	-5.05		
11/16/2007 1:45:00 PM	0.097	-0.23	-5.00	5	
11/16/2007 1:50:00 PM	0.098	-0.23	-5.05		
11/16/2007 1:52:00 PM				5	
11/16/2007 1:55:00 PM	0.098	-0.47	-10.37		
11/16/2007 1:59:00 PM				5	
11/16/2007 2:00:00 PM	0.097	-0.47	-10.27		0.06
11/16/2007 2:05:00 PM	0.095	-0.47	-9.92		
11/16/2007 2:06:00 PM				5	
11/16/2007 2:10:00 PM	0.094	-0.47	-9.76		
11/16/2007 2:13:00 PM				5	
11/16/2007 2:15:00 PM	0.093	-0.47	-9.56		
11/16/2007 2:20:00 PM	0.091	0.20	3.96	5	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 2:25:00 PM	0.088	0.20	3.77		
11/16/2007 2:27:00 PM				5	
11/16/2007 2:30:00 PM	0.085	0.20	3.59		
11/16/2007 2:34:00 PM				6	
11/16/2007 2:35:00 PM	0.082	0.15	2.54		
11/16/2007 2:40:00 PM	0.079	0.15	2.39		
11/16/2007 2:45:00 PM	0.075	0.15	2.22		
11/16/2007 2:50:00 PM	0.072	0.15	2.10		
11/16/2007 2:55:00 PM	0.071	0.15	2.06		
11/16/2007 3:00:00 PM	0.069	0.15	1.96		0.05
11/16/2007 3:05:00 PM	0.067	0.15	1.86		
11/16/2007 3:10:00 PM	0.067	0.15	1.89		
11/16/2007 3:15:00 PM	0.072	0.15	2.10		
11/16/2007 3:18:00 PM				6	
11/16/2007 3:20:00 PM	0.080	0.15	2.43		
11/16/2007 3:22:00 PM				6	
11/16/2007 3:25:00 PM	0.091	-0.20	-3.96		
11/16/2007 3:29:00 PM				6	
11/16/2007 3:30:00 PM	0.105	-0.40	-9.76		
11/16/2007 3:35:00 PM	0.120	-0.65	-19.42		
11/16/2007 3:36:00 PM				6	
11/16/2007 3:40:00 PM	0.136	-0.78	-27.83		
11/16/2007 3:43:00 PM				6	
11/16/2007 3:45:00 PM	0.151	-0.92	-38.52		
11/16/2007 3:50:00 PM	0.165	-1.02	-48.38	6	
11/16/2007 3:55:00 PM	0.173	-1.02	-51.95		
11/16/2007 3:57:00 PM				6	
11/16/2007 4:00:00 PM	0.177	-1.45	-76.75		0.04
11/16/2007 4:04:00 PM				6	
11/16/2007 4:05:00 PM	0.178	-1.09	-58.04		
11/16/2007 4:10:00 PM	0.178	-1.49	-79.60		
11/16/2007 4:11:00 PM				6	
11/16/2007 4:15:00 PM	0.180	-1.62	-87.03		
11/16/2007 4:18:00 PM				7	
11/16/2007 4:20:00 PM	0.186	-1.80	-101.56		
11/16/2007 4:25:00 PM	0.189	-1.78	-102.94	7	
11/16/2007 4:30:00 PM	0.191	-1.89	-110.78		
11/16/2007 4:32:00 PM				7	
11/16/2007 4:35:00 PM	0.195	-2.10	-126.95		
11/16/2007 4:39:00 PM				7	
11/16/2007 4:40:00 PM	0.197	-1.98	-121.76		
11/16/2007 4:45:00 PM	0.196	-2.16	-131.22		
11/16/2007 4:46:00 PM				7	
11/16/2007 4:50:00 PM	0.197	-2.09	-128.08		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 4:53:00 PM				7	
11/16/2007 4:55:00 PM	0.193	-2.04	-121.20		
11/16/2007 5:00:00 PM	0.190	-2.00	-116.94	7	0.02
11/16/2007 5:05:00 PM	0.188	-2.07	-119.02		
11/16/2007 5:07:00 PM				7	
11/16/2007 5:10:00 PM	0.187	-1.75	-99.79		
11/16/2007 5:14:00 PM				7	
11/16/2007 5:15:00 PM	0.185	-1.82	-101.73		
11/16/2007 5:20:00 PM	0.183	-1.79	-98.49		
11/16/2007 5:21:00 PM				7	
11/16/2007 5:25:00 PM	0.182	-1.62	-89.09		
11/16/2007 5:30:00 PM	0.183	-1.76	-97.17		
11/16/2007 5:35:00 PM	0.180	-1.64	-88.90		
11/16/2007 5:40:00 PM	0.180	-1.70	-91.58		
11/16/2007 5:45:00 PM	0.176	-1.13	-58.88		
11/16/2007 5:50:00 PM	0.172	-1.09	-54.95		
11/16/2007 5:55:00 PM	0.169	-1.03	-50.52		
11/16/2007 6:00:00 PM	0.168	-0.97	-46.99		0.00
11/16/2007 6:05:00 PM	0.162	-0.96	-44.53		
11/16/2007 6:10:00 PM	0.156	-0.87	-38.23		
11/16/2007 6:15:00 PM	0.152	-0.76	-32.07		
11/16/2007 6:20:00 PM	0.148	-0.76	-30.75		
11/16/2007 6:25:00 PM	0.145	-0.88	-34.57		
11/16/2007 6:30:00 PM	0.142	-0.61	-23.17		
11/16/2007 6:35:00 PM	0.140	-0.62	-23.08		
11/16/2007 6:40:00 PM	0.138	-0.70	-25.80		
11/16/2007 6:45:00 PM	0.135	-0.50	-17.77		
11/16/2007 6:50:00 PM	0.134	-0.65	-22.65		
11/16/2007 6:55:00 PM	0.131	-0.46	-15.54		
11/16/2007 7:00:00 PM	0.129	-0.42	-13.79		0.00
11/16/2007 7:05:00 PM	0.126	-0.42	-13.46		
11/16/2007 7:10:00 PM	0.123	-0.38	-11.78		
11/16/2007 7:15:00 PM	0.119	-0.39	-11.45		
11/16/2007 7:20:00 PM	0.116	-0.44	-12.41		
11/16/2007 7:25:00 PM	0.113	-0.29	-7.77		
11/16/2007 7:30:00 PM	0.109	-0.20	-5.20		
11/16/2007 7:35:00 PM	0.105	-0.19	-4.58		
11/16/2007 7:40:00 PM	0.102	-0.16	-3.76		
11/16/2007 7:45:00 PM	0.099	-0.16	-3.57		
11/16/2007 7:50:00 PM	0.095	-0.12	-2.52		
11/16/2007 7:55:00 PM	0.091	-0.12	-2.37		
11/16/2007 8:00:00 PM	0.086	0.12	2.19		0.00
11/16/2007 8:05:00 PM	0.080	0.12	1.95		
11/16/2007 8:10:00 PM	0.074	0.12	1.76		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 8:15:00 PM	0.069	0.12	1.56		
11/16/2007 8:20:00 PM	0.063	0.12	1.38		
11/16/2007 8:25:00 PM	0.058	0.12	1.22		
11/16/2007 8:30:00 PM	0.053	0.12	1.06		
11/16/2007 8:35:00 PM	0.048	0.12	0.91		
11/16/2007 8:40:00 PM	0.043	0.12	0.79		
11/16/2007 8:45:00 PM	0.040	0.12	0.69		
11/16/2007 8:50:00 PM	0.036	0.12	0.60		
11/16/2007 8:55:00 PM	0.032	0.12	0.51		
11/16/2007 9:00:00 PM	0.030	0.12	0.45		0.00
11/16/2007 9:05:00 PM	0.028	0.12	0.40		
11/16/2007 9:10:00 PM	0.025	0.12	0.35		
11/16/2007 9:15:00 PM	0.023	0.12	0.30		
11/16/2007 9:20:00 PM	0.021	0.12	0.26		
11/16/2007 9:25:00 PM	0.019	0.12	0.24		
11/16/2007 9:30:00 PM	0.018	0.12	0.22		
11/16/2007 9:35:00 PM	0.017	0.12	0.19		
11/16/2007 9:40:00 PM	0.016	0.12	0.17		
11/16/2007 9:45:00 PM	0.014	0.12	0.14		
11/16/2007 9:50:00 PM	0.011	0.12	0.10		
11/16/2007 9:55:00 PM	0.008	0.12	0.06		
11/16/2007 10:00:00 PM	0.001	0.12	0.00		0.00
11/16/2007 10:05:00 PM	0.000	0.12	0.00		
11/16/2007 10:10:00 PM	0.000	0.12	0.00		
11/16/2007 10:15:00 PM	0.000	0.12	0.00		
11/16/2007 10:20:00 PM	0.000	0.12	0.00		
11/16/2007 10:25:00 PM	0.000	0.12	0.00		
11/16/2007 10:30:00 PM	0.000	0.12	0.00		
11/16/2007 10:35:00 PM	0.000	0.12	0.00		
11/16/2007 10:40:00 PM	0.000	0.12	0.00		
11/16/2007 10:45:00 PM	0.000	0.12	0.00		
11/16/2007 10:50:00 PM	0.000	0.12	0.00		
11/16/2007 10:55:00 PM	0.000	0.12	0.00		
11/16/2007 11:00:00 PM	0.000	0.12	0.00		0.00
11/16/2007 11:05:00 PM	0.000	0.12	0.00		
11/16/2007 11:10:00 PM	0.000	0.12	0.00		
11/16/2007 11:15:00 PM	0.000	0.12	0.00		
11/16/2007 11:20:00 PM	0.000	0.12	0.00		
11/16/2007 11:25:00 PM	0.000	0.12	0.00		
11/16/2007 11:30:00 PM	0.000	0.12	0.00		
11/16/2007 11:35:00 PM	0.000	0.12	0.00		
11/16/2007 11:40:00 PM	0.000	0.12	0.00		
11/16/2007 11:45:00 PM	0.000	0.12	0.00		
11/16/2007 11:50:00 PM	0.000	0.12	0.00		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 11:55:00 PM	0.000	0.12	0.00		
11/17/2007 12:00:00 AM	0.000	0.12	0.00		0.00

Figure N-4 OF-22C City

January 9th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
1/7/2008 6:00:00 PM					0.00
1/7/2008 7:00:00 PM					0.00
1/7/2008 8:00:00 PM					0.00
1/7/2008 8:13:00 PM	0.108	15.90	669.94	1	
1/7/2008 8:33:00 PM	0.120	15.80	778.99	1	
1/7/2008 8:53:00 PM	0.116	15.70	735.91	1	
1/7/2008 9:00:00 PM					0.01
1/7/2008 9:13:00 PM	0.112	15.90	707.28	1	
1/7/2008 9:33:00 PM	0.112	15.70	698.39	1	
1/7/2008 9:53:00 PM	0.108	15.40	648.87	1	
1/7/2008 10:00:00 PM					0.02
1/7/2008 10:13:00 PM	0.118	16.20	778.95	1	
1/7/2008 10:33:00 PM	0.116	15.60	731.22	1	
1/7/2008 10:53:00 PM	0.112	16.20	720.63	1	
1/7/2008 11:00:00 PM					0.05
1/7/2008 11:13:00 PM	0.112	15.80	702.84	1	
1/7/2008 11:33:00 PM	0.105	15.70	634.29	2	
1/7/2008 11:53:00 PM	0.110	15.90	688.53	2	
1/8/2008 12:00:00 AM					0.07
1/8/2008 12:13:00 AM	0.113	16.60	748.28	2	
1/8/2008 12:33:00 AM	0.113	15.90	716.72	2	
1/8/2008 12:53:00 AM	0.116	15.50	726.53	2	
1/8/2008 1:00:00 AM					0.05
1/8/2008 1:13:00 AM	0.115	16.40	758.86	2	
1/8/2008 1:33:00 AM	0.110	16.30	705.85	2	
1/8/2008 1:53:00 AM	0.112	15.90	707.28	2	
1/8/2008 2:00:00 AM					0.06
1/8/2008 2:13:00 AM	0.118	15.90	764.52	2	
1/8/2008 2:33:00 AM	0.110	15.50	671.21	2	
1/8/2008 2:53:00 AM	0.113	16.50	743.77	3	
1/8/2008 3:00:00 AM					0.03
1/8/2008 3:13:00 AM	0.118	16.30	783.76	3	
1/8/2008 3:33:00 AM	0.113	16.20	730.25	3	
1/8/2008 3:53:00 AM	0.116	15.30	717.16	3	
1/8/2008 4:00:00 AM					0.03
1/8/2008 4:13:00 AM	0.115	16.70	772.74	3	
1/8/2008 4:33:00 AM	0.110	16.10	697.19	3	
1/8/2008 4:53:00 AM	0.108	16.10	678.37	3	
1/8/2008 5:00:00 AM					0.03
1/8/2008 5:13:00 AM	0.112	16.10	716.18	3	
1/8/2008 5:33:00 AM	0.110	15.90	688.53	3	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
1/8/2008 5:53:00 AM	0.110	16.00	692.86	3	
1/8/2008 6:00:00 AM					0.01
1/8/2008 6:13:00 AM	0.113	16.20	730.25	4	
1/8/2008 6:33:00 AM	0.116	15.30	717.16	4	
1/8/2008 6:53:00 AM	0.112	15.90	707.28	4	
1/8/2008 7:00:00 AM					0.07
1/8/2008 7:13:00 AM	0.110	15.80	684.20	4	
1/8/2008 7:33:00 AM	0.113	15.70	707.71	4	
1/8/2008 7:53:00 AM	0.118	15.70	754.91	4	
1/8/2008 8:00:00 AM					0.07
1/8/2008 8:13:00 AM	0.120	15.70	774.06	4	
1/8/2008 8:33:00 AM	0.112	15.60	693.94	4	
1/8/2008 8:53:00 AM	0.120	15.50	764.20	4	
1/8/2008 9:00:00 AM					0.06
1/8/2008 9:13:00 AM	0.136	16.20	962.49	4	
1/8/2008 9:33:00 AM	0.141	16.00	1003.1	5	
1/8/2008 9:53:00 AM	0.143	15.80	1011.6	5	
1/8/2008 10:00:00 AM					0.08
1/8/2008 10:13:00 AM	0.130	16.60	922.14	5	
1/8/2008 10:33:00 AM	0.113	15.10	680.66	5	
1/8/2008 10:53:00 AM	0.113	17.10	770.82	5	
1/8/2008 11:00:00 AM					0.01
1/8/2008 11:13:00 AM	0.121	16.10	803.66	5	
1/8/2008 11:33:00 AM	0.140	15.90	986.34	5	
1/8/2008 11:53:00 AM	0.153	15.00	1062.0	5	
1/8/2008 12:00:00 PM					0.01
1/8/2008 12:13:00 PM	0.199	15.00	1569.8	5	
1/8/2008 12:33:00 PM	0.205	15.00	1640.5	5	
1/8/2008 12:53:00 PM	0.213	15.60	1805.9	6	
1/8/2008 1:00:00 PM					0.09
1/8/2008 1:13:00 PM	0.215	14.90	1748.9	6	
1/8/2008 1:33:00 PM	0.218	14.20	1701.4	6	
1/8/2008 1:53:00 PM	0.203	15.20	1638.4	6	
1/8/2008 2:00:00 PM					0.14
1/8/2008 2:13:00 PM	0.215	14.90	1748.9	6	
1/8/2008 2:33:00 PM	0.213	16.10	1863.7	6	
1/8/2008 2:53:00 PM	0.201	14.90	1582.6	6	
1/8/2008 3:00:00 PM					0.00
1/8/2008 3:13:00 PM	0.203	15.70	1692.3	6	
1/8/2008 3:33:00 PM	0.161	14.70	1122.8	6	
1/8/2008 3:53:00 PM	0.141	16.50	1034.5	6	
1/8/2008 4:00:00 PM					0.00
1/8/2008 4:13:00 PM	0.108	15.90	669.94	7	
1/8/2008 4:33:00 PM	0.136	15.40	914.96	7	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
1/8/2008 4:53:00 PM	0.103	17.10	671.31	7	
1/8/2008 5:00:00 PM					0.00
1/8/2008 5:13:00 PM	0.152	17.20	1206.0	7	
1/8/2008 5:33:00 PM	0.158	17.10	1270.0	7	
1/8/2008 5:53:00 PM	0.156	17.10	1246.2	7	
1/8/2008 6:00:00 PM					0.03
1/8/2008 6:13:00 PM	0.140	16.40	1017.4	7	
1/8/2008 6:33:00 PM	0.148	16.50	1111.9	7	
1/8/2008 6:53:00 PM	0.160	17.80	1347.0	7	
1/8/2008 7:00:00 PM					0.01
1/8/2008 7:13:00 PM	0.146	16.20	1069.8	7	
1/8/2008 8:00:00 PM					0.01
1/8/2008 9:00:00 PM					0.00

Figure O-4 OF-22B City

November 16th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/15/2007 8:00:00 PM	0.027				0.00
11/15/2007 8:05:00 PM	0.027				
11/15/2007 8:10:00 PM	0.027				
11/15/2007 8:15:00 PM	0.027				
11/15/2007 8:20:00 PM	0.029				
11/15/2007 8:25:00 PM	0.029				
11/15/2007 8:30:00 PM	0.029				
11/15/2007 8:35:00 PM	0.029				
11/15/2007 8:40:00 PM	0.029				
11/15/2007 8:45:00 PM	0.029				
11/15/2007 8:50:00 PM	0.028				
11/15/2007 8:55:00 PM	0.027				
11/15/2007 9:00:00 PM	0.027				0.01
11/15/2007 9:05:00 PM	0.027				
11/15/2007 9:10:00 PM	0.027				
11/15/2007 9:15:00 PM	0.027				
11/15/2007 9:20:00 PM	0.027				
11/15/2007 9:25:00 PM	0.027				
11/15/2007 9:30:00 PM	0.027				
11/15/2007 9:35:00 PM	0.027				
11/15/2007 9:40:00 PM	0.027				
11/15/2007 9:45:00 PM	0.027				
11/15/2007 9:50:00 PM	0.027				
11/15/2007 9:55:00 PM	0.027				
11/15/2007 10:00:00 PM	0.027				0.00
11/15/2007 10:05:00 PM	0.027				
11/15/2007 10:10:00 PM	0.027				
11/15/2007 10:15:00 PM	0.027				
11/15/2007 10:20:00 PM	0.027				
11/15/2007 10:25:00 PM	0.027				
11/15/2007 10:30:00 PM	0.027				
11/15/2007 10:35:00 PM	0.027				
11/15/2007 10:40:00 PM	0.029				
11/15/2007 10:45:00 PM	0.032				
11/15/2007 10:50:00 PM	0.036				
11/15/2007 10:55:00 PM	0.041				
11/15/2007 11:00:00 PM	0.043				0.00
11/15/2007 11:05:00 PM	0.046				
11/15/2007 11:10:00 PM	0.049				
11/15/2007 11:15:00 PM	0.052				
11/15/2007 11:20:00 PM	0.054				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/15/2007 11:25:00 PM	0.056				
11/15/2007 11:30:00 PM	0.058				
11/15/2007 11:35:00 PM	0.059				
11/15/2007 11:40:00 PM	0.061				
11/15/2007 11:45:00 PM	0.062				
11/15/2007 11:50:00 PM	0.062				
11/15/2007 11:55:00 PM	0.063				
11/16/2007 12:00:00 AM	0.066				0.01
11/16/2007 12:05:00 AM	0.066				
11/16/2007 12:10:00 AM	0.068				
11/16/2007 12:15:00 AM	0.069				
11/16/2007 12:20:00 AM	0.070				
11/16/2007 12:25:00 AM	0.071				
11/16/2007 12:30:00 AM	0.072				
11/16/2007 12:35:00 AM	0.072				
11/16/2007 12:40:00 AM	0.073				
11/16/2007 12:45:00 AM	0.073				
11/16/2007 12:50:00 AM	0.074				
11/16/2007 12:55:00 AM	0.073				
11/16/2007 1:00:00 AM	0.074				0.10
11/16/2007 1:05:00 AM	0.074				
11/16/2007 1:10:00 AM	0.074				
11/16/2007 1:15:00 AM	0.074				
11/16/2007 1:20:00 AM	0.082	0.46	14.30		
11/16/2007 1:25:00 AM	0.090	0.47	16.88		
11/16/2007 1:30:00 AM	0.100	0.51	21.16		
11/16/2007 1:35:00 AM	0.105	0.55	24.79		
11/16/2007 1:40:00 AM	0.109	0.53	25.57		
11/16/2007 1:45:00 AM	0.110	0.54	26.52		
11/16/2007 1:50:00 AM	0.111	0.53	25.90		
11/16/2007 1:55:00 AM	0.110	0.55	26.66		
11/16/2007 2:00:00 AM	0.109	0.54	26.05		0.04
11/16/2007 2:05:00 AM	0.108	0.53	25.01		
11/16/2007 2:10:00 AM	0.106	0.54	24.77		
11/16/2007 2:15:00 AM	0.104	0.51	22.77		
11/16/2007 2:20:00 AM	0.101	0.50	21.49		
11/16/2007 2:25:00 AM	0.101	0.50	21.05		
11/16/2007 2:30:00 AM	0.100	0.49	20.55		
11/16/2007 2:35:00 AM	0.117	0.55	29.31		
11/16/2007 2:40:00 AM	0.146	0.75	55.16		
11/16/2007 2:43:00 AM				1	
11/16/2007 2:45:00 AM	0.175	1.89	182.00		
11/16/2007 2:50:00 AM	0.252	5.96	993.00		
11/16/2007 2:55:00 AM	0.291	6.43	1324.3		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 2:58:00 AM				1	
11/16/2007 3:00:00 AM	0.266	6.48	1173.6		0.06
11/16/2007 3:05:00 AM	0.230	6.36	926.06		
11/16/2007 3:10:00 AM	0.214	5.58	728.92		
11/16/2007 3:13:00 AM				1	
11/16/2007 3:15:00 AM	0.214	5.06	663.13		
11/16/2007 3:20:00 AM	0.218	4.55	611.33		
11/16/2007 3:25:00 AM	0.212	4.29	554.62		
11/16/2007 3:28:00 AM				1	
11/16/2007 3:30:00 AM	0.204	5.29	644.27		
11/16/2007 3:35:00 AM	0.206	5.46	676.40		
11/16/2007 3:40:00 AM	0.207	5.37	666.82		
11/16/2007 3:43:00 AM				1	
11/16/2007 3:45:00 AM	0.203	5.05	612.70		
11/16/2007 3:50:00 AM	0.202	4.38	524.14		
11/16/2007 3:55:00 AM	0.177	4.13	405.76		
11/16/2007 3:58:00 AM				1	
11/16/2007 4:00:00 AM	0.122	3.86	219.66		0.02
11/16/2007 4:05:00 AM	0.114	3.96	203.28		
11/16/2007 4:10:00 AM	0.115	4.10	212.91		
11/16/2007 4:13:00 AM				1	
11/16/2007 4:15:00 AM	0.121	3.97	221.25		
11/16/2007 4:20:00 AM	0.127	3.92	235.81		
11/16/2007 4:25:00 AM	0.136	3.72	248.04		
11/16/2007 4:28:00 AM				1	
11/16/2007 4:30:00 AM	0.213	4.11	532.77		
11/16/2007 4:35:00 AM	0.227	6.00	854.78		
11/16/2007 4:40:00 AM	0.260	6.35	1111.9		
11/16/2007 4:43:00 AM				1	
11/16/2007 4:45:00 AM	0.250	6.51	1070.3		
11/16/2007 4:50:00 AM	0.225	6.31	890.00		
11/16/2007 4:55:00 AM	0.217	5.59	745.93		
11/16/2007 4:58:00 AM				1	
11/16/2007 5:00:00 AM	0.215	5.26	694.30		0.01
11/16/2007 5:05:00 AM	0.220	4.61	627.72		
11/16/2007 5:10:00 AM	0.194	3.94	445.44		
11/16/2007 5:13:00 AM				2	
11/16/2007 5:15:00 AM	0.156	3.90	318.04		
11/16/2007 5:20:00 AM	0.130	3.87	240.49		
11/16/2007 5:25:00 AM	0.126	4.12	243.71		
11/16/2007 5:28:00 AM				2	
11/16/2007 5:30:00 AM	0.139	3.98	273.04		
11/16/2007 5:35:00 AM	0.168	3.41	310.97		
11/16/2007 5:40:00 AM	0.169	3.26	298.56		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 5:43:00 AM				2	
11/16/2007 5:45:00 AM	0.170	3.22	297.46		
11/16/2007 5:50:00 AM	0.161	3.00	255.82		
11/16/2007 5:55:00 AM	0.168	2.97	270.39		
11/16/2007 5:58:00 AM				2	
11/16/2007 6:00:00 AM	0.163	2.51	219.46		0.03
11/16/2007 6:05:00 AM	0.170	2.56	238.04		
11/16/2007 6:10:00 AM	0.167	2.36	212.89		
11/16/2007 6:13:00 AM				2	
11/16/2007 6:15:00 AM	0.162	2.15	186.27		
11/16/2007 6:20:00 AM	0.163	1.92	166.83		
11/16/2007 6:25:00 AM	0.165	1.60	142.13		
11/16/2007 6:27:00 AM				2	
11/16/2007 6:29:00 AM				2	
11/16/2007 6:30:00 AM	0.165	1.09	97.10	2	
11/16/2007 6:35:00 AM	0.160	1.07	91.54		
11/16/2007 6:40:00 AM	0.158	0.95	79.35		
11/16/2007 6:45:00 AM	0.157	0.82	67.71		
11/16/2007 6:50:00 AM	0.153	0.77	61.06		
11/16/2007 6:55:00 AM	0.150	0.67	51.58		
11/16/2007 7:00:00 AM	0.147	0.66	49.34		0.08
11/16/2007 7:05:00 AM	0.145	0.66	48.20		
11/16/2007 7:10:00 AM	0.141	0.65	45.91		
11/16/2007 7:15:00 AM	0.139	0.59	41.11		
11/16/2007 7:20:00 AM	0.137	0.66	44.51		
11/16/2007 7:25:00 AM	0.137	0.61	40.78		
11/16/2007 7:30:00 AM	0.135	0.60	39.58		
11/16/2007 7:35:00 AM	0.141	0.62	43.65		
11/16/2007 7:40:00 AM	0.152	0.79	62.41		
11/16/2007 7:45:00 AM	0.161	0.96	82.08		
11/16/2007 7:48:00 AM				2	
11/16/2007 7:50:00 AM	0.173	1.26	119.48		
11/16/2007 7:55:00 AM	0.176	1.86	181.09		
11/16/2007 8:00:00 AM	0.172	2.15	201.90		0.08
11/16/2007 8:02:00 AM				2	
11/16/2007 8:05:00 AM	0.171	2.02	189.88		
11/16/2007 8:10:00 AM	0.176	1.93	187.94		
11/16/2007 8:15:00 AM	0.179	1.96	195.66		
11/16/2007 8:17:00 AM				3	
11/16/2007 8:20:00 AM	0.184	2.68	279.81		
11/16/2007 8:25:00 AM	0.201	4.29	509.99		
11/16/2007 8:30:00 AM	0.236	4.91	741.72		
11/16/2007 8:32:00 AM				3	
11/16/2007 8:35:00 AM	0.235	5.15	772.32		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 8:40:00 AM	0.234	4.92	735.08		
11/16/2007 8:45:00 AM	0.233	4.79	710.17		
11/16/2007 8:47:00 AM				3	
11/16/2007 8:50:00 AM	0.229	4.38	634.76		
11/16/2007 8:55:00 AM	0.238	3.77	576.09		
11/16/2007 9:00:00 AM	0.254	4.68	788.05		0.03
11/16/2007 9:02:00 AM				3	
11/16/2007 9:05:00 AM	0.293	6.02	1256.5		
11/16/2007 9:10:00 AM	0.329	5.92	1463.4		
11/16/2007 9:15:00 AM	0.337	6.40	1641.5		
11/16/2007 9:17:00 AM				3	
11/16/2007 9:20:00 AM	0.335	6.58	1668.6		
11/16/2007 9:25:00 AM	0.314	6.62	1525.3		
11/16/2007 9:30:00 AM	0.294	6.41	1342.3		
11/16/2007 9:32:00 AM				3	
11/16/2007 9:35:00 AM	0.278	6.65	1278.4		
11/16/2007 9:40:00 AM	0.266	6.43	1158.9		
11/16/2007 9:45:00 AM	0.252	6.16	1029.5		
11/16/2007 9:47:00 AM				3	
11/16/2007 9:50:00 AM	0.240	6.05	940.87		
11/16/2007 9:55:00 AM	0.231	6.26	915.37		
11/16/2007 10:00:00 AM	0.243	6.43	1017.0		0.03
11/16/2007 10:02:00 AM				3	
11/16/2007 10:05:00 AM	0.242	6.43	1010.9		
11/16/2007 10:10:00 AM	0.231	6.39	937.59		
11/16/2007 10:15:00 AM	0.236	6.03	911.28		
11/16/2007 10:17:00 AM				3	
11/16/2007 10:20:00 AM	0.227	6.24	891.60		
11/16/2007 10:25:00 AM	0.229	6.37	921.91		
11/16/2007 10:30:00 AM	0.233	6.54	967.70		
11/16/2007 10:32:00 AM				3	
11/16/2007 10:35:00 AM	0.220	6.04	823.05		
11/16/2007 10:40:00 AM	0.216	5.47	726.91		
11/16/2007 10:45:00 AM	0.225	4.87	685.29		
11/16/2007 10:47:00 AM				4	
11/16/2007 10:50:00 AM	0.200	4.19	496.53		
11/16/2007 10:55:00 AM	0.155	4.00	322.11		
11/16/2007 11:00:00 AM	0.132	4.18	265.98		0.04
11/16/2007 11:02:00 AM				4	
11/16/2007 11:05:00 AM	0.142	4.04	288.19		
11/16/2007 11:10:00 AM	0.138	4.11	278.64		
11/16/2007 11:15:00 AM	0.140	4.01	280.17		
11/16/2007 11:17:00 AM				4	
11/16/2007 11:20:00 AM	0.156	3.98	325.83		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 11:25:00 AM	0.154	4.04	321.85		
11/16/2007 11:30:00 AM	0.148	3.97	299.67		
11/16/2007 11:32:00 AM				4	
11/16/2007 11:35:00 AM	0.139	4.19	289.34		
11/16/2007 11:40:00 AM	0.135	4.17	275.05		
11/16/2007 11:45:00 AM	0.136	4.15	275.92		
11/16/2007 11:47:00 AM				4	
11/16/2007 11:50:00 AM	0.156	4.16	338.18		
11/16/2007 11:55:00 AM	0.174	4.13	398.12		
11/16/2007 12:00:00 PM	0.158	4.09	340.89		0.02
11/16/2007 12:02:00 PM				4	
11/16/2007 12:05:00 PM	0.141	4.02	282.48		
11/16/2007 12:10:00 PM	0.133	4.09	263.80		
11/16/2007 12:15:00 PM	0.166	3.53	317.06		
11/16/2007 12:17:00 PM				4	
11/16/2007 12:20:00 PM	0.176	3.39	331.89		
11/16/2007 12:25:00 PM	0.140	4.15	290.09		
11/16/2007 12:30:00 PM	0.200	4.04	478.74		
11/16/2007 12:32:00 PM				4	
11/16/2007 12:35:00 PM	0.225	4.67	657.88		
11/16/2007 12:40:00 PM	0.221	4.44	610.21		
11/16/2007 12:45:00 PM	0.207	4.18	520.28		
11/16/2007 12:47:00 PM				4	
11/16/2007 12:50:00 PM	0.170	4.08	378.86		
11/16/2007 12:55:00 PM	0.139	4.04	279.11		
11/16/2007 1:00:00 PM	0.136	4.16	276.25		0.05
11/16/2007 1:02:00 PM				4	
11/16/2007 1:05:00 PM	0.147	4.11	308.57		
11/16/2007 1:10:00 PM	0.165	3.64	322.33		
11/16/2007 1:15:00 PM	0.144	4.10	298.30		
11/16/2007 1:17:00 PM				5	
11/16/2007 1:20:00 PM	0.166	4.09	365.41		
11/16/2007 1:25:00 PM	0.160	4.00	340.63		
11/16/2007 1:30:00 PM	0.152	3.94	308.52		
11/16/2007 1:32:00 PM				5	
11/16/2007 1:35:00 PM	0.135	4.09	269.64		
11/16/2007 1:40:00 PM	0.133	4.09	264.26		
11/16/2007 1:45:00 PM	0.158	3.92	326.72		
11/16/2007 1:47:00 PM				5	
11/16/2007 1:50:00 PM	0.165	3.42	304.65		
11/16/2007 1:55:00 PM	0.161	3.12	266.93		
11/16/2007 2:00:00 PM	0.160	3.03	257.60		0.06
11/16/2007 2:02:00 PM				5	
11/16/2007 2:05:00 PM	0.168	2.64	241.21		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 2:10:00 PM	0.167	2.68	241.56		
11/16/2007 2:15:00 PM	0.163	2.49	217.88		
11/16/2007 2:17:00 PM				5	
11/16/2007 2:20:00 PM	0.163	2.17	189.71		
11/16/2007 2:25:00 PM	0.159	2.01	169.44		
11/16/2007 2:30:00 PM	0.164	2.03	178.43		
11/16/2007 2:32:00 PM				5	
11/16/2007 2:35:00 PM	0.165	2.19	194.37		
11/16/2007 2:40:00 PM	0.163	2.85	249.65		
11/16/2007 2:45:00 PM	0.168	3.78	345.71		
11/16/2007 2:47:00 PM				5	
11/16/2007 2:50:00 PM	0.141	4.07	285.00		
11/16/2007 2:55:00 PM	0.164	4.09	358.78		
11/16/2007 3:00:00 PM	0.169	3.88	356.17		0.05
11/16/2007 3:02:00 PM				5	
11/16/2007 3:05:00 PM	0.197	3.83	442.87		
11/16/2007 3:10:00 PM	0.232	4.79	704.23		
11/16/2007 3:15:00 PM	0.230	5.33	775.43		
11/16/2007 3:17:00 PM				5	
11/16/2007 3:20:00 PM	0.240	5.32	823.99		
11/16/2007 3:25:00 PM	0.237	5.86	893.37		
11/16/2007 3:30:00 PM	0.255	6.39	1086.5		
11/16/2007 3:32:00 PM				5	
11/16/2007 3:35:00 PM	0.261	6.43	1131.0		
11/16/2007 3:40:00 PM	0.246	6.65	1072.1		
11/16/2007 3:45:00 PM	0.224	6.24	876.04		
11/16/2007 3:50:00 PM	0.230	5.28	769.02		
11/16/2007 3:55:00 PM	0.225	4.93	695.09		
11/16/2007 4:00:00 PM	0.224	5.20	728.66		0.04
11/16/2007 4:05:00 PM	0.224	6.20	870.57		
11/16/2007 4:10:00 PM	0.223	6.37	886.11		
11/16/2007 4:15:00 PM	0.221	5.86	803.13		
11/16/2007 4:20:00 PM	0.219	5.63	760.75		
11/16/2007 4:25:00 PM	0.214	5.53	724.69		
11/16/2007 4:30:00 PM	0.215	5.54	727.26		
11/16/2007 4:35:00 PM	0.215	5.32	698.12		
11/16/2007 4:40:00 PM	0.215	5.09	671.23		
11/16/2007 4:45:00 PM	0.223	4.83	671.88		
11/16/2007 4:50:00 PM	0.224	4.70	659.52		
11/16/2007 4:55:00 PM	0.220	4.90	667.46		
11/16/2007 5:00:00 PM	0.216	5.09	675.53		0.02
11/16/2007 5:05:00 PM	0.215	5.07	668.98		
11/16/2007 5:10:00 PM	0.221	4.80	661.11		
11/16/2007 5:15:00 PM	0.216	4.36	576.92		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 5:20:00 PM	0.197	3.94	455.58		
11/16/2007 5:25:00 PM	0.163	3.90	341.09		
11/16/2007 5:30:00 PM	0.140	3.85	268.79		
11/16/2007 5:35:00 PM	0.138	3.88	263.97		
11/16/2007 5:40:00 PM	0.139	3.98	273.04		
11/16/2007 5:45:00 PM	0.138	3.96	269.62		
11/16/2007 5:50:00 PM	0.133	3.97	254.31		
11/16/2007 5:55:00 PM	0.134	3.94	256.93		
11/16/2007 6:00:00 PM	0.152	4.02	314.78		0.00
11/16/2007 6:05:00 PM	0.194	4.15	469.21		
11/16/2007 6:10:00 PM	0.212	4.32	554.90		
11/16/2007 6:15:00 PM	0.216	4.33	572.69		
11/16/2007 6:20:00 PM	0.213	4.37	566.25		
11/16/2007 6:25:00 PM	0.210	4.08	518.64		
11/16/2007 6:30:00 PM	0.195	4.04	459.05		
11/16/2007 6:35:00 PM	0.180	3.96	400.67		
11/16/2007 6:40:00 PM	0.153	3.96	314.70		
11/16/2007 6:45:00 PM	0.137	3.99	268.78		
11/16/2007 6:50:00 PM	0.131	4.11	259.27		
11/16/2007 6:55:00 PM	0.125	4.04	237.12		
11/16/2007 7:00:00 PM	0.128	4.04	246.77		0.00
11/16/2007 7:05:00 PM	0.167	3.73	338.17		
11/16/2007 7:10:00 PM	0.166	3.50	314.81		
11/16/2007 7:15:00 PM	0.142	3.02	214.74		
11/16/2007 7:20:00 PM	0.159	3.17	266.92		
11/16/2007 7:25:00 PM	0.161	2.58	220.88		
11/16/2007 7:30:00 PM	0.159	2.75	231.33		
11/16/2007 7:35:00 PM	0.159	2.40	201.10		
11/16/2007 7:40:00 PM	0.159	2.11	176.95		
11/16/2007 7:45:00 PM	0.159	1.78	150.16		
11/16/2007 7:50:00 PM	0.156	1.63	133.33		
11/16/2007 7:55:00 PM	0.156	1.13	91.86		
11/16/2007 8:00:00 PM	0.151	0.95	73.70		0.00
11/16/2007 8:05:00 PM	0.148	1.03	77.37		
11/16/2007 8:10:00 PM	0.144	0.90	65.12		
11/16/2007 8:15:00 PM	0.141	0.83	58.15		
11/16/2007 8:20:00 PM	0.139	0.79	54.06		
11/16/2007 8:25:00 PM	0.135	0.71	46.69		
11/16/2007 8:30:00 PM	0.133	0.65	41.98		
11/16/2007 8:35:00 PM	0.131	0.63	39.78		
11/16/2007 8:40:00 PM	0.130	0.62	38.59		
11/16/2007 8:45:00 PM	0.130	0.60	37.18		
11/16/2007 8:50:00 PM	0.129	0.58	35.40		
11/16/2007 8:55:00 PM	0.128	0.60	36.65		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/16/2007 9:00:00 PM	0.127	0.58	35.28		0.00
11/16/2007 9:05:00 PM	0.127	0.55	32.80		
11/16/2007 9:10:00 PM	0.126	0.59	34.90		
11/16/2007 9:15:00 PM	0.124	0.54	31.74		
11/16/2007 9:20:00 PM	0.124	0.55	31.78		
11/16/2007 9:25:00 PM	0.122	0.54	30.58		
11/16/2007 9:30:00 PM	0.121	0.54	30.22		
11/16/2007 9:35:00 PM	0.119	0.54	29.50		
11/16/2007 9:40:00 PM	0.118	0.53	28.46		
11/16/2007 9:45:00 PM	0.116	0.48	25.25		
11/16/2007 9:50:00 PM	0.114	0.47	24.10		
11/16/2007 9:55:00 PM	0.112	0.47	23.38		
11/16/2007 10:00:00 PM	0.111	0.45	22.33		0.00
11/16/2007 10:05:00 PM	0.110	0.45	21.84		
11/16/2007 10:10:00 PM	0.108	0.46	21.79		
11/16/2007 10:15:00 PM	0.107	0.45	20.69		
11/16/2007 10:20:00 PM	0.105	0.46	21.04		
11/16/2007 10:25:00 PM	0.104	0.45	20.07		
11/16/2007 10:30:00 PM	0.102	0.47	20.25		
11/16/2007 10:35:00 PM	0.101	0.45	19.10		
11/16/2007 10:40:00 PM	0.099	0.43	17.96		
11/16/2007 10:45:00 PM	0.097	0.43	17.42		
11/16/2007 10:50:00 PM	0.096	0.42	16.94		
11/16/2007 10:55:00 PM	0.095	0.42	16.32		
11/16/2007 11:00:00 PM	0.094	0.41	15.96		0.00

Figure O-5 OF-22B City

November 27th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/26/2007 2:00:00 PM	0.097	0.26	10.72		0.00
11/26/2007 2:05:00 PM	0.096	0.26	10.51		
11/26/2007 2:10:00 PM	0.097	0.26	10.62		
11/26/2007 2:15:00 PM	0.097	0.27	10.94		
11/26/2007 2:20:00 PM	0.096	0.28	10.90		
11/26/2007 2:25:00 PM	0.097	0.26	10.62		
11/26/2007 2:30:00 PM	0.097	0.26	10.41		
11/26/2007 2:35:00 PM	0.097	0.26	10.41		
11/26/2007 2:40:00 PM	0.098	0.27	10.98		
11/26/2007 2:45:00 PM	0.097	0.27	10.74		
11/26/2007 2:50:00 PM	0.097	0.27	10.94		
11/26/2007 2:55:00 PM	0.097	0.26	10.64		
11/26/2007 3:00:00 PM	0.097	0.26	10.72		0.00
11/26/2007 3:05:00 PM	0.097	0.26	10.62		
11/26/2007 3:10:00 PM	0.097	0.27	10.74		
11/26/2007 3:15:00 PM	0.097	0.26	10.62		
11/26/2007 3:20:00 PM	0.097	0.27	10.74		
11/26/2007 3:25:00 PM	0.097	0.26	10.62		
11/26/2007 3:30:00 PM	0.097	0.26	10.62		
11/26/2007 3:35:00 PM	0.097	0.27	10.74		
11/26/2007 3:40:00 PM	0.097	0.26	10.52		
11/26/2007 3:45:00 PM	0.097	0.27	10.93		
11/26/2007 3:50:00 PM	0.096	0.26	10.28		
11/26/2007 3:55:00 PM	0.097	0.27	10.74		
11/26/2007 4:00:00 PM	0.097	0.26	10.62		0.10
11/26/2007 4:05:00 PM	0.097	0.27	10.74		
11/26/2007 4:10:00 PM	0.097	0.27	11.05		
11/26/2007 4:15:00 PM	0.097	0.27	10.84		
11/26/2007 4:20:00 PM	0.097	0.27	10.82		
11/26/2007 4:25:00 PM	0.097	0.26	10.54		
11/26/2007 4:30:00 PM	0.097	0.26	10.64		
11/26/2007 4:35:00 PM	0.097	0.26	10.64		
11/26/2007 4:40:00 PM	0.097	0.26	10.72		
11/26/2007 4:45:00 PM	0.098	0.26	10.75		
11/26/2007 4:50:00 PM	0.097	0.27	10.84		
11/26/2007 4:55:00 PM	0.097	0.27	10.82		
11/26/2007 5:00:00 PM	0.097	0.27	10.82		0.10
11/26/2007 5:05:00 PM	0.097	0.27	10.84		
11/26/2007 5:10:00 PM	0.098	0.27	10.90		
11/26/2007 5:15:00 PM	0.098	0.27	10.90		
11/26/2007 5:20:00 PM	0.098	0.27	10.98		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/26/2007 5:25:00 PM	0.097	0.26	10.62		
11/26/2007 5:30:00 PM	0.098	0.27	10.98		
11/26/2007 5:35:00 PM	0.107	0.31	14.49		
11/26/2007 5:40:00 PM	0.119	0.37	20.39		
11/26/2007 5:45:00 PM	0.121	0.45	25.17		
11/26/2007 5:47:00 PM				1	
11/26/2007 5:50:00 PM	0.157	2.47	204.60		
11/26/2007 5:53:00 PM				1	
11/26/2007 5:55:00 PM	0.227	5.15	734.98		
11/26/2007 5:56:00 PM				1	
11/26/2007 5:58:00 PM				1	
11/26/2007 6:00:00 PM	0.248	6.27	1020.9		0.08
11/26/2007 6:01:00 PM				1	
11/26/2007 6:03:00 PM				1	
11/26/2007 6:05:00 PM	0.259	6.33	1098.1	1	
11/26/2007 6:07:00 PM				1	
11/26/2007 6:09:00 PM				1	
11/26/2007 6:10:00 PM	0.255	6.33	1075.1		
11/26/2007 6:12:00 PM				1	
11/26/2007 6:14:00 PM				2	
11/26/2007 6:15:00 PM	0.253	6.40	1072.9		
11/26/2007 6:16:00 PM				2	
11/26/2007 6:18:00 PM				2	
11/26/2007 6:20:00 PM	0.254	6.33	1069.0	2	
11/26/2007 6:23:00 PM				2	
11/26/2007 6:25:00 PM	0.249	6.38	1046.6	2	
11/26/2007 6:27:00 PM				2	
11/26/2007 6:30:00 PM	0.245	6.39	1023.8	2	
11/26/2007 6:32:00 PM				2	
11/26/2007 6:35:00 PM	0.234	6.43	960.15	2	
11/26/2007 6:37:00 PM				3	
11/26/2007 6:40:00 PM	0.226	6.20	882.09	3	
11/26/2007 6:43:00 PM				3	
11/26/2007 6:45:00 PM	0.221	6.33	867.52	3	
11/26/2007 6:48:00 PM				3	
11/26/2007 6:50:00 PM	0.217	6.47	864.84		
11/26/2007 6:51:00 PM				3	
11/26/2007 6:54:00 PM				3	
11/26/2007 6:55:00 PM	0.209	6.42	808.27		
11/26/2007 6:57:00 PM				3	
11/26/2007 7:00:00 PM	0.202	6.41	772.26	3	0.01
11/26/2007 7:03:00 PM				3	
11/26/2007 7:05:00 PM	0.194	6.52	735.97		
11/26/2007 7:06:00 PM				4	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/26/2007 7:10:00 PM	0.188	6.39	689.38	4	
11/26/2007 7:13:00 PM				4	
11/26/2007 7:15:00 PM	0.187	6.18	660.04		
11/26/2007 7:17:00 PM				4	
11/26/2007 7:20:00 PM	0.184	6.26	652.68		
11/26/2007 7:21:00 PM				4	
11/26/2007 7:25:00 PM	0.179	6.09	609.51	4	
11/26/2007 7:28:00 PM				4	
11/26/2007 7:30:00 PM	0.187	5.67	605.40		
11/26/2007 7:33:00 PM				4	
11/26/2007 7:35:00 PM	0.181	5.79	589.32		
11/26/2007 7:37:00 PM				4	
11/26/2007 7:40:00 PM	0.179	5.56	559.31		
11/26/2007 7:41:00 PM				4	
11/26/2007 7:45:00 PM	0.185	5.53	582.96	5	
11/26/2007 7:49:00 PM				5	
11/26/2007 7:50:00 PM	0.193	5.64	629.87		
11/26/2007 7:53:00 PM				5	
11/26/2007 7:55:00 PM	0.188	5.78	623.28		
11/26/2007 7:56:00 PM				5	
11/26/2007 8:00:00 PM	0.178	5.73	571.91		0.00
11/26/2007 8:01:00 PM				5	
11/26/2007 8:04:00 PM				5	
11/26/2007 8:05:00 PM	0.181	6.38	649.03		
11/26/2007 8:08:00 PM				5	
11/26/2007 8:10:00 PM	0.178	6.28	627.11		
11/26/2007 8:12:00 PM				5	
11/26/2007 8:15:00 PM	0.174	5.93	569.82		
11/26/2007 8:16:00 PM				5	
11/26/2007 8:20:00 PM	0.175	5.70	550.14	5	
11/26/2007 8:25:00 PM	0.182	5.45	559.91	6	
11/26/2007 8:29:00 PM				6	
11/26/2007 8:30:00 PM	0.189	4.97	538.72		
11/26/2007 8:35:00 PM	0.176	4.24	415.41	6	
11/26/2007 8:40:00 PM	0.123	4.09	233.67		
11/26/2007 8:45:00 PM	0.089	4.13	146.54		
11/26/2007 8:47:00 PM				6	
11/26/2007 8:50:00 PM	0.104	4.01	178.72		
11/26/2007 8:55:00 PM	0.111	3.38	165.08		
11/26/2007 9:00:00 PM	0.121	3.01	169.28		0.00
11/26/2007 9:01:00 PM				6	
11/26/2007 9:05:00 PM	0.137	2.81	189.05		
11/26/2007 9:10:00 PM	0.136	2.51	166.96		
11/26/2007 9:15:00 PM	0.135	2.01	132.45	6	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/26/2007 9:20:00 PM	0.133	1.67	107.05		
11/26/2007 9:25:00 PM	0.131	1.23	77.24		
11/26/2007 9:30:00 PM	0.127	0.98	58.65		
11/26/2007 9:35:00 PM	0.124	0.89	51.31		
11/26/2007 9:40:00 PM	0.119	0.79	42.86		
11/26/2007 9:45:00 PM	0.116	0.74	38.92		
11/26/2007 9:50:00 PM	0.113	0.68	34.17		
11/26/2007 9:55:00 PM	0.111	0.65	31.67		
11/26/2007 10:00:00 PM	0.108	0.62	29.27		0.00
11/26/2007 10:01:00 PM				6	
11/26/2007 10:05:00 PM	0.107	0.59	27.54		
11/26/2007 10:10:00 PM	0.103	0.53	23.22		
11/26/2007 10:15:00 PM	0.101	0.55	23.53		
11/26/2007 10:20:00 PM	0.099	0.52	21.80		
11/26/2007 10:25:00 PM	0.097	0.52	21.16		
11/26/2007 10:30:00 PM	0.096	0.52	20.92		
11/26/2007 10:35:00 PM	0.095	0.49	19.13		
11/26/2007 10:40:00 PM	0.094	0.50	18.83		
11/26/2007 10:45:00 PM	0.094	0.50	18.93		
11/26/2007 10:50:00 PM	0.094	0.49	18.64		
11/26/2007 10:55:00 PM	0.092	0.50	18.74		
11/26/2007 11:00:00 PM	0.092	0.46	17.16		0.00
11/26/2007 11:05:00 PM	0.092	0.45	16.58		
11/26/2007 11:10:00 PM	0.090	0.45	16.05		
11/26/2007 11:15:00 PM	0.090	0.45	16.23		
11/26/2007 11:20:00 PM	0.088	0.42	14.49		
11/26/2007 11:25:00 PM	0.088	0.43	14.94		
11/26/2007 11:30:00 PM	0.087	0.43	14.84		
11/26/2007 11:35:00 PM	0.086	0.43	14.53		
11/26/2007 11:40:00 PM	0.084	0.40	12.90		
11/26/2007 11:45:00 PM	0.083	0.42	13.47		
11/26/2007 11:50:00 PM	0.082	0.40	12.59		
11/26/2007 11:55:00 PM	0.080	0.40	11.99		
11/27/2007 12:00:00 AM	0.080	0.40	11.99		0.00
11/27/2007 12:05:00 AM	0.078	0.40	11.70		
11/27/2007 12:10:00 AM	0.078	0.40	11.70		
11/27/2007 12:15:00 AM	0.078	0.40	11.62		
11/27/2007 12:20:00 AM	0.078	0.40	11.70		
11/27/2007 12:25:00 AM	0.078	0.40	11.55		
11/27/2007 12:30:00 AM	0.077	0.40	11.33		
11/27/2007 12:35:00 AM	0.077	0.40	11.33		
11/27/2007 12:40:00 AM	0.076	0.40	11.19		
11/27/2007 12:45:00 AM	0.075	0.40	10.90		
11/27/2007 12:50:00 AM	0.073	0.40	10.62		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/27/2007 12:55:00 AM	0.073	0.40	10.62		
11/27/2007 1:00:00 AM	0.073	0.40	10.55		0.00
11/27/2007 1:05:00 AM	0.073	0.40	10.55		
11/27/2007 1:10:00 AM	0.073	0.40	10.62		
11/27/2007 1:15:00 AM	0.074	0.40	10.69		
11/27/2007 1:20:00 AM	0.075	0.40	10.97		
11/27/2007 1:25:00 AM	0.075	0.40	10.90		
11/27/2007 1:30:00 AM	0.074	0.40	10.83		
11/27/2007 1:35:00 AM	0.073	0.40	10.62		
11/27/2007 1:40:00 AM	0.073	0.40	10.62		
11/27/2007 1:45:00 AM	0.073	0.40	10.55		
11/27/2007 1:50:00 AM	0.073	0.40	10.40		
11/27/2007 1:55:00 AM	0.073	0.40	10.40		
11/27/2007 2:00:00 AM	0.073	0.40	10.55		0.00
11/27/2007 2:05:00 AM	0.072	0.40	10.33		
11/27/2007 2:10:00 AM	0.073	0.40	10.62		
11/27/2007 2:15:00 AM	0.073	0.40	10.62		
11/27/2007 2:20:00 AM	0.073	0.40	10.62		
11/27/2007 2:25:00 AM	0.073	0.40	10.62		
11/27/2007 2:30:00 AM	0.074	0.40	10.69		
11/27/2007 2:35:00 AM	0.073	0.40	10.62		
11/27/2007 2:40:00 AM	0.073	0.40	10.62		
11/27/2007 2:45:00 AM	0.073	0.40	10.62		
11/27/2007 2:50:00 AM	0.074	0.40	10.83		
11/27/2007 2:55:00 AM	0.073	0.40	10.62		
11/27/2007 3:00:00 AM	0.073	0.40	10.62		0.00
11/27/2007 3:05:00 AM	0.073	0.40	10.40		
11/27/2007 3:10:00 AM	0.072	0.40	10.26		
11/27/2007 3:15:00 AM	0.073	0.40	10.55		
11/27/2007 3:20:00 AM	0.073	0.40	10.62		
11/27/2007 3:25:00 AM	0.073	0.40	10.62		
11/27/2007 3:30:00 AM	0.073	0.40	10.62		
11/27/2007 3:35:00 AM	0.074	0.40	10.69		
11/27/2007 3:40:00 AM	0.073	0.40	10.62		
11/27/2007 3:45:00 AM	0.075	0.40	10.97		
11/27/2007 3:50:00 AM	0.075	0.40	10.97		
11/27/2007 3:55:00 AM	0.076	0.40	11.19		
11/27/2007 4:00:00 AM	0.077	0.40	11.33		0.00
11/27/2007 4:05:00 AM	0.077	0.40	11.33		
11/27/2007 4:10:00 AM	0.077	0.40	11.33		
11/27/2007 4:15:00 AM	0.077	0.40	11.33		
11/27/2007 4:20:00 AM	0.077	0.40	11.33		
11/27/2007 4:25:00 AM	0.078	0.40	11.55		
11/27/2007 4:30:00 AM	0.078	0.40	11.70		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/27/2007 4:35:00 AM	0.078	0.40	11.70		
11/27/2007 4:40:00 AM	0.078	0.40	11.70		
11/27/2007 4:45:00 AM	0.078	0.40	11.62		
11/27/2007 4:50:00 AM	0.077	0.40	11.41		
11/27/2007 4:55:00 AM	0.078	0.40	11.62		
11/27/2007 5:00:00 AM	0.077	0.40	11.41		0.00
11/27/2007 5:05:00 AM	0.077	0.40	11.33		
11/27/2007 5:10:00 AM	0.077	0.40	11.33		
11/27/2007 5:15:00 AM	0.077	0.40	11.33		
11/27/2007 5:20:00 AM	0.077	0.40	11.33		
11/27/2007 5:25:00 AM	0.077	0.40	11.33		
11/27/2007 5:30:00 AM	0.077	0.40	11.33		
11/27/2007 5:35:00 AM	0.078	0.40	11.62		
11/27/2007 5:40:00 AM	0.078	0.40	11.70		
11/27/2007 5:45:00 AM	0.078	0.40	11.70		
11/27/2007 5:50:00 AM	0.078	0.40	11.62		
11/27/2007 5:55:00 AM	0.078	0.40	11.62		
11/27/2007 6:00:00 AM	0.078	0.40	11.55		0.01
11/27/2007 6:05:00 AM	0.077	0.40	11.33		
11/27/2007 6:10:00 AM	0.076	0.40	11.26		
11/27/2007 6:15:00 AM	0.076	0.40	11.19		
11/27/2007 6:20:00 AM	0.076	0.40	11.19		
11/27/2007 6:25:00 AM	0.075	0.40	11.04		
11/27/2007 6:30:00 AM	0.075	0.40	10.97		
11/27/2007 6:35:00 AM	0.075	0.40	10.97		
11/27/2007 6:40:00 AM	0.075	0.40	10.97		
11/27/2007 6:45:00 AM	0.075	0.40	11.04		
11/27/2007 6:50:00 AM	0.075	0.40	10.97		
11/27/2007 6:55:00 AM	0.075	0.40	10.90		
11/27/2007 7:00:00 AM	0.074	0.40	10.69		0.00
11/27/2007 7:05:00 AM	0.073	0.40	10.62		
11/27/2007 7:10:00 AM	0.073	0.40	10.62		
11/27/2007 7:15:00 AM	0.075	0.40	10.90		
11/27/2007 7:20:00 AM	0.075	0.40	10.97		
11/27/2007 7:25:00 AM	0.075	0.40	10.97		
11/27/2007 7:30:00 AM	0.074	0.40	10.83		
11/27/2007 7:35:00 AM	0.075	0.40	10.97		
11/27/2007 7:40:00 AM	0.075	0.40	11.04		
11/27/2007 7:45:00 AM	0.075	0.40	10.97		
11/27/2007 7:50:00 AM	0.075	0.40	11.04		
11/27/2007 7:55:00 AM	0.075	0.40	10.97		
11/27/2007 8:00:00 AM	0.075	0.40	10.97		0.01
11/27/2007 8:05:00 AM	0.075	0.40	10.97		
11/27/2007 8:10:00 AM	0.075	0.40	10.90		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/27/2007 8:15:00 AM	0.075	0.40	10.90		
11/27/2007 8:20:00 AM	0.074	0.40	10.83		
11/27/2007 8:25:00 AM	0.073	0.40	10.62		
11/27/2007 8:30:00 AM	0.073	0.40	10.62		
11/27/2007 8:35:00 AM	0.073	0.40	10.62		
11/27/2007 8:40:00 AM	0.073	0.40	10.62		
11/27/2007 8:45:00 AM	0.074	0.40	10.69		
11/27/2007 8:50:00 AM	0.075	0.40	10.97		
11/27/2007 8:55:00 AM	0.076	0.40	11.19		
11/27/2007 9:00:00 AM	0.076	0.40	11.26		0.00
11/27/2007 9:05:00 AM	0.076	0.40	11.26		
11/27/2007 9:10:00 AM	0.077	0.40	11.33		
11/27/2007 9:15:00 AM	0.078	0.40	11.62		
11/27/2007 9:20:00 AM	0.080	0.40	12.07		
11/27/2007 9:25:00 AM	0.080	0.40	12.07		
11/27/2007 9:30:00 AM	0.107	0.58	26.85		
11/27/2007 9:35:00 AM	0.123	0.77	43.85		
11/27/2007 9:38:00 AM				6	
11/27/2007 9:40:00 AM	0.134	0.90	58.72		
11/27/2007 9:45:00 AM	0.140	1.27	88.26		
11/27/2007 9:50:00 AM	0.140	1.71	118.55		
11/27/2007 9:55:00 AM	0.144	1.87	135.45		
11/27/2007 9:59:00 AM				6	
11/27/2007 10:00:00 AM	0.141	2.14	150.66		0.00
11/27/2007 10:05:00 AM	0.144	1.94	141.15		
11/27/2007 10:10:00 AM	0.145	1.95	142.84		
11/27/2007 10:15:00 AM	0.146	1.67	123.37		
11/27/2007 10:19:00 AM				6	
11/27/2007 10:20:00 AM	0.145	1.17	86.36		
11/27/2007 10:25:00 AM	0.143	1.01	72.74		
11/27/2007 10:30:00 AM	0.142	0.97	69.02		
11/27/2007 10:35:00 AM	0.139	0.80	55.28		
11/27/2007 10:40:00 AM	0.136	0.77	51.53		
11/27/2007 10:45:00 AM	0.134	0.77	50.43		
11/27/2007 10:50:00 AM	0.131	0.70	44.50		
11/27/2007 10:55:00 AM	0.128	0.64	39.08		
11/27/2007 11:00:00 AM	0.124	0.62	35.96		0.00
11/27/2007 11:05:00 AM	0.121	0.58	32.17		
11/27/2007 11:07:00 AM				7	
11/27/2007 11:10:00 AM	0.118	0.51	27.39		
11/27/2007 11:15:00 AM	0.116	0.52	27.50		
11/27/2007 11:20:00 AM	0.113	0.54	27.48		
11/27/2007 11:25:00 AM	0.112	0.51	25.25		
11/27/2007 11:30:00 AM	0.110	0.47	22.57		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	WPCL Rain Gage (in)
11/27/2007 11:35:00 AM	0.109	0.49	23.45		
11/27/2007 11:40:00 AM	0.106	0.47	21.37		
11/27/2007 11:45:00 AM	0.106	0.44	20.23		
11/27/2007 11:50:00 AM	0.104	0.47	20.86		
11/27/2007 11:55:00 AM	0.103	0.47	20.57		
11/27/2007 12:00:00 PM	0.102	0.43	18.64		0.00
11/27/2007 12:05:00 PM	0.101	0.43	18.49		
11/27/2007 12:10:00 PM	0.099	0.40	16.80		
11/27/2007 12:15:00 PM	0.098	0.41	16.96		
11/27/2007 12:20:00 PM	0.098	0.42	17.00		
11/27/2007 12:25:00 PM	0.097	0.40	16.22		
11/27/2007 12:30:00 PM	0.096	0.41	16.38		
11/27/2007 12:35:00 PM	0.093	0.42	16.01		
11/27/2007 12:40:00 PM	0.095	0.40	15.42		
11/27/2007 12:45:00 PM	0.091	0.38	13.67		
11/27/2007 12:50:00 PM	0.094	0.37	14.27		
11/27/2007 12:55:00 PM	0.094	0.34	12.75		
11/27/2007 1:00:00 PM	0.093	0.34	13.06		0.03
11/27/2007 1:05:00 PM	0.092	0.35	13.04		
11/27/2007 1:10:00 PM	0.092	0.34	12.71		
11/27/2007 1:15:00 PM	0.091	0.36	13.05		
11/27/2007 1:20:00 PM	0.090	0.36	12.98		
11/27/2007 1:21:00 PM				7	
11/27/2007 1:25:00 PM	0.090	0.34	12.26		
11/27/2007 1:30:00 PM	0.090	0.35	12.73		
11/27/2007 1:35:00 PM	0.089	0.34	12.04		
11/27/2007 1:40:00 PM	0.088	0.33	11.62		
11/27/2007 1:45:00 PM	0.087	0.34	11.70		
11/27/2007 1:50:00 PM	0.087	0.34	11.60		
11/27/2007 1:55:00 PM	0.086	0.34	11.37		
11/27/2007 2:00:00 PM					0.01
11/27/2007 3:00:00 PM					0.01

Figure T-4 WR-218 UPRR Albina

November 27th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/26/2007 3:00:00 PM	1.369				0.00
11/26/2007 3:05:00 PM	1.369				
11/26/2007 3:10:00 PM	1.370	0.63	778.53		
11/26/2007 3:15:00 PM	1.369	0.63	778.30		
11/26/2007 3:20:00 PM	1.369	0.63	778.30		
11/26/2007 3:25:00 PM	1.368	0.63	777.61		
11/26/2007 3:30:00 PM	1.369	0.63	778.30		
11/26/2007 3:35:00 PM	1.368	0.63	777.14		
11/26/2007 3:40:00 PM	1.368	0.63	777.14		
11/26/2007 3:45:00 PM	1.368	0.63	777.61		
11/26/2007 3:50:00 PM	1.369	0.63	778.07		
11/26/2007 3:55:00 PM	1.369	0.63	778.07		
11/26/2007 4:00:00 PM	1.369	0.63	778.30		0.09
11/26/2007 4:05:00 PM	1.369	0.63	778.30		
11/26/2007 4:10:00 PM	1.369	0.63	778.30		
11/26/2007 4:15:00 PM	1.369	0.63	778.30		
11/26/2007 4:20:00 PM	1.369	0.63	778.30		
11/26/2007 4:25:00 PM	1.369	0.63	778.30		
11/26/2007 4:30:00 PM	1.369	0.63	778.30		
11/26/2007 4:35:00 PM	1.369	0.63	778.30		
11/26/2007 4:40:00 PM	1.369	0.63	778.30		
11/26/2007 4:45:00 PM	1.369	0.63	778.30		
11/26/2007 4:50:00 PM	1.369	0.15	185.31		
11/26/2007 4:55:00 PM	1.369	0.15	185.31		
11/26/2007 5:00:00 PM	1.369	0.15	185.31		0.15
11/26/2007 5:05:00 PM	1.369	0.15	185.31		
11/26/2007 5:10:00 PM	1.369	0.15	185.31		
11/26/2007 5:15:00 PM	1.369	0.15	185.31		
11/26/2007 5:20:00 PM	1.369	0.15	185.31		
11/26/2007 5:25:00 PM	1.370	0.15	185.36		
11/26/2007 5:30:00 PM	1.370	0.15	185.36		
11/26/2007 5:33:00 PM				1	
11/26/2007 5:35:00 PM	1.421	-0.08	-103.42		
11/26/2007 5:40:00 PM	1.492	-0.06	-86.41		
11/26/2007 5:42:00 PM				1	
11/26/2007 5:45:00 PM	1.512	-0.06	-79.41		
11/26/2007 5:50:00 PM	1.549	-0.21	-305.46		
11/26/2007 5:52:00 PM				1	
11/26/2007 5:55:00 PM	1.577	-0.19	-278.30		
11/26/2007 6:00:00 PM	1.632	0.37	571.39		0.10
11/26/2007 6:02:00 PM				1	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/26/2007 6:05:00 PM	1.670	-0.21	-336.14		
11/26/2007 6:10:00 PM	1.764	-0.35	-589.93		
11/26/2007 6:12:00 PM				1	
11/26/2007 6:15:00 PM	1.820	-0.64	-1094.3		
11/26/2007 6:20:00 PM	1.832	-0.64	-1102.4		
11/26/2007 6:22:00 PM				1	
11/26/2007 6:25:00 PM	1.817	-0.64	-1092.8		
11/26/2007 6:30:00 PM	1.808	-0.64	-1087.1		
11/26/2007 6:32:00 PM				1	
11/26/2007 6:35:00 PM	1.804	-0.64	-1084.2		
11/26/2007 6:40:00 PM	1.804	-0.64	-1084.4		
11/26/2007 6:42:00 PM				1	
11/26/2007 6:45:00 PM	1.806	-0.64	-1085.9		
11/26/2007 6:50:00 PM	1.814	-0.64	-1090.7		
11/26/2007 6:52:00 PM				1	
11/26/2007 6:55:00 PM	1.818	-0.64	-1093.2		
11/26/2007 7:00:00 PM	1.815	-0.64	-1091.1		0.01
11/26/2007 7:02:00 PM				1	
11/26/2007 7:05:00 PM	1.805	-0.64	-1085.0		
11/26/2007 7:10:00 PM	1.800	-0.64	-1081.7		
11/26/2007 7:12:00 PM				2	
11/26/2007 7:15:00 PM	1.788	-0.64	-1074.3		
11/26/2007 7:20:00 PM	1.767	-0.40	-666.05		
11/26/2007 7:22:00 PM				2	
11/26/2007 7:25:00 PM	1.754	-0.42	-701.68		
11/26/2007 7:30:00 PM	1.741	-0.47	-761.91		
11/26/2007 7:32:00 PM				2	
11/26/2007 7:35:00 PM	1.740	-0.49	-801.87		
11/26/2007 7:40:00 PM	1.753	-0.38	-622.30		
11/26/2007 7:42:00 PM				2	
11/26/2007 7:45:00 PM	1.747	-0.43	-707.03		
11/26/2007 7:50:00 PM	1.739	-0.47	-768.83		
11/26/2007 7:52:00 PM				2	
11/26/2007 7:55:00 PM	1.748	-0.45	-731.99		
11/26/2007 8:00:00 PM	1.751	-0.45	-741.74		0.00
11/26/2007 8:02:00 PM				2	
11/26/2007 8:05:00 PM	1.745	-0.56	-919.46		
11/26/2007 8:10:00 PM	1.732	-0.51	-830.62		
11/26/2007 8:12:00 PM				2	
11/26/2007 8:15:00 PM	1.712	-0.44	-712.29		
11/26/2007 8:20:00 PM	1.679	-0.49	-770.84		
11/26/2007 8:22:00 PM				2	
11/26/2007 8:25:00 PM	1.646	-0.49	-753.81		
11/26/2007 8:30:00 PM	1.615	-0.38	-572.20		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/26/2007 8:32:00 PM				2	
11/26/2007 8:35:00 PM	1.588	-0.38	-560.79		
11/26/2007 8:40:00 PM	1.565	-0.38	-551.47		
11/26/2007 8:42:00 PM				2	
11/26/2007 8:45:00 PM	1.546	-0.38	-543.60		
11/26/2007 8:50:00 PM	1.527	-0.38	-535.70		
11/26/2007 8:52:00 PM				3	
11/26/2007 8:55:00 PM	1.511	-0.38	-529.15		
11/26/2007 9:00:00 PM	1.497	-0.38	-523.26		0.00
11/26/2007 9:02:00 PM				3	
11/26/2007 9:05:00 PM	1.484	-0.38	-517.90		
11/26/2007 9:10:00 PM	1.474	-0.38	-513.50		
11/26/2007 9:12:00 PM				3	
11/26/2007 9:15:00 PM	1.466	-0.38	-510.06		
11/26/2007 9:20:00 PM	1.458	-0.38	-507.03		
11/26/2007 9:22:00 PM				3	
11/26/2007 9:25:00 PM	1.450	-0.38	-503.71		
11/26/2007 9:30:00 PM	1.444	-0.38	-500.95		
11/26/2007 9:32:00 PM				3	
11/26/2007 9:35:00 PM	1.437	-0.38	-497.91		
11/26/2007 9:40:00 PM	1.431	-0.38	-495.42		
11/26/2007 9:42:00 PM				3	
11/26/2007 9:45:00 PM	1.426	-0.38	-493.34		
11/26/2007 9:50:00 PM	1.420	-0.38	-490.71		
11/26/2007 9:52:00 PM				3	
11/26/2007 9:55:00 PM	1.414	-0.38	-488.49		
11/26/2007 10:00:00 PM	1.407	-0.38	-485.44		0.00
11/26/2007 10:02:00 PM				3	
11/26/2007 10:05:00 PM	1.402	-0.38	-483.08		
11/26/2007 10:10:00 PM	1.396	-0.38	-480.58		
11/26/2007 10:15:00 PM	1.391	-0.38	-478.63		
11/26/2007 10:20:00 PM	1.388	-0.38	-477.24		
11/26/2007 10:25:00 PM	1.385	-0.38	-475.99		
11/26/2007 10:30:00 PM	1.383	-0.38	-475.16		
11/26/2007 10:35:00 PM	1.381	-0.38	-474.18		
11/26/2007 10:40:00 PM	1.379	-0.38	-473.35		
11/26/2007 10:45:00 PM	1.377	-0.38	-472.65		
11/26/2007 10:50:00 PM	1.375	-0.38	-471.96		
11/26/2007 10:55:00 PM	1.374	-0.38	-471.26		
11/26/2007 11:00:00 PM	1.372	-0.38	-470.42		0.00
11/26/2007 11:05:00 PM	1.369	-0.38	-469.45		
11/26/2007 11:10:00 PM	1.369	-0.38	-469.31		
11/26/2007 11:15:00 PM	1.368	-0.38	-468.75		
11/26/2007 11:20:00 PM	1.367	-0.38	-468.48		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/26/2007 11:25:00 PM	1.366	-0.38	-468.06		
11/26/2007 11:30:00 PM	1.366	-0.38	-468.06		
11/26/2007 11:35:00 PM	1.365	-0.38	-467.36		
11/26/2007 11:40:00 PM	1.365	-0.38	-467.36		
11/26/2007 11:45:00 PM	1.363	-0.38	-466.80		
11/26/2007 11:50:00 PM	1.363	-0.38	-466.52		
11/26/2007 11:55:00 PM	1.362	-0.38	-466.11		
11/27/2007 12:00:00 AM	1.361	-0.38	-465.69		0.00
11/27/2007 12:05:00 AM	1.359	-0.38	-465.13		
11/27/2007 12:10:00 AM	1.359	-0.38	-465.13		
11/27/2007 12:15:00 AM	1.359	-0.38	-465.13		
11/27/2007 12:20:00 AM	1.359	-0.38	-464.85		
11/27/2007 12:25:00 AM	1.358	-0.38	-464.43		
11/27/2007 12:30:00 AM	1.358	-0.38	-464.43		
11/27/2007 12:35:00 AM	1.358	-0.38	-464.43		
11/27/2007 12:40:00 AM	1.358	-0.38	-464.43		
11/27/2007 12:45:00 AM	1.358	-0.38	-464.43		
11/27/2007 12:50:00 AM	1.358	-0.38	-464.43		
11/27/2007 12:55:00 AM	1.358	-0.38	-464.43		
11/27/2007 1:00:00 AM	1.358	-0.38	-464.43		0.00
11/27/2007 1:05:00 AM	1.358	-0.38	-464.43		
11/27/2007 1:10:00 AM	1.358	-0.38	-464.43		
11/27/2007 1:15:00 AM	1.358	-0.38	-464.43		
11/27/2007 1:20:00 AM	1.359	-0.38	-465.13		
11/27/2007 1:25:00 AM	1.359	-0.38	-465.13		
11/27/2007 1:30:00 AM	1.359	-0.38	-465.13		
11/27/2007 1:35:00 AM	1.359	-0.38	-465.13		
11/27/2007 1:40:00 AM	1.360	-0.38	-465.27		
11/27/2007 1:45:00 AM	1.361	-0.38	-465.83		
11/27/2007 1:50:00 AM	1.361	-0.38	-465.83		
11/27/2007 1:55:00 AM	1.361	-0.38	-465.83		
11/27/2007 2:00:00 AM	1.361	-0.38	-465.69		0.00
11/27/2007 2:05:00 AM	1.360	-0.38	-465.27		
11/27/2007 2:10:00 AM	1.359	-0.38	-465.13		
11/27/2007 2:15:00 AM	1.359	-0.38	-465.13		
11/27/2007 2:20:00 AM	1.358	-0.38	-464.57		
11/27/2007 2:25:00 AM	1.358	-0.38	-464.43		
11/27/2007 2:30:00 AM	1.358	-0.38	-464.43		
11/27/2007 2:35:00 AM	1.359	-0.38	-464.85		
11/27/2007 2:40:00 AM	1.361	-0.38	-465.83		
11/27/2007 2:45:00 AM	1.361	-0.38	-465.83		
11/27/2007 2:50:00 AM	1.361	-0.38	-465.83		
11/27/2007 2:55:00 AM	1.361	-0.38	-465.83		
11/27/2007 3:00:00 AM	1.361	-0.38	-465.83		0.00

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/27/2007 3:05:00 AM	1.360	-0.38	-465.27		
11/27/2007 3:10:00 AM	1.359	-0.38	-465.13		
11/27/2007 3:15:00 AM	1.359	-0.38	-465.13		
11/27/2007 3:20:00 AM	1.359	-0.38	-465.13		
11/27/2007 3:25:00 AM	1.359	-0.38	-465.13		
11/27/2007 3:30:00 AM	1.359	-0.38	-465.13		
11/27/2007 3:35:00 AM	1.359	-0.38	-464.99		
11/27/2007 3:40:00 AM	1.358	-0.38	-464.43		
11/27/2007 3:45:00 AM	1.358	-0.38	-464.43		
11/27/2007 3:50:00 AM	1.358	-0.38	-464.43		
11/27/2007 3:55:00 AM	1.358	-0.38	-464.43		
11/27/2007 4:00:00 AM	1.358	-0.38	-464.43		0.00
11/27/2007 4:05:00 AM	1.358	-0.38	-464.43		
11/27/2007 4:10:00 AM	1.358	-0.38	-464.43		
11/27/2007 4:15:00 AM	1.358	-0.38	-464.43		
11/27/2007 4:20:00 AM	1.358	-0.38	-464.43		
11/27/2007 4:25:00 AM	1.358	-0.38	-464.43		
11/27/2007 4:30:00 AM	1.358	-0.38	-464.43		
11/27/2007 4:35:00 AM	1.358	-0.38	-464.43		
11/27/2007 4:40:00 AM	1.356	-0.38	-463.88		
11/27/2007 4:45:00 AM	1.356	-0.38	-463.74		
11/27/2007 4:50:00 AM	1.356	-0.38	-463.74		
11/27/2007 4:55:00 AM	1.356	-0.38	-463.74		
11/27/2007 5:00:00 AM	1.356	-0.38	-463.74		0.00
11/27/2007 5:05:00 AM	1.356	-0.38	-463.74		
11/27/2007 5:10:00 AM	1.356	-0.38	-463.74		
11/27/2007 5:15:00 AM	1.356	-0.38	-463.60		
11/27/2007 5:20:00 AM	1.355	-0.38	-463.18		
11/27/2007 5:25:00 AM	1.354	-0.38	-463.04		
11/27/2007 5:30:00 AM	1.354	-0.38	-463.04		
11/27/2007 5:35:00 AM	1.354	-0.38	-463.04		
11/27/2007 5:40:00 AM	1.354	-0.38	-463.04		
11/27/2007 5:45:00 AM	1.354	-0.38	-462.90		
11/27/2007 5:50:00 AM	1.353	-0.38	-462.34		
11/27/2007 5:55:00 AM	1.352	-0.38	-461.93		
11/27/2007 6:00:00 AM	1.350	-0.38	-461.09		0.00
11/27/2007 6:05:00 AM	1.347	-0.38	-459.83		
11/27/2007 6:10:00 AM	1.345	-0.38	-459.28		
11/27/2007 6:15:00 AM	1.344	-0.38	-458.72		
11/27/2007 6:20:00 AM	1.344	-0.38	-458.72		
11/27/2007 6:25:00 AM	1.343	-0.38	-458.30		
11/27/2007 6:30:00 AM	1.343	-0.38	-458.02		
11/27/2007 6:35:00 AM	1.343	-0.38	-458.02		
11/27/2007 6:40:00 AM	1.343	-0.38	-458.02		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/27/2007 6:45:00 AM	1.343	-0.38	-458.02		
11/27/2007 6:50:00 AM	1.343	-0.38	-458.02		
11/27/2007 6:55:00 AM	1.343	-0.38	-458.02		
11/27/2007 7:00:00 AM	1.343	-0.38	-458.02		0.00
11/27/2007 7:05:00 AM	1.343	-0.38	-458.02		
11/27/2007 7:10:00 AM	1.343	-0.38	-458.02		
11/27/2007 7:15:00 AM	1.343	-0.38	-458.02		
11/27/2007 7:20:00 AM	1.343	-0.38	-458.02		
11/27/2007 7:25:00 AM	1.343	-0.38	-458.02		
11/27/2007 7:30:00 AM	1.343	-0.38	-458.02		
11/27/2007 7:35:00 AM	1.343	-0.38	-458.02		
11/27/2007 7:40:00 AM	1.343	-0.38	-458.02		
11/27/2007 7:45:00 AM	1.343	-0.38	-458.02		
11/27/2007 7:50:00 AM	1.343	-0.38	-458.02		
11/27/2007 7:55:00 AM	1.344	-0.38	-458.58		
11/27/2007 8:00:00 AM	1.344	-0.38	-458.72		0.01
11/27/2007 8:05:00 AM	1.344	-0.38	-458.72		
11/27/2007 8:10:00 AM	1.344	-0.38	-458.72		
11/27/2007 8:15:00 AM	1.344	-0.38	-458.72		
11/27/2007 8:20:00 AM	1.344	-0.38	-458.72		
11/27/2007 8:25:00 AM	1.344	-0.38	-458.72		
11/27/2007 8:30:00 AM	1.344	-0.38	-458.72		
11/27/2007 8:35:00 AM	1.344	-0.38	-458.72		
11/27/2007 8:40:00 AM	1.344	-0.38	-458.72		
11/27/2007 8:45:00 AM	1.344	-0.38	-458.72		
11/27/2007 8:50:00 AM	1.344	-0.38	-458.72		
11/27/2007 8:55:00 AM	1.344	-0.38	-458.72		
11/27/2007 9:00:00 AM	1.344	-0.38	-458.72		0.00
11/27/2007 9:05:00 AM	1.344	-0.38	-458.72		
11/27/2007 9:10:00 AM	1.344	-0.38	-458.72		
11/27/2007 9:15:00 AM	1.345	-0.38	-459.28		
11/27/2007 9:20:00 AM	1.348	-0.38	-460.53		
11/27/2007 9:25:00 AM	1.350	-0.38	-461.09		
11/27/2007 9:30:00 AM	1.351	-0.38	-461.79		
11/27/2007 9:35:00 AM	1.354	-0.38	-462.90		
11/27/2007 9:40:00 AM	1.354	-0.38	-463.04		
11/27/2007 9:45:00 AM	1.353	-0.38	-462.62		
11/27/2007 9:50:00 AM	1.353	-0.38	-462.34		
11/27/2007 9:55:00 AM	1.353	-0.38	-462.34		
11/27/2007 10:00:00 AM	1.353	-0.38	-462.34		0.00
11/27/2007 10:05:00 AM	1.352	-0.38	-461.93		
11/27/2007 10:10:00 AM	1.354	-0.38	-462.90		
11/27/2007 10:15:00 AM	1.354	-0.38	-463.04		
11/27/2007 10:20:00 AM	1.354	-0.38	-463.04		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/27/2007 10:25:00 AM	1.354	-0.38	-462.90		
11/27/2007 10:30:00 AM	1.353	-0.38	-462.34		
11/27/2007 10:35:00 AM	1.353	-0.38	-462.34		
11/27/2007 10:40:00 AM	1.351	-0.38	-461.65		
11/27/2007 10:45:00 AM	1.351	-0.38	-461.65		
11/27/2007 10:50:00 AM	1.350	-0.38	-461.09		
11/27/2007 10:55:00 AM	1.349	-0.38	-460.95		
11/27/2007 11:00:00 AM	1.349	-0.38	-460.95		0.00
11/27/2007 11:05:00 AM	1.348	-0.38	-460.39		
11/27/2007 11:10:00 AM	1.348	-0.38	-460.25		
11/27/2007 11:15:00 AM	1.348	-0.38	-460.25		
11/27/2007 11:20:00 AM	1.348	-0.38	-460.25		
11/27/2007 11:25:00 AM	1.348	-0.38	-460.25		
11/27/2007 11:30:00 AM	1.348	-0.38	-460.25		
11/27/2007 11:35:00 AM	1.346	-0.38	-459.69		
11/27/2007 11:40:00 AM	1.346	-0.38	-459.69		
11/27/2007 11:45:00 AM	1.346	-0.38	-459.42		
11/27/2007 11:50:00 AM	1.346	-0.38	-459.42		
11/27/2007 11:55:00 AM	1.346	-0.38	-459.42		
11/27/2007 12:00:00 PM	1.346	-0.38	-459.42		0.00
11/27/2007 12:05:00 PM	1.346	-0.38	-459.42		
11/27/2007 12:10:00 PM	1.346	-0.38	-459.42		
11/27/2007 12:15:00 PM	1.346	-0.38	-459.42		
11/27/2007 12:20:00 PM	1.346	-0.38	-459.42		
11/27/2007 12:25:00 PM	1.346	-0.38	-459.42		
11/27/2007 12:30:00 PM	1.346	-0.38	-459.42		
11/27/2007 12:35:00 PM	1.346	-0.38	-459.42		
11/27/2007 12:40:00 PM	1.346	-0.38	-459.42		
11/27/2007 12:45:00 PM	1.346	-0.38	-459.42		
11/27/2007 12:50:00 PM	1.346	-0.38	-459.42		
11/27/2007 12:55:00 PM	1.346	-0.38	-459.42		
11/27/2007 1:00:00 PM	1.346	-0.38	-459.42		0.04
11/27/2007 1:05:00 PM	1.346	-0.38	-459.42		
11/27/2007 1:10:00 PM	1.346	-0.38	-459.42		
11/27/2007 1:15:00 PM	1.346	-0.38	-459.42		
11/27/2007 1:20:00 PM	1.346	-0.38	-459.42		
11/27/2007 1:25:00 PM	1.346	-0.38	-459.42		
11/27/2007 1:30:00 PM	1.346	-0.38	-459.42		
11/27/2007 1:35:00 PM	1.346	-0.38	-459.42		
11/27/2007 1:40:00 PM	1.346	-0.38	-459.42		
11/27/2007 1:45:00 PM	1.346	-0.38	-459.42		
11/27/2007 1:50:00 PM	1.346	-0.38	-459.42		
11/27/2007 1:55:00 PM	1.346	-0.38	-459.42		
11/27/2007 2:00:00 PM	1.346	-0.38	-459.42		0.01

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/27/2007 2:05:00 PM	1.346	-0.38	-459.42		
11/27/2007 2:10:00 PM	1.346	-0.38	-459.42		
11/27/2007 2:15:00 PM	1.346	-0.38	-459.42		
11/27/2007 2:20:00 PM	1.346	-0.38	-459.42		
11/27/2007 2:25:00 PM	1.346	-0.38	-459.42		
11/27/2007 2:30:00 PM	1.346	-0.38	-459.42		
11/27/2007 2:35:00 PM	1.349	-0.38	-460.67		
11/27/2007 2:37:00 PM				3	
11/27/2007 2:40:00 PM	1.419	-0.38	-490.29		
11/27/2007 2:45:00 PM	1.439	-0.38	-498.74	3	
11/27/2007 2:50:00 PM	1.453	-0.38	-504.96		
11/27/2007 2:55:00 PM	1.490	-0.14	-191.62	4	
11/27/2007 3:00:00 PM	1.519	-0.22	-308.17		0.00
11/27/2007 3:05:00 PM	1.515	-0.19	-265.32	4	
11/27/2007 3:10:00 PM	1.493	-0.19	-260.80		
11/27/2007 3:15:00 PM	1.514	-0.19	-265.19	4	
11/27/2007 3:20:00 PM	1.567	-0.19	-276.14		
11/27/2007 3:25:00 PM	1.549	-0.19	-272.48		
11/27/2007 3:30:00 PM	1.567	-0.19	-276.07		
11/27/2007 3:35:00 PM	1.551	-0.19	-272.89		
11/27/2007 3:40:00 PM	1.531	-0.19	-268.67		
11/27/2007 3:45:00 PM	1.513	-0.19	-265.05		
11/27/2007 3:50:00 PM	1.500	-0.17	-234.58		
11/27/2007 3:55:00 PM	1.487	-0.17	-232.25		
11/27/2007 4:00:00 PM	1.476	-0.17	-230.16		0.01
11/27/2007 4:05:00 PM	1.467	-0.17	-228.49		
11/27/2007 4:10:00 PM	1.460	-0.17	-227.14		
11/27/2007 4:15:00 PM	1.455	-0.17	-226.15		
11/27/2007 4:20:00 PM	1.450	-0.17	-225.28		
11/27/2007 4:25:00 PM	1.443	-0.17	-223.99		
11/27/2007 4:30:00 PM	1.437	-0.17	-222.75		
11/27/2007 4:35:00 PM	1.430	-0.17	-221.57		
11/27/2007 4:40:00 PM	1.425	-0.17	-220.46		
11/27/2007 4:45:00 PM	1.420	-0.17	-219.65		
11/27/2007 4:50:00 PM	1.417	-0.17	-218.97		
11/27/2007 4:55:00 PM	1.412	-0.17	-218.10		
11/27/2007 5:00:00 PM	1.409	-0.17	-217.54		0.00
11/27/2007 5:05:00 PM	1.406	-0.17	-216.92		
11/27/2007 5:10:00 PM	1.401	-0.17	-216.05		
11/27/2007 5:15:00 PM	1.397	-0.17	-215.24		
11/27/2007 5:20:00 PM	1.393	-0.17	-214.44		
11/27/2007 5:25:00 PM	1.388	-0.17	-213.63		
11/27/2007 5:30:00 PM	1.385	-0.17	-213.01		
11/27/2007 5:35:00 PM	1.382	-0.17	-212.38		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/27/2007 5:40:00 PM	1.379	-0.17	-211.82		
11/27/2007 5:45:00 PM	1.376	-0.17	-211.32		
11/27/2007 5:50:00 PM	1.374	-0.17	-210.89		
11/27/2007 5:55:00 PM	1.373	-0.17	-210.64		
11/27/2007 6:00:00 PM	1.371	-0.17	-210.33		0.00
11/27/2007 6:05:00 PM	1.370	-0.17	-210.08		
11/27/2007 6:10:00 PM	1.368	-0.17	-209.83		
11/27/2007 6:15:00 PM	1.367	-0.17	-209.52		
11/27/2007 6:20:00 PM	1.365	-0.17	-209.27		
11/27/2007 6:25:00 PM	1.365	-0.17	-209.08		
11/27/2007 6:30:00 PM	1.363	-0.17	-208.71		
11/27/2007 6:35:00 PM	1.361	-0.17	-208.40		
11/27/2007 6:40:00 PM	1.360	-0.17	-208.27		
11/27/2007 6:45:00 PM	1.359	-0.17	-208.02		
11/27/2007 6:50:00 PM	1.358	-0.17	-207.77		
11/27/2007 6:55:00 PM	1.357	-0.17	-207.71		
11/27/2007 7:00:00 PM	1.356	-0.17	-207.46		0.02
11/27/2007 7:05:00 PM	1.355	-0.17	-207.21		
11/27/2007 7:10:00 PM	1.354	-0.17	-207.15		
11/27/2007 7:15:00 PM	1.353	-0.17	-206.90		
11/27/2007 7:20:00 PM	1.353	-0.17	-206.84		
11/27/2007 7:25:00 PM	1.353	-0.17	-206.84		
11/27/2007 7:30:00 PM	1.351	-0.17	-206.53		
11/27/2007 7:35:00 PM	1.351	-0.17	-206.53		
11/27/2007 7:40:00 PM	1.351	-0.17	-206.53		
11/27/2007 7:45:00 PM	1.351	-0.17	-206.53		
11/27/2007 7:50:00 PM	1.350	-0.17	-206.28		
11/27/2007 7:55:00 PM	1.350	-0.17	-206.28		
11/27/2007 8:00:00 PM	1.395	-0.17	-214.87		0.00
11/27/2007 8:05:00 PM	1.440	-0.17	-223.31		
11/27/2007 8:10:00 PM	1.433	-0.17	-222.13		
11/27/2007 8:15:00 PM	1.423	-0.17	-220.15		
11/27/2007 8:20:00 PM	1.403	-0.17	-216.42		
11/27/2007 8:25:00 PM	1.389	-0.17	-213.75		
11/27/2007 8:30:00 PM	1.380	-0.17	-212.07		
11/27/2007 8:35:00 PM	1.374	-0.17	-210.95		
11/27/2007 8:40:00 PM	1.370	-0.17	-210.14		
11/27/2007 8:45:00 PM	1.368	-0.17	-209.83		
11/27/2007 8:50:00 PM	1.368	-0.17	-209.71		
11/27/2007 8:55:00 PM	1.369	-0.17	-210.02		
11/27/2007 9:00:00 PM	1.371	-0.17	-210.39		0.00
11/27/2007 9:05:00 PM	1.375	-0.17	-211.01		
11/27/2007 9:10:00 PM	1.377	-0.17	-211.45		
11/27/2007 9:15:00 PM	1.379	-0.17	-211.82		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/27/2007 9:20:00 PM	1.379	-0.17	-211.89		
11/27/2007 9:25:00 PM	1.379	-0.17	-211.89		
11/27/2007 9:30:00 PM	1.379	-0.17	-211.76		
11/27/2007 9:35:00 PM	1.378	-0.17	-211.57		
11/27/2007 9:40:00 PM	1.377	-0.17	-211.45		
11/27/2007 9:45:00 PM	1.376	-0.17	-211.20		
11/27/2007 9:50:00 PM	1.374	-0.17	-210.95		
11/27/2007 9:55:00 PM	1.373	-0.17	-210.64		
11/27/2007 10:00:00 PM	1.371	-0.17	-210.39		0.00
11/27/2007 10:05:00 PM	1.370	-0.17	-210.14		
11/27/2007 10:10:00 PM	1.369	-0.17	-209.95		
11/27/2007 10:15:00 PM	1.368	-0.17	-209.71		
11/27/2007 10:20:00 PM	1.366	-0.17	-209.39		
11/27/2007 10:25:00 PM	1.365	-0.17	-209.14		
11/27/2007 10:30:00 PM	1.365	-0.17	-209.08		
11/27/2007 10:35:00 PM	1.363	-0.17	-208.83		
11/27/2007 10:40:00 PM	1.362	-0.17	-208.58		
11/27/2007 10:45:00 PM	1.361	-0.17	-208.40		
11/27/2007 10:50:00 PM	1.360	-0.17	-208.15		
11/27/2007 10:55:00 PM	1.359	-0.17	-208.09		
11/27/2007 11:00:00 PM	1.358	-0.17	-207.84		0.00
11/27/2007 11:05:00 PM	1.358	-0.17	-207.77		
11/27/2007 11:10:00 PM	1.356	-0.17	-207.52		
11/27/2007 11:15:00 PM	1.356	-0.17	-207.46		
11/27/2007 11:20:00 PM	1.356	-0.17	-207.40		
11/27/2007 11:25:00 PM	1.355	-0.17	-207.21		
11/27/2007 11:30:00 PM	1.354	-0.17	-207.15		
11/27/2007 11:35:00 PM	1.354	-0.17	-207.15		
11/27/2007 11:40:00 PM	1.353	-0.17	-206.90		
11/27/2007 11:45:00 PM	1.353	-0.17	-206.84		
11/27/2007 11:50:00 PM	1.353	-0.17	-206.84		
11/27/2007 11:55:00 PM	1.352	-0.17	-206.78		
11/28/2007 12:00:00 AM	1.351	-0.17	-206.59		0.00
11/28/2007 12:05:00 AM	1.351	-0.17	-206.53		
11/28/2007 12:10:00 AM	1.351	-0.17	-206.53		
11/28/2007 12:15:00 AM	1.351	-0.17	-206.53		
11/28/2007 12:20:00 AM	1.351	-0.17	-206.53		
11/28/2007 12:25:00 AM	1.350	-0.17	-206.28		
11/28/2007 12:30:00 AM	1.349	-0.17	-206.21		
11/28/2007 12:35:00 AM	1.349	-0.17	-206.21		
11/28/2007 12:40:00 AM	1.349	-0.17	-206.21		
11/28/2007 12:45:00 AM	1.349	-0.17	-206.21		
11/28/2007 12:50:00 AM	1.349	-0.17	-206.21		
11/28/2007 12:55:00 AM	1.349	-0.17	-206.09		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/28/2007 1:00:00 AM	1.348	-0.17	-205.96		0.00

Figure T-5 WR-218 UPRR Albina

November 29th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/28/2007 11:00:00 AM	1.349				0.00
11/28/2007 11:05:00 AM	1.349				
11/28/2007 11:10:00 AM	1.349				
11/28/2007 11:15:00 AM	1.349				
11/28/2007 11:20:00 AM	1.349				
11/28/2007 11:25:00 AM	1.349				
11/28/2007 11:30:00 AM	1.349				
11/28/2007 11:35:00 AM	1.349				
11/28/2007 11:40:00 AM	1.349				
11/28/2007 11:45:00 AM	1.349				
11/28/2007 11:50:00 AM	1.349				
11/28/2007 11:55:00 AM	1.348				
11/28/2007 12:00:00 PM	1.348				0.00
11/28/2007 12:05:00 PM	1.348				
11/28/2007 12:10:00 PM	1.348				
11/28/2007 12:15:00 PM	1.348				
11/28/2007 12:20:00 PM	1.349				
11/28/2007 12:25:00 PM	1.349				
11/28/2007 12:30:00 PM	1.349				
11/28/2007 12:35:00 PM	1.349				
11/28/2007 12:40:00 PM	1.349				
11/28/2007 12:45:00 PM	1.349				
11/28/2007 12:50:00 PM	1.349				
11/28/2007 12:55:00 PM	1.349				
11/28/2007 1:00:00 PM	1.349				0.08
11/28/2007 1:05:00 PM	1.349				
11/28/2007 1:10:00 PM	1.349				
11/28/2007 1:15:00 PM	1.349				
11/28/2007 1:20:00 PM	1.349				
11/28/2007 1:25:00 PM	1.349				
11/28/2007 1:30:00 PM	1.349				
11/28/2007 1:35:00 PM	1.349				
11/28/2007 1:40:00 PM	1.349				
11/28/2007 1:45:00 PM	1.349				
11/28/2007 1:50:00 PM	1.349				
11/28/2007 1:55:00 PM	1.349				
11/28/2007 2:00:00 PM	1.349				0.05
11/28/2007 2:05:00 PM	1.349				
11/28/2007 2:10:00 PM	1.349				
11/28/2007 2:15:00 PM	1.349				
11/28/2007 2:20:00 PM	1.362				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/28/2007 2:22:00 PM				1	
11/28/2007 2:25:00 PM	1.430				
11/28/2007 2:30:00 PM	1.462				
11/28/2007 2:31:00 PM				1	
11/28/2007 2:35:00 PM	1.490	-0.17	-232.86		
11/28/2007 2:40:00 PM	1.515	-0.20	-279.29		
11/28/2007 2:41:00 PM				1	
11/28/2007 2:45:00 PM	1.544	-0.13	-185.74		
11/28/2007 2:50:00 PM	1.570	-0.23	-330.72		
11/28/2007 2:51:00 PM				1	
11/28/2007 2:55:00 PM	1.591	-0.23	-335.80		
11/28/2007 3:00:00 PM	1.645	-0.20	-307.54		0.01
11/28/2007 3:01:00 PM				1	
11/28/2007 3:05:00 PM	1.707	-0.23	-376.56		
11/28/2007 3:10:00 PM	1.732	-0.57	-928.34		
11/28/2007 3:11:00 PM				1	
11/28/2007 3:15:00 PM	1.719	-0.57	-920.39		
11/28/2007 3:20:00 PM	1.690	-0.50	-792.44		
11/28/2007 3:21:00 PM				1	
11/28/2007 3:25:00 PM	1.660	-0.41	-636.88		
11/28/2007 3:30:00 PM	1.643	-0.41	-629.59		
11/28/2007 3:31:00 PM				1	
11/28/2007 3:35:00 PM	1.629	-0.34	-524.59		
11/28/2007 3:40:00 PM	1.617	-0.35	-535.30		
11/28/2007 3:41:00 PM				1	
11/28/2007 3:45:00 PM	1.611	-0.30	-450.15		
11/28/2007 3:50:00 PM	1.601	-0.30	-446.97		
11/28/2007 3:51:00 PM				1	
11/28/2007 3:55:00 PM	1.589	-0.30	-443.04		
11/28/2007 4:00:00 PM	1.580	-0.20	-293.59		0.03
11/28/2007 4:01:00 PM				2	
11/28/2007 4:05:00 PM	1.574	-0.13	-189.96		
11/28/2007 4:10:00 PM	1.566	-0.17	-246.89		
11/28/2007 4:11:00 PM				2	
11/28/2007 4:15:00 PM	1.555	-0.17	-244.89		
11/28/2007 4:20:00 PM	1.543	-0.17	-242.64		
11/28/2007 4:21:00 PM				2	
11/28/2007 4:25:00 PM	1.530	-0.17	-240.14		
11/28/2007 4:30:00 PM	1.523	-0.17	-238.92		
11/28/2007 4:31:00 PM				2	
11/28/2007 4:35:00 PM	1.515	-0.17	-237.52		
11/28/2007 4:40:00 PM	1.510	-0.17	-236.42		
11/28/2007 4:41:00 PM				2	
11/28/2007 4:45:00 PM	1.506	-0.17	-235.80		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/28/2007 4:50:00 PM	1.504	-0.17	-235.31		
11/28/2007 4:51:00 PM				2	
11/28/2007 4:55:00 PM	1.502	-0.17	-234.95		
11/28/2007 5:00:00 PM	1.502	-0.17	-235.07		0.11
11/28/2007 5:01:00 PM				2	
11/28/2007 5:05:00 PM	1.504	-0.17	-235.44		
11/28/2007 5:10:00 PM	1.505	-0.09	-124.74		
11/28/2007 5:11:00 PM				2	
11/28/2007 5:15:00 PM	1.505	-0.09	-124.71		
11/28/2007 5:20:00 PM	1.504	-0.09	-124.64		
11/28/2007 5:21:00 PM				2	
11/28/2007 5:25:00 PM	1.504	-0.09	-124.61		
11/28/2007 5:30:00 PM	1.504	-0.09	-124.61		
11/28/2007 5:31:00 PM				2	
11/28/2007 5:35:00 PM	1.505	-0.09	-124.74		
11/28/2007 5:40:00 PM	1.509	-0.09	-125.06		
11/28/2007 5:41:00 PM				3	
11/28/2007 5:45:00 PM	1.513	-0.09	-125.55		
11/28/2007 5:50:00 PM	1.519	-0.09	-126.07		
11/28/2007 5:51:00 PM				3	
11/28/2007 5:55:00 PM	1.520	-0.09	-126.20		
11/28/2007 6:00:00 PM	1.520	-0.09	-126.23		0.07
11/28/2007 6:01:00 PM				3	
11/28/2007 6:05:00 PM	1.530	-0.09	-127.20		
11/28/2007 6:10:00 PM	1.553	-0.09	-129.42		
11/28/2007 6:11:00 PM				3	
11/28/2007 6:15:00 PM	1.573	-0.09	-131.35		
11/28/2007 6:20:00 PM	1.582	-0.09	-132.28		
11/28/2007 6:21:00 PM				3	
11/28/2007 6:25:00 PM	1.596	-0.09	-133.68		
11/28/2007 6:30:00 PM	1.619	-0.09	-135.90		
11/28/2007 6:31:00 PM				3	
11/28/2007 6:35:00 PM	1.643	-0.29	-437.64		
11/28/2007 6:40:00 PM	1.682	-0.29	-449.43		
11/28/2007 6:41:00 PM				3	
11/28/2007 6:45:00 PM	1.764	-0.29	-473.70		
11/28/2007 6:50:00 PM	1.804	-0.29	-485.17		
11/28/2007 6:51:00 PM				3	
11/28/2007 6:55:00 PM	1.795	-0.29	-482.44		
11/28/2007 7:00:00 PM	1.787	-0.29	-480.17		0.05
11/28/2007 7:01:00 PM				3	
11/28/2007 7:05:00 PM	1.784	-0.29	-479.41		
11/28/2007 7:10:00 PM	1.786	-0.29	-479.89		
11/28/2007 7:11:00 PM				3	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/28/2007 7:15:00 PM	1.769	-0.29	-474.94		
11/28/2007 7:20:00 PM	1.750	-0.56	-922.67		
11/28/2007 7:21:00 PM				4	
11/28/2007 7:25:00 PM	1.727	-0.56	-909.39		
11/28/2007 7:30:00 PM	1.706	-0.56	-897.15		
11/28/2007 7:31:00 PM				4	
11/28/2007 7:35:00 PM	1.702	-0.56	-894.66		
11/28/2007 7:40:00 PM	1.714	-0.56	-901.37		
11/28/2007 7:41:00 PM				4	
11/28/2007 7:45:00 PM	1.733	-0.56	-912.82		
11/28/2007 7:50:00 PM	1.752	-0.56	-923.62		
11/28/2007 7:51:00 PM				4	
11/28/2007 7:55:00 PM	1.752	-0.56	-923.81		
11/28/2007 8:00:00 PM	1.740	-0.27	-442.12		0.02
11/28/2007 8:01:00 PM				4	
11/28/2007 8:05:00 PM	1.725	-0.27	-437.81		
11/28/2007 8:10:00 PM	1.712	-0.27	-434.13		
11/28/2007 8:11:00 PM				4	
11/28/2007 8:15:00 PM	1.692	-0.27	-428.57		
11/28/2007 8:20:00 PM	1.673	-0.27	-423.16		
11/28/2007 8:21:00 PM				4	
11/28/2007 8:25:00 PM	1.658	-0.27	-418.85		
11/28/2007 8:30:00 PM	1.660	-0.27	-419.41		
11/28/2007 8:31:00 PM				4	
11/28/2007 8:35:00 PM	1.664	-0.27	-420.54		
11/28/2007 8:40:00 PM	1.660	-0.27	-419.41		
11/28/2007 8:41:00 PM				4	
11/28/2007 8:45:00 PM	1.664	-0.27	-420.44		
11/28/2007 8:50:00 PM	1.657	-0.27	-418.57		
11/28/2007 8:51:00 PM				4	
11/28/2007 8:55:00 PM	1.648	-0.27	-416.02		
11/28/2007 9:00:00 PM	1.635	-0.27	-412.15		0.01
11/28/2007 9:01:00 PM				5	
11/28/2007 9:05:00 PM	1.622	-0.27	-408.46		
11/28/2007 9:10:00 PM	1.602	-0.27	-402.56		
11/28/2007 9:11:00 PM				5	
11/28/2007 9:15:00 PM	1.581	-0.27	-396.54		
11/28/2007 9:20:00 PM	1.562	-0.27	-390.97		
11/28/2007 9:21:00 PM				5	
11/28/2007 9:25:00 PM	1.544	-0.27	-385.57		
11/28/2007 9:30:00 PM	1.529	-0.27	-381.12		
11/28/2007 9:31:00 PM				5	
11/28/2007 9:35:00 PM	1.524	-0.27	-379.66		
11/28/2007 9:40:00 PM	1.551	-0.27	-387.59		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/28/2007 9:41:00 PM				5	
11/28/2007 9:45:00 PM	1.567	-0.27	-392.31		
11/28/2007 9:50:00 PM	1.579	-0.27	-396.06		
11/28/2007 9:51:00 PM				5	
11/28/2007 9:55:00 PM	1.586	-0.27	-397.88		
11/28/2007 10:00:00 PM	1.575	-0.27	-394.81		0.00
11/28/2007 10:01:00 PM				5	
11/28/2007 10:05:00 PM	1.572	-0.27	-393.95		
11/28/2007 10:10:00 PM	1.569	-0.27	-392.99		
11/28/2007 10:11:00 PM				5	
11/28/2007 10:15:00 PM	1.564	-0.27	-391.64		
11/28/2007 10:20:00 PM	1.557	-0.27	-389.43		
11/28/2007 10:21:00 PM				5	
11/28/2007 10:25:00 PM	1.544	-0.27	-385.57		
11/28/2007 10:30:00 PM	1.531	-0.27	-381.79		
11/28/2007 10:31:00 PM				5	
11/28/2007 10:35:00 PM	1.519	-0.27	-378.40		
11/28/2007 10:40:00 PM	1.511	-0.27	-375.87		
11/28/2007 10:41:00 PM				6	
11/28/2007 10:45:00 PM	1.507	-0.27	-374.71		
11/28/2007 10:50:00 PM	1.505	-0.27	-374.12		
11/28/2007 10:51:00 PM				6	
11/28/2007 10:55:00 PM	1.501	-0.27	-372.86		
11/28/2007 11:00:00 PM	1.493	-0.27	-370.62		0.00
11/28/2007 11:01:00 PM				6	
11/28/2007 11:05:00 PM	1.486	-0.27	-368.47		
11/28/2007 11:10:00 PM	1.480	-0.27	-366.81		
11/28/2007 11:11:00 PM				6	
11/28/2007 11:15:00 PM	1.475	-0.27	-365.25		
11/28/2007 11:20:00 PM	1.471	-0.27	-363.98		
11/28/2007 11:21:00 PM				6	
11/28/2007 11:25:00 PM	1.466	-0.27	-362.61		
11/28/2007 11:30:00 PM	1.464	-0.27	-361.82		
11/28/2007 11:31:00 PM				6	
11/28/2007 11:35:00 PM	1.459	-0.27	-360.55		
11/28/2007 11:40:00 PM	1.456	-0.27	-359.57		
11/28/2007 11:41:00 PM				6	
11/28/2007 11:45:00 PM	1.453	-0.27	-358.78		
11/28/2007 11:50:00 PM	1.449	-0.27	-357.41		
11/28/2007 11:51:00 PM				6	
11/28/2007 11:55:00 PM	1.446	-0.27	-356.43		
11/29/2007 12:00:00 AM	1.442	-0.27	-355.45		0.00
11/29/2007 12:01:00 AM				6	
11/29/2007 12:05:00 AM	1.438	-0.27	-354.17		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/29/2007 12:10:00 AM	1.434	-0.27	-352.99		
11/29/2007 12:11:00 AM				6	
11/29/2007 12:15:00 AM	1.431	-0.27	-352.11		
11/29/2007 12:20:00 AM	1.427	-0.27	-350.93		
11/29/2007 12:21:00 AM				7	
11/29/2007 12:25:00 AM	1.423	-0.27	-349.65		
11/29/2007 12:30:00 AM	1.419	-0.27	-348.46		
11/29/2007 12:31:00 AM				7	
11/29/2007 12:35:00 AM	1.416	-0.27	-347.68		
11/29/2007 12:40:00 AM	1.414	-0.27	-347.09		
11/29/2007 12:41:00 AM				7	
11/29/2007 12:45:00 AM	1.413	-0.27	-346.59		
11/29/2007 12:50:00 AM	1.411	-0.27	-346.10		
11/29/2007 12:51:00 AM				7	
11/29/2007 12:55:00 AM	1.411	-0.27	-346.00		
11/29/2007 1:00:00 AM	1.410	-0.27	-345.71		0.00
11/29/2007 1:01:00 AM				7	
11/29/2007 1:05:00 AM	1.409	-0.27	-345.61		
11/29/2007 1:10:00 AM	1.409	-0.27	-345.61		
11/29/2007 1:11:00 AM				7	
11/29/2007 1:15:00 AM	1.408	-0.27	-345.21		
11/29/2007 1:20:00 AM	1.406	-0.27	-344.72		
11/29/2007 1:21:00 AM				7	
11/29/2007 1:25:00 AM	1.406	-0.27	-344.72		
11/29/2007 1:30:00 AM	1.406	-0.27	-344.62		
11/29/2007 1:31:00 AM				7	
11/29/2007 1:35:00 AM	1.405	-0.27	-344.13		
11/29/2007 1:40:00 AM	1.404	-0.27	-344.03		
11/29/2007 1:41:00 AM				7	
11/29/2007 1:45:00 AM	1.403	-0.27	-343.73		
11/29/2007 1:50:00 AM	1.402	-0.27	-343.44		
11/29/2007 1:51:00 AM				7	
11/29/2007 1:55:00 AM	1.401	-0.27	-343.14		
11/29/2007 2:00:00 AM	1.401	-0.27	-343.14		0.00
11/29/2007 2:05:00 AM	1.400	-0.27	-342.75		
11/29/2007 2:10:00 AM	1.399	-0.27	-342.45		
11/29/2007 2:15:00 AM	1.398	-0.27	-342.06		
11/29/2007 2:20:00 AM	1.398	-0.27	-342.06		
11/29/2007 2:25:00 AM	1.398	-0.27	-342.25		
11/29/2007 2:30:00 AM	1.398	-0.27	-342.06		
11/29/2007 2:35:00 AM	1.398	-0.27	-342.06		
11/29/2007 2:40:00 AM	1.398	-0.27	-342.06		
11/29/2007 2:45:00 AM	1.398	-0.27	-342.06		
11/29/2007 2:50:00 AM	1.398	-0.27	-342.06		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Albina Rain Gage (in)
11/29/2007 2:55:00 AM	1.398	-0.27	-342.06		
11/29/2007 3:00:00 AM	1.398	-0.27	-342.06		0.00
11/29/2007 3:05:00 AM	1.398	-0.27	-342.06		
11/29/2007 3:10:00 AM	1.398	-0.27	-342.06		
11/29/2007 3:15:00 AM	1.397	-0.27	-341.96		
11/29/2007 3:20:00 AM	1.397	-0.27	-341.76		
11/29/2007 3:25:00 AM	1.396	-0.27	-341.56		
11/29/2007 3:30:00 AM	1.396	-0.27	-341.56		
11/29/2007 3:35:00 AM	1.397	-0.27	-341.76		
11/29/2007 3:40:00 AM	1.396	-0.27	-341.56		
11/29/2007 3:45:00 AM	1.396	-0.27	-341.56		
11/29/2007 3:50:00 AM	1.396	-0.27	-341.56		
11/29/2007 3:55:00 AM	1.396	-0.27	-341.46		
11/29/2007 4:00:00 AM	1.396	-0.27	-341.56		0.00

Figure X-4 Highway 30 A

November 16th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/15/2007 4:00:00 PM	0.059				0.00
11/15/2007 4:05:00 PM	0.059				
11/15/2007 4:10:00 PM	0.059				
11/15/2007 4:15:00 PM	0.059				
11/15/2007 4:20:00 PM	0.059				
11/15/2007 4:25:00 PM	0.059				
11/15/2007 4:30:00 PM	0.060				
11/15/2007 4:35:00 PM	0.059				
11/15/2007 4:40:00 PM	0.060				
11/15/2007 4:45:00 PM	0.060				
11/15/2007 4:50:00 PM	0.059				
11/15/2007 4:55:00 PM	0.059				
11/15/2007 5:00:00 PM	0.060				0.02
11/15/2007 5:05:00 PM	0.060				
11/15/2007 5:10:00 PM	0.060				
11/15/2007 5:15:00 PM	0.060				
11/15/2007 5:20:00 PM	0.061				
11/15/2007 5:25:00 PM	0.060				
11/15/2007 5:30:00 PM	0.060				
11/15/2007 5:35:00 PM	0.060				
11/15/2007 5:40:00 PM	0.060				
11/15/2007 5:45:00 PM	0.061				
11/15/2007 5:50:00 PM	0.060				
11/15/2007 5:55:00 PM	0.060				
11/15/2007 6:00:00 PM	0.059				0.04
11/15/2007 6:05:00 PM	0.060				
11/15/2007 6:10:00 PM	0.060				
11/15/2007 6:15:00 PM	0.059				
11/15/2007 6:20:00 PM	0.059				
11/15/2007 6:25:00 PM	0.059				
11/15/2007 6:30:00 PM	0.059				
11/15/2007 6:35:00 PM	0.059				
11/15/2007 6:40:00 PM	0.059				
11/15/2007 6:45:00 PM	0.059				
11/15/2007 6:50:00 PM	0.059				
11/15/2007 6:55:00 PM	0.059				
11/15/2007 7:00:00 PM	0.060				0.00
11/15/2007 7:02:00 PM				1	
11/15/2007 7:05:00 PM	0.230	0.41	38.53		
11/15/2007 7:10:00 PM	0.395	0.55	114.21		
11/15/2007 7:15:00 PM	0.460	0.70	179.75		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/15/2007 7:16:00 PM				1	
11/15/2007 7:20:00 PM	0.521	0.72	218.91		
11/15/2007 7:25:00 PM	0.583	0.62	221.49		
11/15/2007 7:30:00 PM	0.587	0.64	231.92		
11/15/2007 7:31:00 PM				1	
11/15/2007 7:35:00 PM	0.561	0.56	188.62		
11/15/2007 7:40:00 PM	0.522	0.49	150.29		
11/15/2007 7:45:00 PM	0.485	0.41	112.94		
11/15/2007 7:46:00 PM				1	
11/15/2007 7:50:00 PM	0.456	0.40	102.02		
11/15/2007 7:55:00 PM	0.428	0.32	75.34		
11/15/2007 8:00:00 PM	0.404	0.29	61.26		0.00
11/15/2007 8:01:00 PM				1	
11/15/2007 8:05:00 PM	0.384	0.25	50.02		
11/15/2007 8:10:00 PM	0.367	0.21	39.86		
11/15/2007 8:15:00 PM	0.354	0.19	33.99		
11/15/2007 8:16:00 PM				1	
11/15/2007 8:20:00 PM	0.343	0.17	28.63		
11/15/2007 8:25:00 PM	0.333	0.15	24.22		
11/15/2007 8:30:00 PM	0.325	0.13	20.68		
11/15/2007 8:31:00 PM				1	
11/15/2007 8:35:00 PM	0.318	0.13	20.08		
11/15/2007 8:40:00 PM	0.310	0.11	15.96		
11/15/2007 8:45:00 PM	0.303	0.11	15.47		
11/15/2007 8:46:00 PM				1	
11/15/2007 8:50:00 PM	0.296	0.11	14.92		
11/15/2007 8:55:00 PM	0.288	0.11	14.37		
11/15/2007 9:00:00 PM	0.279	0.11	13.73		0.01
11/15/2007 9:01:00 PM				1	
11/15/2007 9:05:00 PM	0.270	0.11	13.07		
11/15/2007 9:10:00 PM	0.261	0.11	12.47		
11/15/2007 9:15:00 PM	0.251	0.11	11.73		
11/15/2007 9:16:00 PM				1	
11/15/2007 9:20:00 PM	0.240	0.11	10.97		
11/15/2007 9:25:00 PM	0.226	0.11	10.08		
11/15/2007 9:30:00 PM	0.213	0.11	9.23		
11/15/2007 9:31:00 PM				2	
11/15/2007 9:35:00 PM	0.201	0.11	8.47		
11/15/2007 9:40:00 PM	0.190	0.13	9.25		
11/15/2007 9:45:00 PM	0.182	0.13	8.67		
11/15/2007 9:46:00 PM				2	
11/15/2007 9:50:00 PM	0.175	0.13	8.17		
11/15/2007 9:55:00 PM	0.169	0.13	7.76		
11/15/2007 10:00:00 PM	0.165	0.13	7.52		0.00

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/15/2007 10:01:00 PM				2	
11/15/2007 10:05:00 PM	0.162	0.13	7.28		
11/15/2007 10:10:00 PM	0.159	0.17	9.26		
11/15/2007 10:15:00 PM	0.156	0.17	9.04		
11/15/2007 10:16:00 PM				2	
11/15/2007 10:20:00 PM	0.155	0.20	10.47		
11/15/2007 10:25:00 PM	0.154	0.20	10.44		
11/15/2007 10:30:00 PM	0.156	0.20	10.57		
11/15/2007 10:31:00 PM				2	
11/15/2007 10:35:00 PM	0.159	0.20	10.90		
11/15/2007 10:40:00 PM	0.162	0.20	11.20		
11/15/2007 10:45:00 PM	0.166	0.17	9.86		
11/15/2007 10:46:00 PM				2	
11/15/2007 10:50:00 PM	0.170	0.17	10.24		
11/15/2007 10:55:00 PM	0.170	0.15	9.01		
11/15/2007 11:00:00 PM	0.173	0.15	9.24		0.00
11/15/2007 11:01:00 PM				2	
11/15/2007 11:05:00 PM	0.179	0.15	9.79		
11/15/2007 11:10:00 PM	0.183	0.15	10.06		
11/15/2007 11:15:00 PM	0.184	0.15	10.16		
11/15/2007 11:16:00 PM				2	
11/15/2007 11:20:00 PM	0.185	0.15	10.24		
11/15/2007 11:25:00 PM	0.185	0.15	10.24		
11/15/2007 11:30:00 PM	0.181	0.15	9.90		
11/15/2007 11:31:00 PM				2	
11/15/2007 11:35:00 PM	0.178	0.15	9.66		
11/15/2007 11:40:00 PM	0.173	0.15	9.29		
11/15/2007 11:45:00 PM	0.167	0.15	8.83		
11/15/2007 11:46:00 PM				2	
11/15/2007 11:50:00 PM	0.164	0.15	8.60		
11/15/2007 11:55:00 PM	0.162	0.15	8.40		
11/16/2007 12:00:00 AM	0.159	0.15	8.22		0.00
11/16/2007 12:01:00 AM				3	
11/16/2007 12:05:00 AM	0.157	0.15	8.05		
11/16/2007 12:10:00 AM	0.154	0.15	7.83		
11/16/2007 12:15:00 AM	0.152	0.15	7.63		
11/16/2007 12:16:00 AM				3	
11/16/2007 12:20:00 AM	0.150	0.15	7.51		
11/16/2007 12:25:00 AM	0.148	0.15	7.36		
11/16/2007 12:30:00 AM	0.147	0.15	7.32		
11/16/2007 12:31:00 AM				3	
11/16/2007 12:35:00 AM	0.146	0.15	7.20		
11/16/2007 12:40:00 AM	0.148	0.15	7.36		
11/16/2007 12:45:00 AM	0.157	0.17	9.12		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 12:46:00 AM				3	
11/16/2007 12:50:00 AM	0.190	0.14	9.94		
11/16/2007 12:55:00 AM	0.213	0.12	10.10		
11/16/2007 1:00:00 AM	0.224	0.11	9.77		0.04
11/16/2007 1:01:00 AM				3	
11/16/2007 1:05:00 AM	0.250	0.10	10.43		
11/16/2007 1:10:00 AM	0.276	0.10	11.92		
11/16/2007 1:15:00 AM	0.285	0.10	12.46		
11/16/2007 1:16:00 AM				3	
11/16/2007 1:20:00 AM	0.284	0.10	12.80		
11/16/2007 1:25:00 AM	0.278	0.10	12.41		
11/16/2007 1:30:00 AM	0.270	0.09	11.29		
11/16/2007 1:31:00 AM				3	
11/16/2007 1:35:00 AM	0.262	0.09	10.83		
11/16/2007 1:40:00 AM	0.255	0.10	11.25		
11/16/2007 1:45:00 AM	0.245	0.11	11.32		
11/16/2007 1:46:00 AM				3	
11/16/2007 1:50:00 AM	0.233	0.11	10.56		
11/16/2007 1:55:00 AM	0.223	0.11	9.87		
11/16/2007 2:00:00 AM	0.213	0.13	10.91		0.04
11/16/2007 2:01:00 AM				3	
11/16/2007 2:05:00 AM	0.203	0.15	11.77		
11/16/2007 2:10:00 AM	0.197	0.14	10.44		
11/16/2007 2:15:00 AM	0.191	0.16	11.41		
11/16/2007 2:16:00 AM				3	
11/16/2007 2:20:00 AM	0.185	0.16	10.95		
11/16/2007 2:25:00 AM	0.180	0.16	10.47		
11/16/2007 2:30:00 AM	0.175	0.17	10.55		
11/16/2007 2:31:00 AM				4	
11/16/2007 2:35:00 AM	0.170	0.18	10.69		
11/16/2007 2:40:00 AM	0.221	0.14	12.87		
11/16/2007 2:45:00 AM	0.539	0.57	183.27		
11/16/2007 2:46:00 AM				4	
11/16/2007 2:50:00 AM	0.651	0.75	314.75		
11/16/2007 2:55:00 AM	0.612	0.60	229.12		
11/16/2007 3:00:00 AM	0.554	0.40	133.71		0.04
11/16/2007 3:01:00 AM				4	
11/16/2007 3:05:00 AM	0.507	0.40	117.91		
11/16/2007 3:10:00 AM	0.466	0.40	104.39		
11/16/2007 3:15:00 AM	0.439	0.40	95.99		
11/16/2007 3:16:00 AM				4	
11/16/2007 3:20:00 AM	0.424	0.40	91.30		
11/16/2007 3:25:00 AM	0.424	0.40	91.20		
11/16/2007 3:30:00 AM	0.431	0.40	93.43		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 3:31:00 AM				4	
11/16/2007 3:35:00 AM	0.440	0.40	96.19		
11/16/2007 3:40:00 AM	0.435	0.40	94.76		
11/16/2007 3:45:00 AM	0.424	0.40	91.20		
11/16/2007 3:46:00 AM				4	
11/16/2007 3:50:00 AM	0.423	0.40	90.90		
11/16/2007 3:55:00 AM	0.436	0.40	94.96		
11/16/2007 4:00:00 AM	0.456	0.40	101.26		0.00
11/16/2007 4:01:00 AM				4	
11/16/2007 4:05:00 AM	0.467	0.22	57.59		
11/16/2007 4:10:00 AM	0.471	0.22	58.40		
11/16/2007 4:15:00 AM	0.478	0.22	59.56		
11/16/2007 4:16:00 AM				4	
11/16/2007 4:20:00 AM	0.526	0.32	97.82		
11/16/2007 4:25:00 AM	0.566	0.32	108.29		
11/16/2007 4:30:00 AM	0.565	0.32	108.03		
11/16/2007 4:31:00 AM				4	
11/16/2007 4:35:00 AM	0.557	0.32	105.91		
11/16/2007 4:40:00 AM	0.539	0.32	101.28		
11/16/2007 4:45:00 AM	0.515	0.32	94.90		
11/16/2007 4:46:00 AM				4	
11/16/2007 4:50:00 AM	0.495	0.32	89.63		
11/16/2007 4:55:00 AM	0.473	0.32	84.11		
11/16/2007 5:00:00 AM	0.455	0.32	79.58		0.00
11/16/2007 5:01:00 AM				5	
11/16/2007 5:05:00 AM	0.445	0.32	77.13		
11/16/2007 5:10:00 AM	0.438	0.32	75.35		
11/16/2007 5:15:00 AM	0.427	0.32	72.62		
11/16/2007 5:16:00 AM				5	
11/16/2007 5:20:00 AM	0.413	0.32	69.28		
11/16/2007 5:25:00 AM	0.401	0.32	66.30		
11/16/2007 5:30:00 AM	0.390	0.32	63.74		
11/16/2007 5:31:00 AM				5	
11/16/2007 5:35:00 AM	0.380	0.32	61.43		
11/16/2007 5:40:00 AM	0.371	0.32	59.46		
11/16/2007 5:45:00 AM	0.367	0.32	58.40		
11/16/2007 5:46:00 AM				5	
11/16/2007 5:50:00 AM	0.363	0.32	57.57		
11/16/2007 5:55:00 AM	0.359	0.32	56.67		
11/16/2007 6:00:00 AM	0.356	0.32	55.85		0.03
11/16/2007 6:01:00 AM				5	
11/16/2007 6:05:00 AM	0.351	0.32	54.89		
11/16/2007 6:10:00 AM	0.346	0.32	53.78		
11/16/2007 6:15:00 AM	0.341	0.32	52.60		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 6:16:00 AM				5	
11/16/2007 6:20:00 AM	0.333	0.32	50.86		
11/16/2007 6:25:00 AM	0.327	0.32	49.41		
11/16/2007 6:30:00 AM	0.319	0.32	47.69		
11/16/2007 6:31:00 AM				5	
11/16/2007 6:35:00 AM	0.311	0.32	45.92		
11/16/2007 6:40:00 AM	0.306	0.32	45.01		
11/16/2007 6:45:00 AM	0.300	0.32	43.62		
11/16/2007 6:46:00 AM				5	
11/16/2007 6:50:00 AM	0.294	0.32	42.37		
11/16/2007 6:55:00 AM	0.287	0.32	41.00		
11/16/2007 7:00:00 AM	0.282	0.32	39.98		0.08
11/16/2007 7:01:00 AM				5	
11/16/2007 7:05:00 AM	0.277	0.32	38.90		
11/16/2007 7:10:00 AM	0.272	0.32	37.83		
11/16/2007 7:15:00 AM	0.265	0.32	36.51		
11/16/2007 7:16:00 AM				5	
11/16/2007 7:20:00 AM	0.261	0.32	35.72		
11/16/2007 7:25:00 AM	0.285	0.32	40.46		
11/16/2007 7:30:00 AM	0.359	0.32	56.67		
11/16/2007 7:31:00 AM				6	
11/16/2007 7:35:00 AM	0.411	0.32	68.81		
11/16/2007 7:40:00 AM	0.428	0.11	25.47		
11/16/2007 7:45:00 AM	0.431	0.13	30.37		
11/16/2007 7:46:00 AM				6	
11/16/2007 7:50:00 AM	0.427	0.13	29.94		
11/16/2007 7:55:00 AM	0.420	0.13	29.28		
11/16/2007 8:00:00 AM	0.411	0.13	28.40		0.08
11/16/2007 8:01:00 AM				6	
11/16/2007 8:05:00 AM	0.408	0.13	28.10		
11/16/2007 8:10:00 AM	0.435	0.17	40.23		
11/16/2007 8:15:00 AM	0.518	0.37	110.96		
11/16/2007 8:16:00 AM				6	
11/16/2007 8:20:00 AM	0.575	0.37	128.45		
11/16/2007 8:25:00 AM	0.547	0.37	119.78		
11/16/2007 8:30:00 AM	0.493	0.37	103.28		
11/16/2007 8:31:00 AM				6	
11/16/2007 8:35:00 AM	0.453	0.37	91.54		
11/16/2007 8:40:00 AM	0.432	0.37	85.54		
11/16/2007 8:45:00 AM	0.419	0.37	82.02		
11/16/2007 8:46:00 AM				6	
11/16/2007 8:50:00 AM	0.413	0.37	80.19		
11/16/2007 8:55:00 AM	0.431	0.37	85.26		
11/16/2007 9:00:00 AM	0.529	0.37	114.15		0.08

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 9:01:00 AM				6	
11/16/2007 9:05:00 AM	0.649	0.37	152.14		
11/16/2007 9:10:00 AM	0.688	0.37	164.72		
11/16/2007 9:15:00 AM	0.695	0.37	167.22		
11/16/2007 9:16:00 AM				6	
11/16/2007 9:20:00 AM	0.684	0.37	163.42		
11/16/2007 9:25:00 AM	0.627	0.37	145.03		
11/16/2007 9:30:00 AM	0.606	0.37	138.09		
11/16/2007 9:31:00 AM				6	
11/16/2007 9:35:00 AM	0.589	0.37	132.68		
11/16/2007 9:40:00 AM	0.558	0.37	123.13		
11/16/2007 9:45:00 AM	0.525	0.37	112.85		
11/16/2007 9:46:00 AM				6	
11/16/2007 9:50:00 AM	0.516	0.37	110.36		
11/16/2007 9:55:00 AM	0.526	0.37	113.35		
11/16/2007 10:00:00 AM	0.512	0.37	109.07		0.02
11/16/2007 10:01:00 AM				7	
11/16/2007 10:05:00 AM	0.476	0.37	98.33		
11/16/2007 10:10:00 AM	0.451	0.37	91.07		
11/16/2007 10:15:00 AM	0.471	0.37	96.88		
11/16/2007 10:16:00 AM				7	
11/16/2007 10:20:00 AM	0.575	0.37	128.35		
11/16/2007 10:25:00 AM	0.651	0.37	152.78		
11/16/2007 10:30:00 AM	0.625	0.37	144.18		
11/16/2007 10:31:00 AM				7	
11/16/2007 10:35:00 AM	0.586	0.37	131.75		
11/16/2007 10:40:00 AM	0.538	0.37	116.96		
11/16/2007 10:45:00 AM	0.501	0.37	105.63		
11/16/2007 10:46:00 AM				7	
11/16/2007 10:50:00 AM	0.479	0.37	99.29		
11/16/2007 10:55:00 AM	0.472	0.37	97.08		
11/16/2007 11:00:00 AM	0.471	0.37	96.88		0.04
11/16/2007 11:01:00 AM				7	
11/16/2007 11:05:00 AM	0.461	0.37	93.92		
11/16/2007 11:10:00 AM	0.439	0.37	87.59		
11/16/2007 11:15:00 AM	0.416	0.37	81.10		
11/16/2007 11:16:00 AM				7	
11/16/2007 11:20:00 AM	0.393	0.37	74.66		
11/16/2007 11:25:00 AM	0.377	0.37	70.48		
11/16/2007 11:30:00 AM	0.368	0.37	68.11		
11/16/2007 11:31:00 AM				7	
11/16/2007 11:35:00 AM	0.357	0.37	65.06		
11/16/2007 11:40:00 AM	0.361	0.37	66.19		
11/16/2007 11:45:00 AM	0.375	0.37	69.77		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 11:46:00 AM				7	
11/16/2007 11:50:00 AM	0.386	0.37	72.96		
11/16/2007 11:55:00 AM	0.388	0.37	73.41		
11/16/2007 12:00:00 PM	0.376	0.37	70.04		0.01
11/16/2007 12:01:00 PM				7	
11/16/2007 12:05:00 PM	0.368	0.37	67.93		
11/16/2007 12:10:00 PM	0.368	0.37	68.11		
11/16/2007 12:15:00 PM	0.385	0.37	72.52		
11/16/2007 12:16:00 PM				7	
11/16/2007 12:20:00 PM	0.408	0.37	78.91		
11/16/2007 12:25:00 PM	0.414	0.37	80.65		
11/16/2007 12:30:00 PM	0.411	0.37	79.73		
11/16/2007 12:35:00 PM	0.396	0.37	75.56		
11/16/2007 12:40:00 PM	0.378	0.37	70.74		
11/16/2007 12:45:00 PM	0.365	0.37	67.15		
11/16/2007 12:50:00 PM	0.356	0.37	64.72		
11/16/2007 12:55:00 PM	0.344	0.37	61.80		
11/16/2007 1:00:00 PM	0.340	0.37	60.70		0.08
11/16/2007 1:05:00 PM	0.345	0.37	61.89		
11/16/2007 1:10:00 PM	0.356	0.37	64.72		
11/16/2007 1:15:00 PM	0.365	0.37	67.15		
11/16/2007 1:20:00 PM	0.366	0.37	67.41		
11/16/2007 1:25:00 PM	0.357	0.37	65.15		
11/16/2007 1:30:00 PM	0.348	0.37	62.83		
11/16/2007 1:35:00 PM	0.337	0.37	59.77		
11/16/2007 1:40:00 PM	0.329	0.37	57.84		
11/16/2007 1:45:00 PM	0.323	0.37	56.17		
11/16/2007 1:50:00 PM	0.322	0.37	56.01		
11/16/2007 1:55:00 PM	0.322	0.37	56.01		
11/16/2007 2:00:00 PM	0.324	0.37	56.59		0.07
11/16/2007 2:05:00 PM	0.327	0.37	57.42		
11/16/2007 2:10:00 PM	0.332	0.37	58.59		
11/16/2007 2:15:00 PM	0.337	0.37	59.77		
11/16/2007 2:20:00 PM	0.355	0.37	64.63		
11/16/2007 2:25:00 PM	0.399	0.37	76.28		
11/16/2007 2:30:00 PM	0.459	0.37	93.44		
11/16/2007 2:35:00 PM	0.477	0.37	98.71		
11/16/2007 2:40:00 PM	0.493	0.37	103.37		
11/16/2007 2:45:00 PM	0.507	0.37	107.59		
11/16/2007 2:50:00 PM	0.505	0.37	107.00		
11/16/2007 2:55:00 PM	0.491	0.37	102.79		
11/16/2007 3:00:00 PM	0.490	0.37	102.59		0.04
11/16/2007 3:05:00 PM	0.496	0.37	104.25		
11/16/2007 3:10:00 PM	0.506	0.37	107.20		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 3:15:00 PM	0.526	0.37	113.15		
11/16/2007 3:20:00 PM	0.552	0.37	121.30		
11/16/2007 3:25:00 PM	0.561	0.37	124.15		
11/16/2007 3:30:00 PM	0.561	0.37	124.15		
11/16/2007 3:35:00 PM	0.539	0.37	117.36		
11/16/2007 3:40:00 PM	0.511	0.37	108.68		
11/16/2007 3:45:00 PM	0.480	0.37	99.39		
11/16/2007 3:50:00 PM	0.453	0.37	91.54		
11/16/2007 3:55:00 PM	0.432	0.37	85.72		
11/16/2007 4:00:00 PM	0.419	0.37	82.02		0.03
11/16/2007 4:05:00 PM	0.419	0.37	81.84		
11/16/2007 4:10:00 PM	0.428	0.37	84.42		
11/16/2007 4:15:00 PM	0.433	0.37	85.82		
11/16/2007 4:20:00 PM	0.436	0.37	86.66		
11/16/2007 4:25:00 PM	0.428	0.37	84.42		
11/16/2007 4:30:00 PM	0.418	0.37	81.65		
11/16/2007 4:35:00 PM	0.409	0.37	79.27		
11/16/2007 4:40:00 PM	0.406	0.37	78.36		
11/16/2007 4:45:00 PM	0.399	0.37	76.46		
11/16/2007 4:50:00 PM	0.408	0.37	79.00		
11/16/2007 4:55:00 PM	0.420	0.37	82.30		
11/16/2007 5:00:00 PM	0.418	0.37	81.65		0.03
11/16/2007 5:05:00 PM	0.399	0.37	76.37		
11/16/2007 5:10:00 PM	0.382	0.37	71.81		
11/16/2007 5:15:00 PM	0.368	0.37	68.11		
11/16/2007 5:20:00 PM	0.354	0.37	64.29		
11/16/2007 5:25:00 PM	0.346	0.37	62.14		
11/16/2007 5:30:00 PM	0.341	0.37	60.78		
11/16/2007 5:35:00 PM	0.332	0.37	58.68		
11/16/2007 5:40:00 PM	0.324	0.37	56.67		
11/16/2007 5:45:00 PM	0.318	0.37	55.10		
11/16/2007 5:50:00 PM	0.317	0.37	54.85		
11/16/2007 5:55:00 PM	0.326	0.37	57.00		
11/16/2007 6:00:00 PM	0.342	0.37	61.12		0.00
11/16/2007 6:05:00 PM	0.359	0.37	65.50		
11/16/2007 6:10:00 PM	0.369	0.37	68.28		
11/16/2007 6:15:00 PM	0.363	0.37	66.71		
11/16/2007 6:20:00 PM	0.351	0.37	63.43		
11/16/2007 6:25:00 PM	0.334	0.37	59.10		
11/16/2007 6:30:00 PM	0.322	0.37	55.93		
11/16/2007 6:35:00 PM	0.312	0.37	53.46		
11/16/2007 6:40:00 PM	0.309	0.37	52.89		
11/16/2007 6:45:00 PM	0.323	0.37	56.17		
11/16/2007 6:50:00 PM	0.344	0.37	61.72		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 6:55:00 PM	0.357	0.37	64.98		
11/16/2007 7:00:00 PM	0.356	0.37	64.72		0.01
11/16/2007 7:05:00 PM	0.346	0.37	62.31		
11/16/2007 7:10:00 PM	0.334	0.37	59.10		
11/16/2007 7:15:00 PM	0.317	0.37	54.77		
11/16/2007 7:20:00 PM	0.299	0.37	50.22		
11/16/2007 7:25:00 PM	0.281	0.37	46.09		
11/16/2007 7:30:00 PM	0.272	0.37	43.84		
11/16/2007 7:35:00 PM	0.262	0.37	41.47		
11/16/2007 7:40:00 PM	0.252	0.37	39.21		
11/16/2007 7:45:00 PM	0.249	0.37	38.47		
11/16/2007 7:50:00 PM	0.245	0.37	37.58		
11/16/2007 7:55:00 PM	0.242	0.37	37.06		
11/16/2007 8:00:00 PM	0.236	0.37	35.68		0.01
11/16/2007 8:05:00 PM	0.236	0.37	35.60		
11/16/2007 8:10:00 PM	0.235	0.37	35.46		
11/16/2007 8:15:00 PM	0.234	0.37	35.17		
11/16/2007 8:20:00 PM	0.233	0.37	35.02		
11/16/2007 8:25:00 PM	0.232	0.37	34.74		
11/16/2007 8:30:00 PM	0.232	0.37	34.66		
11/16/2007 8:35:00 PM	0.232	0.37	34.81		
11/16/2007 8:40:00 PM	0.232	0.37	34.81		
11/16/2007 8:45:00 PM	0.236	0.37	35.68		
11/16/2007 8:50:00 PM	0.239	0.37	36.33		
11/16/2007 8:55:00 PM	0.241	0.37	36.70		
11/16/2007 9:00:00 PM	0.241	0.37	36.70		0.00
11/16/2007 9:05:00 PM	0.239	0.37	36.33		
11/16/2007 9:10:00 PM	0.236	0.37	35.60		
11/16/2007 9:15:00 PM	0.232	0.37	34.81		
11/16/2007 9:20:00 PM	0.228	0.37	33.95		
11/16/2007 9:25:00 PM	0.224	0.37	33.02		
11/16/2007 9:30:00 PM	0.221	0.37	32.31		
11/16/2007 9:35:00 PM	0.217	0.37	31.40		
11/16/2007 9:40:00 PM	0.215	0.37	30.98		
11/16/2007 9:45:00 PM	0.212	0.37	30.36		
11/16/2007 9:50:00 PM	0.209	0.37	29.81		
11/16/2007 9:55:00 PM	0.207	0.37	29.33		
11/16/2007 10:00:00 PM	0.204	0.37	28.78		0.00
11/16/2007 10:05:00 PM	0.201	0.37	28.11		
11/16/2007 10:10:00 PM	0.197	0.37	27.23		
11/16/2007 10:15:00 PM	0.193	0.37	26.50		
11/16/2007 10:20:00 PM	0.190	0.37	25.84		
11/16/2007 10:25:00 PM	0.187	0.37	25.25		
11/16/2007 10:30:00 PM	0.184	0.37	24.79		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/16/2007 10:35:00 PM	0.183	0.37	24.47		
11/16/2007 10:40:00 PM	0.181	0.37	24.08		
11/16/2007 10:45:00 PM	0.179	0.37	23.82		
11/16/2007 10:50:00 PM	0.179	0.37	23.76		
11/16/2007 10:55:00 PM	0.179	0.37	23.76		
11/16/2007 11:00:00 PM	0.179	0.37	23.76		0.00
11/16/2007 11:05:00 PM	0.178	0.37	23.57		
11/16/2007 11:10:00 PM	0.177	0.37	23.44		
11/16/2007 11:15:00 PM	0.177	0.37	23.38		
11/16/2007 11:20:00 PM	0.176	0.37	23.12		
11/16/2007 11:25:00 PM	0.175	0.37	22.87		
11/16/2007 11:30:00 PM	0.173	0.37	22.61		
11/16/2007 11:35:00 PM	0.173	0.37	22.49		
11/16/2007 11:40:00 PM	0.171	0.37	22.24		
11/16/2007 11:45:00 PM	0.170	0.37	21.92		
11/16/2007 11:50:00 PM	0.169	0.37	21.73		
11/16/2007 11:55:00 PM	0.167	0.37	21.49		
11/17/2007 12:00:00 AM	0.166	0.37	21.18		0.00
11/17/2007 12:05:00 AM	0.164	0.37	20.87		
11/17/2007 12:10:00 AM	0.164	0.37	20.87		
11/17/2007 12:15:00 AM	0.164	0.37	20.87		
11/17/2007 12:20:00 AM	0.164	0.37	20.81		
11/17/2007 12:25:00 AM	0.162	0.37	20.56		
11/17/2007 12:30:00 AM	0.162	0.37	20.56		
11/17/2007 12:35:00 AM	0.161	0.37	20.25		
11/17/2007 12:40:00 AM	0.161	0.37	20.25		
11/17/2007 12:45:00 AM	0.161	0.37	20.25		
11/17/2007 12:50:00 AM	0.161	0.37	20.25		
11/17/2007 12:55:00 AM	0.159	0.37	19.95		
11/17/2007 1:00:00 AM	0.159	0.37	19.95		0.03

Figure X-5 Highway 30 A

November 27th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/26/2007 3:00:00 PM	0.094				0.00
11/26/2007 3:05:00 PM	0.094				
11/26/2007 3:10:00 PM	0.094				
11/26/2007 3:15:00 PM	0.093				
11/26/2007 3:20:00 PM	0.094				
11/26/2007 3:25:00 PM	0.094				
11/26/2007 3:30:00 PM	0.094				
11/26/2007 3:35:00 PM	0.094				
11/26/2007 3:40:00 PM	0.094				
11/26/2007 3:45:00 PM	0.094				
11/26/2007 3:50:00 PM	0.094				
11/26/2007 3:55:00 PM	0.094				
11/26/2007 4:00:00 PM	0.095				0.10
11/26/2007 4:05:00 PM	0.096				
11/26/2007 4:10:00 PM	0.095				
11/26/2007 4:15:00 PM	0.094				
11/26/2007 4:20:00 PM	0.094				
11/26/2007 4:25:00 PM	0.094				
11/26/2007 4:30:00 PM	0.094			1	
11/26/2007 4:35:00 PM	0.094				
11/26/2007 4:40:00 PM	0.094				
11/26/2007 4:45:00 PM	0.094				
11/26/2007 4:50:00 PM	0.094				
11/26/2007 4:55:00 PM	0.094				
11/26/2007 5:00:00 PM	0.094				0.13
11/26/2007 5:05:00 PM	0.094				
11/26/2007 5:10:00 PM	0.096				
11/26/2007 5:15:00 PM	0.096				
11/26/2007 5:20:00 PM	0.096				
11/26/2007 5:25:00 PM	0.096				
11/26/2007 5:30:00 PM	0.096				
11/26/2007 5:35:00 PM	0.096				
11/26/2007 5:40:00 PM	0.096				
11/26/2007 5:42:00 PM				1	
11/26/2007 5:45:00 PM	0.122	0.35	12.92		
11/26/2007 5:50:00 PM	0.383	0.49	96.64		
11/26/2007 5:52:00 PM				1	
11/26/2007 5:55:00 PM	0.456	0.49	124.04		
11/26/2007 6:00:00 PM	0.492	0.49	138.38		0.08
11/26/2007 6:02:00 PM				1	
11/26/2007 6:05:00 PM	0.493	0.49	138.78		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/26/2007 6:10:00 PM	0.492	0.49	138.38		
11/26/2007 6:12:00 PM				1	
11/26/2007 6:15:00 PM	0.485	0.49	135.51		
11/26/2007 6:20:00 PM	0.474	0.49	131.23		
11/26/2007 6:22:00 PM				1	
11/26/2007 6:25:00 PM	0.464	0.49	127.11		
11/26/2007 6:30:00 PM	0.449	0.49	121.37		
11/26/2007 6:32:00 PM				1	
11/26/2007 6:35:00 PM	0.440	0.49	118.09		
11/26/2007 6:40:00 PM	0.435	0.49	115.96		
11/26/2007 6:42:00 PM				1	
11/26/2007 6:45:00 PM	0.442	0.49	118.72		
11/26/2007 6:50:00 PM	0.449	0.49	121.63		
11/26/2007 6:52:00 PM				1	
11/26/2007 6:55:00 PM	0.452	0.49	122.77		
11/26/2007 7:00:00 PM	0.450	0.49	121.75		0.01
11/26/2007 7:02:00 PM				1	
11/26/2007 7:05:00 PM	0.435	0.49	115.96		
11/26/2007 7:10:00 PM	0.419	0.49	109.99		
11/26/2007 7:12:00 PM				1	
11/26/2007 7:15:00 PM	0.406	0.49	104.96		
11/26/2007 7:20:00 PM	0.391	0.49	99.51		
11/26/2007 7:22:00 PM				2	
11/26/2007 7:25:00 PM	0.374	0.49	93.31		
11/26/2007 7:30:00 PM	0.359	0.49	88.04		
11/26/2007 7:32:00 PM				2	
11/26/2007 7:35:00 PM	0.351	0.49	85.38		
11/26/2007 7:40:00 PM	0.365	0.49	90.14		
11/26/2007 7:42:00 PM				2	
11/26/2007 7:45:00 PM	0.387	0.49	98.31		
11/26/2007 7:50:00 PM	0.393	0.49	100.35		
11/26/2007 7:52:00 PM				2	
11/26/2007 7:55:00 PM	0.385	0.49	97.47		
11/26/2007 8:00:00 PM	0.387	0.49	98.31		0.00
11/26/2007 8:02:00 PM				2	
11/26/2007 8:05:00 PM	0.389	0.49	99.03		
11/26/2007 8:10:00 PM	0.382	0.49	96.40		
11/26/2007 8:12:00 PM				2	
11/26/2007 8:15:00 PM	0.365	0.49	90.14		
11/26/2007 8:20:00 PM	0.336	0.49	79.90		
11/26/2007 8:22:00 PM				2	
11/26/2007 8:25:00 PM	0.308	0.49	70.56		
11/26/2007 8:30:00 PM	0.285	0.49	63.15		
11/26/2007 8:32:00 PM				2	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/26/2007 8:35:00 PM	0.271	0.49	58.44		
11/26/2007 8:40:00 PM	0.253	0.49	53.04		
11/26/2007 8:42:00 PM				2	
11/26/2007 8:45:00 PM	0.236	0.49	47.89		
11/26/2007 8:50:00 PM	0.219	0.49	42.72		
11/26/2007 8:52:00 PM				2	
11/26/2007 8:55:00 PM	0.210	0.49	40.20		
11/26/2007 9:00:00 PM	0.198	0.49	36.83		0.00
11/26/2007 9:02:00 PM				3	
11/26/2007 9:05:00 PM	0.183	0.49	33.02		
11/26/2007 9:10:00 PM	0.172	0.49	30.02		
11/26/2007 9:12:00 PM				3	
11/26/2007 9:15:00 PM	0.163	0.49	27.85		
11/26/2007 9:20:00 PM	0.155	0.49	25.73		
11/26/2007 9:22:00 PM				3	
11/26/2007 9:25:00 PM	0.147	0.49	23.74		
11/26/2007 9:30:00 PM	0.139	0.49	22.03		
11/26/2007 9:32:00 PM				3	
11/26/2007 9:35:00 PM	0.135	0.49	20.89		
11/26/2007 9:40:00 PM	0.129	0.49	19.69		
11/26/2007 9:42:00 PM				3	
11/26/2007 9:45:00 PM	0.124	0.49	18.45		
11/26/2007 9:50:00 PM	0.119	0.49	17.51		
11/26/2007 9:52:00 PM				3	
11/26/2007 9:55:00 PM	0.117	0.49	16.95		
11/26/2007 10:00:00 PM	0.116	0.49	16.73		0.00
11/26/2007 10:02:00 PM				3	
11/26/2007 10:05:00 PM	0.115	0.49	16.52		
11/26/2007 10:10:00 PM	0.116	0.49	16.73		
11/26/2007 10:12:00 PM				3	
11/26/2007 10:15:00 PM	0.116	0.49	16.73		
11/26/2007 10:20:00 PM	0.116	0.49	16.73		
11/26/2007 10:22:00 PM				3	
11/26/2007 10:25:00 PM	0.115	0.49	16.52		
11/26/2007 10:30:00 PM	0.114	0.49	16.38		
11/26/2007 10:32:00 PM				3	
11/26/2007 10:35:00 PM	0.114	0.49	16.38		
11/26/2007 10:40:00 PM	0.114	0.49	16.38		
11/26/2007 10:42:00 PM				4	
11/26/2007 10:45:00 PM	0.114	0.49	16.38		
11/26/2007 10:50:00 PM	0.114	0.49	16.38		
11/26/2007 10:52:00 PM				4	
11/26/2007 10:55:00 PM	0.114	0.49	16.38		
11/26/2007 11:00:00 PM	0.114	0.49	16.38		0.00

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/26/2007 11:02:00 PM				4	
11/26/2007 11:05:00 PM	0.114	0.49	16.38		
11/26/2007 11:10:00 PM	0.113	0.49	16.17		
11/26/2007 11:12:00 PM				4	
11/26/2007 11:15:00 PM	0.113	0.49	16.04		
11/26/2007 11:20:00 PM	0.113	0.49	16.10		
11/26/2007 11:22:00 PM				4	
11/26/2007 11:25:00 PM	0.113	0.49	16.04		
11/26/2007 11:30:00 PM	0.113	0.49	16.04		
11/26/2007 11:32:00 PM				4	
11/26/2007 11:35:00 PM	0.113	0.49	16.10		
11/26/2007 11:40:00 PM	0.113	0.49	16.17		
11/26/2007 11:42:00 PM				4	
11/26/2007 11:45:00 PM	0.113	0.49	16.10		
11/26/2007 11:50:00 PM	0.113	0.49	16.04		
11/26/2007 11:52:00 PM				4	
11/26/2007 11:55:00 PM	0.113	0.49	16.04		
11/27/2007 12:00:00 AM	0.113	0.49	16.04		0.00
11/27/2007 12:02:00 AM				4	
11/27/2007 12:05:00 AM	0.113	0.49	16.04		
11/27/2007 12:10:00 AM	0.113	0.49	16.04		
11/27/2007 12:12:00 AM				4	
11/27/2007 12:15:00 AM	0.113	0.49	16.04		
11/27/2007 12:20:00 AM	0.113	0.49	16.04		
11/27/2007 12:22:00 AM				5	
11/27/2007 12:25:00 AM	0.113	0.49	16.04		
11/27/2007 12:30:00 AM	0.113	0.49	16.04		
11/27/2007 12:32:00 AM				5	
11/27/2007 12:35:00 AM	0.113	0.49	16.04		
11/27/2007 12:40:00 AM	0.113	0.49	16.04		
11/27/2007 12:42:00 AM				5	
11/27/2007 12:45:00 AM	0.113	0.49	16.04		
11/27/2007 12:50:00 AM	0.113	0.49	16.04		
11/27/2007 12:52:00 AM				5	
11/27/2007 12:55:00 AM	0.113	0.49	16.04		
11/27/2007 1:00:00 AM	0.113	0.49	16.04		0.00
11/27/2007 1:02:00 AM				5	
11/27/2007 1:05:00 AM	0.113	0.49	16.04		
11/27/2007 1:10:00 AM	0.113	0.49	16.04		
11/27/2007 1:12:00 AM				5	
11/27/2007 1:15:00 AM	0.113	0.49	16.04		
11/27/2007 1:20:00 AM	0.113	0.49	16.04		
11/27/2007 1:22:00 AM				5	
11/27/2007 1:25:00 AM	0.113	0.49	16.04		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/27/2007 1:30:00 AM	0.113	0.49	16.04		
11/27/2007 1:32:00 AM				5	
11/27/2007 1:35:00 AM	0.113	0.49	16.04		
11/27/2007 1:40:00 AM	0.113	0.49	16.04		
11/27/2007 1:42:00 AM				5	
11/27/2007 1:45:00 AM	0.113	0.49	16.04		
11/27/2007 1:50:00 AM	0.113	0.49	16.04		
11/27/2007 1:52:00 AM				5	
11/27/2007 1:55:00 AM	0.113	0.49	16.04		
11/27/2007 2:00:00 AM	0.113	0.49	16.04		0.00
11/27/2007 2:02:00 AM				6	
11/27/2007 2:05:00 AM	0.113	0.49	16.04		
11/27/2007 2:10:00 AM	0.113	0.49	16.04		
11/27/2007 2:12:00 AM				6	
11/27/2007 2:15:00 AM	0.113	0.49	16.04		
11/27/2007 2:20:00 AM	0.113	0.49	16.04		
11/27/2007 2:22:00 AM				6	
11/27/2007 2:25:00 AM	0.113	0.49	16.04		
11/27/2007 2:30:00 AM	0.113	0.49	16.04		
11/27/2007 2:32:00 AM				6	
11/27/2007 2:35:00 AM	0.113	0.49	16.04		
11/27/2007 2:40:00 AM	0.113	0.49	16.04		
11/27/2007 2:42:00 AM				6	
11/27/2007 2:45:00 AM	0.113	0.49	16.04		
11/27/2007 2:50:00 AM	0.113	0.49	16.04		
11/27/2007 2:52:00 AM				6	
11/27/2007 2:55:00 AM	0.113	0.49	16.04		
11/27/2007 3:00:00 AM	0.113	0.49	16.04		0.00
11/27/2007 3:02:00 AM				6	
11/27/2007 3:05:00 AM	0.113	0.49	16.04		
11/27/2007 3:10:00 AM	0.113	0.49	16.04		
11/27/2007 3:12:00 AM				6	
11/27/2007 3:15:00 AM	0.113	0.49	16.04		
11/27/2007 3:20:00 AM	0.113	0.49	16.04		
11/27/2007 3:22:00 AM				6	
11/27/2007 3:25:00 AM	0.112	0.49	15.97		
11/27/2007 3:30:00 AM	0.112	0.49	15.97		
11/27/2007 3:32:00 AM				6	
11/27/2007 3:35:00 AM	0.112	0.49	15.83		
11/27/2007 3:40:00 AM	0.113	0.49	16.04		
11/27/2007 3:42:00 AM				7	
11/27/2007 3:45:00 AM	0.111	0.49	15.76		
11/27/2007 3:50:00 AM	0.111	0.49	15.76		
11/27/2007 3:52:00 AM				7	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/27/2007 3:55:00 AM	0.112	0.49	15.83		
11/27/2007 4:00:00 AM	0.111	0.49	15.76		0.00
11/27/2007 4:02:00 AM				7	
11/27/2007 4:05:00 AM	0.111	0.49	15.69		
11/27/2007 4:10:00 AM	0.111	0.49	15.69		
11/27/2007 4:12:00 AM				7	
11/27/2007 4:15:00 AM	0.111	0.49	15.69		
11/27/2007 4:20:00 AM	0.111	0.49	15.69		
11/27/2007 4:22:00 AM				7	
11/27/2007 4:25:00 AM	0.111	0.49	15.69		
11/27/2007 4:30:00 AM	0.113	0.49	16.04		
11/27/2007 4:32:00 AM				7	
11/27/2007 4:35:00 AM	0.113	0.49	16.04		
11/27/2007 4:40:00 AM	0.113	0.49	16.04		
11/27/2007 4:42:00 AM				7	
11/27/2007 4:45:00 AM	0.112	0.49	15.97		
11/27/2007 4:50:00 AM	0.111	0.49	15.76		
11/27/2007 4:52:00 AM				7	
11/27/2007 4:55:00 AM	0.111	0.49	15.76		
11/27/2007 5:00:00 AM	0.111	0.49	15.69		0.00
11/27/2007 5:02:00 AM				7	
11/27/2007 5:05:00 AM	0.111	0.49	15.69		
11/27/2007 5:10:00 AM	0.111	0.49	15.69		
11/27/2007 5:12:00 AM				7	
11/27/2007 5:15:00 AM	0.111	0.49	15.69		
11/27/2007 5:20:00 AM	0.111	0.49	15.69		
11/27/2007 5:25:00 AM	0.111	0.49	15.69		
11/27/2007 5:30:00 AM	0.111	0.49	15.69		
11/27/2007 5:35:00 AM	0.111	0.49	15.69		
11/27/2007 5:40:00 AM	0.110	0.49	15.41		
11/27/2007 5:45:00 AM	0.110	0.49	15.41		
11/27/2007 5:50:00 AM	0.110	0.49	15.41		
11/27/2007 5:55:00 AM	0.109	0.49	15.35		
11/27/2007 6:00:00 AM	0.109	0.49	15.35		0.00
11/27/2007 6:05:00 AM	0.109	0.49	15.35		
11/27/2007 6:10:00 AM	0.109	0.49	15.21		
11/27/2007 6:15:00 AM	0.109	0.49	15.21		
11/27/2007 6:20:00 AM	0.108	0.49	15.07		
11/27/2007 6:25:00 AM	0.108	0.49	15.07		
11/27/2007 6:30:00 AM	0.108	0.49	15.01		
11/27/2007 6:35:00 AM	0.108	0.49	15.07		
11/27/2007 6:40:00 AM	0.108	0.49	15.07		
11/27/2007 6:45:00 AM	0.108	0.49	15.07		
11/27/2007 6:50:00 AM	0.108	0.49	15.01		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/27/2007 6:55:00 AM	0.108	0.49	15.01		
11/27/2007 7:00:00 AM	0.108	0.49	15.01		0.01

Figure X-6 Highway 30 A

January 28th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 8:00:00 AM	0.146				0.00
1/26/2008 8:05:00 AM	0.146				
1/26/2008 8:10:00 AM	0.146				
1/26/2008 8:15:00 AM	0.146				
1/26/2008 8:20:00 AM	0.146				
1/26/2008 8:25:00 AM	0.146				
1/26/2008 8:30:00 AM	0.146				
1/26/2008 8:35:00 AM	0.146				
1/26/2008 8:40:00 AM	0.146				
1/26/2008 8:45:00 AM	0.146				
1/26/2008 8:50:00 AM	0.146				
1/26/2008 8:55:00 AM	0.146				
1/26/2008 9:00:00 AM	0.146				0.02
1/26/2008 9:05:00 AM	0.146				
1/26/2008 9:10:00 AM	0.146				
1/26/2008 9:15:00 AM	0.146				
1/26/2008 9:20:00 AM	0.146				
1/26/2008 9:25:00 AM	0.146				
1/26/2008 9:30:00 AM	0.147				
1/26/2008 9:35:00 AM	0.146				
1/26/2008 9:40:00 AM	0.147				
1/26/2008 9:45:00 AM	0.146				
1/26/2008 9:50:00 AM	0.146				
1/26/2008 9:55:00 AM	0.147				
1/26/2008 10:00:00 AM	0.147				0.05
1/26/2008 10:05:00 AM	0.147				
1/26/2008 10:10:00 AM	0.147				
1/26/2008 10:15:00 AM	0.147				
1/26/2008 10:20:00 AM	0.147				
1/26/2008 10:25:00 AM	0.147				
1/26/2008 10:30:00 AM	0.146				
1/26/2008 10:35:00 AM	0.147				
1/26/2008 10:40:00 AM	0.147				
1/26/2008 10:45:00 AM	0.146				
1/26/2008 10:50:00 AM	0.147				
1/26/2008 10:55:00 AM	0.147				
1/26/2008 11:00:00 AM	0.147				0.05
1/26/2008 11:05:00 AM	0.146				
1/26/2008 11:10:00 AM	0.147				
1/26/2008 11:15:00 AM	0.169			1	
1/26/2008 11:20:00 AM	0.344				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 11:24:00 AM				1	
1/26/2008 11:25:00 AM	0.396				
1/26/2008 11:30:00 AM	0.447				
1/26/2008 11:34:00 AM				1	
1/26/2008 11:35:00 AM	0.481				
1/26/2008 11:40:00 AM	0.508				
1/26/2008 11:44:00 AM				1	
1/26/2008 11:45:00 AM	0.520				
1/26/2008 11:50:00 AM	0.510				
1/26/2008 11:54:00 AM				1	
1/26/2008 11:55:00 AM	0.497				
1/26/2008 12:00:00 PM	0.489				0.05
1/26/2008 12:04:00 PM				1	
1/26/2008 12:05:00 PM	0.493				
1/26/2008 12:10:00 PM	0.501				
1/26/2008 12:14:00 PM				1	
1/26/2008 12:15:00 PM	0.499				
1/26/2008 12:20:00 PM	0.491				
1/26/2008 12:24:00 PM				1	
1/26/2008 12:25:00 PM	0.474				
1/26/2008 12:30:00 PM	0.455				
1/26/2008 12:34:00 PM				1	
1/26/2008 12:35:00 PM	0.436				
1/26/2008 12:40:00 PM	0.423				
1/26/2008 12:44:00 PM				1	
1/26/2008 12:45:00 PM	0.418				
1/26/2008 12:50:00 PM	0.415				
1/26/2008 12:54:00 PM				2	
1/26/2008 12:55:00 PM	0.417				
1/26/2008 1:00:00 PM	0.419				0.06
1/26/2008 1:04:00 PM				2	
1/26/2008 1:05:00 PM	0.422				
1/26/2008 1:10:00 PM	0.426				
1/26/2008 1:14:00 PM				2	
1/26/2008 1:15:00 PM	0.426				
1/26/2008 1:20:00 PM	0.427				
1/26/2008 1:24:00 PM				2	
1/26/2008 1:25:00 PM	0.428				
1/26/2008 1:30:00 PM	0.429				
1/26/2008 1:34:00 PM				2	
1/26/2008 1:35:00 PM	0.426				
1/26/2008 1:40:00 PM	0.427				
1/26/2008 1:44:00 PM				2	
1/26/2008 1:45:00 PM	0.436				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 1:50:00 PM	0.460				
1/26/2008 1:54:00 PM				2	
1/26/2008 1:55:00 PM	0.492				
1/26/2008 2:00:00 PM	0.509				0.06
1/26/2008 2:04:00 PM				2	
1/26/2008 2:05:00 PM	0.523				
1/26/2008 2:10:00 PM	0.536				
1/26/2008 2:14:00 PM				2	
1/26/2008 2:15:00 PM	0.544				
1/26/2008 2:20:00 PM	0.547				
1/26/2008 2:24:00 PM				2	
1/26/2008 2:25:00 PM	0.552				
1/26/2008 2:30:00 PM	0.556				
1/26/2008 2:34:00 PM				3	
1/26/2008 2:35:00 PM	0.541				
1/26/2008 2:40:00 PM	0.516				
1/26/2008 2:44:00 PM				3	
1/26/2008 2:45:00 PM	0.497				
1/26/2008 2:50:00 PM	0.477				
1/26/2008 2:54:00 PM				3	
1/26/2008 2:55:00 PM	0.456				
1/26/2008 3:00:00 PM	0.434				0.07
1/26/2008 3:04:00 PM				3	
1/26/2008 3:05:00 PM	0.420				
1/26/2008 3:10:00 PM	0.415				
1/26/2008 3:14:00 PM				3	
1/26/2008 3:15:00 PM	0.420				
1/26/2008 3:20:00 PM	0.431				
1/26/2008 3:24:00 PM				3	
1/26/2008 3:25:00 PM	0.434				
1/26/2008 3:30:00 PM	0.435				
1/26/2008 3:34:00 PM				3	
1/26/2008 3:35:00 PM	0.442				
1/26/2008 3:40:00 PM	0.460				
1/26/2008 3:44:00 PM				3	
1/26/2008 3:45:00 PM	0.487				
1/26/2008 3:50:00 PM	0.501				
1/26/2008 3:54:00 PM				3	
1/26/2008 3:55:00 PM	0.509				
1/26/2008 4:00:00 PM	0.521				0.05
1/26/2008 4:04:00 PM				3	
1/26/2008 4:05:00 PM	0.537				
1/26/2008 4:10:00 PM	0.549				
1/26/2008 4:14:00 PM				4	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 4:15:00 PM	0.546				
1/26/2008 4:20:00 PM	0.545				
1/26/2008 4:24:00 PM				4	
1/26/2008 4:25:00 PM	0.544				
1/26/2008 4:30:00 PM	0.534				
1/26/2008 4:34:00 PM				4	
1/26/2008 4:35:00 PM	0.520				
1/26/2008 4:40:00 PM	0.503				
1/26/2008 4:44:00 PM				4	
1/26/2008 4:45:00 PM	0.495				
1/26/2008 4:50:00 PM	0.496				
1/26/2008 4:54:00 PM				4	
1/26/2008 4:55:00 PM	0.498				
1/26/2008 5:00:00 PM	0.493				0.11
1/26/2008 5:04:00 PM				4	
1/26/2008 5:05:00 PM	0.490				
1/26/2008 5:10:00 PM	0.483				
1/26/2008 5:14:00 PM				4	
1/26/2008 5:15:00 PM	0.472				
1/26/2008 5:20:00 PM	0.466				
1/26/2008 5:24:00 PM				4	
1/26/2008 5:25:00 PM	0.461				
1/26/2008 5:30:00 PM	0.461				
1/26/2008 5:34:00 PM				4	
1/26/2008 5:35:00 PM	0.460				
1/26/2008 5:40:00 PM	0.456				
1/26/2008 5:44:00 PM				4	
1/26/2008 5:45:00 PM	0.456				
1/26/2008 5:50:00 PM	0.461				
1/26/2008 5:54:00 PM				5	
1/26/2008 5:55:00 PM	0.466				
1/26/2008 6:00:00 PM	0.467				0.08
1/26/2008 6:04:00 PM				5	
1/26/2008 6:05:00 PM	0.470				
1/26/2008 6:10:00 PM	0.487				
1/26/2008 6:14:00 PM				5	
1/26/2008 6:15:00 PM	0.503				
1/26/2008 6:20:00 PM	0.518				
1/26/2008 6:24:00 PM				5	
1/26/2008 6:25:00 PM	0.533				
1/26/2008 6:30:00 PM	0.558				
1/26/2008 6:34:00 PM				5	
1/26/2008 6:35:00 PM	0.577				
1/26/2008 6:40:00 PM	0.603				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 6:44:00 PM				5	
1/26/2008 6:45:00 PM	0.622				
1/26/2008 6:50:00 PM	0.620				
1/26/2008 6:54:00 PM				5	
1/26/2008 6:55:00 PM	0.610				
1/26/2008 7:00:00 PM	0.610				0.04
1/26/2008 7:04:00 PM				5	
1/26/2008 7:05:00 PM	0.634				
1/26/2008 7:10:00 PM	0.657				
1/26/2008 7:14:00 PM				5	
1/26/2008 7:15:00 PM	0.661				
1/26/2008 7:20:00 PM	0.638				
1/26/2008 7:24:00 PM				5	
1/26/2008 7:25:00 PM	0.606				
1/26/2008 7:30:00 PM	0.586				
1/26/2008 7:34:00 PM				6	
1/26/2008 7:35:00 PM	0.570				
1/26/2008 7:40:00 PM	0.544				
1/26/2008 7:44:00 PM				6	
1/26/2008 7:45:00 PM	0.514				
1/26/2008 7:50:00 PM	0.492				
1/26/2008 7:54:00 PM				6	
1/26/2008 7:55:00 PM	0.479				
1/26/2008 8:00:00 PM	0.468				0.02
1/26/2008 8:04:00 PM				6	
1/26/2008 8:05:00 PM	0.459				
1/26/2008 8:10:00 PM	0.460				
1/26/2008 8:14:00 PM				6	
1/26/2008 8:15:00 PM	0.472				
1/26/2008 8:20:00 PM	0.480				
1/26/2008 8:24:00 PM				6	
1/26/2008 8:25:00 PM	0.473				
1/26/2008 8:30:00 PM	0.465				
1/26/2008 8:34:00 PM				6	
1/26/2008 8:35:00 PM	0.456				
1/26/2008 8:40:00 PM	0.450				
1/26/2008 8:44:00 PM				6	
1/26/2008 8:45:00 PM	0.445				
1/26/2008 8:50:00 PM	0.439				
1/26/2008 8:54:00 PM				6	
1/26/2008 8:55:00 PM	0.431				
1/26/2008 9:00:00 PM	0.411				0.00
1/26/2008 9:04:00 PM				6	
1/26/2008 9:05:00 PM	0.390				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 9:10:00 PM	0.377				
1/26/2008 9:14:00 PM				7	
1/26/2008 9:15:00 PM	0.368				
1/26/2008 9:20:00 PM	0.370				
1/26/2008 9:24:00 PM				7	
1/26/2008 9:25:00 PM	0.380				
1/26/2008 9:30:00 PM	0.384				
1/26/2008 9:34:00 PM				7	
1/26/2008 9:35:00 PM	0.380				
1/26/2008 9:40:00 PM	0.372				
1/26/2008 9:44:00 PM				7	
1/26/2008 9:45:00 PM	0.362				
1/26/2008 9:50:00 PM	0.351				
1/26/2008 9:54:00 PM				7	
1/26/2008 9:55:00 PM	0.342				
1/26/2008 10:00:00 PM	0.333				0.02
1/26/2008 10:04:00 PM				7	
1/26/2008 10:05:00 PM	0.323				
1/26/2008 10:10:00 PM	0.319				
1/26/2008 10:14:00 PM				7	
1/26/2008 10:15:00 PM	0.313				
1/26/2008 10:20:00 PM	0.308				
1/26/2008 10:24:00 PM				7	
1/26/2008 10:25:00 PM	0.303				
1/26/2008 10:30:00 PM	0.300				
1/26/2008 10:34:00 PM				7	
1/26/2008 10:35:00 PM	0.300				
1/26/2008 10:40:00 PM	0.297				
1/26/2008 10:44:00 PM				7	
1/26/2008 10:45:00 PM	0.294				
1/26/2008 10:50:00 PM	0.292				
1/26/2008 10:55:00 PM	0.289				
1/26/2008 11:00:00 PM	0.287				0.06
1/26/2008 11:05:00 PM	0.287				
1/26/2008 11:10:00 PM	0.286				
1/26/2008 11:15:00 PM	0.286				
1/26/2008 11:20:00 PM	0.287				
1/26/2008 11:25:00 PM	0.289				
1/26/2008 11:30:00 PM	0.292				
1/26/2008 11:35:00 PM	0.295				
1/26/2008 11:40:00 PM	0.299				
1/26/2008 11:45:00 PM	0.304				
1/26/2008 11:50:00 PM	0.317				
1/26/2008 11:55:00 PM	0.342				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/27/2008 12:00:00 AM	0.384				0.04
1/27/2008 12:05:00 AM	0.421				
1/27/2008 12:10:00 AM	0.440				
1/27/2008 12:15:00 AM	0.444				
1/27/2008 12:20:00 AM	0.443				
1/27/2008 12:25:00 AM	0.455				
1/27/2008 12:30:00 AM	0.479				
1/27/2008 12:35:00 AM	0.494				
1/27/2008 12:40:00 AM	0.501				
1/27/2008 12:45:00 AM	0.502				
1/27/2008 12:50:00 AM	0.494				
1/27/2008 12:55:00 AM	0.489				
1/27/2008 1:00:00 AM	0.501				0.00
1/27/2008 1:05:00 AM	0.525				
1/27/2008 1:10:00 AM	0.548				
1/27/2008 1:15:00 AM	0.549				
1/27/2008 1:20:00 AM	0.530				
1/27/2008 1:25:00 AM	0.509				
1/27/2008 1:30:00 AM	0.484				
1/27/2008 1:35:00 AM	0.466				
1/27/2008 1:40:00 AM	0.453				
1/27/2008 1:45:00 AM	0.443				
1/27/2008 1:50:00 AM	0.432				
1/27/2008 1:55:00 AM	0.424				
1/27/2008 2:00:00 AM	0.427				0.00
1/27/2008 2:05:00 AM	0.430				
1/27/2008 2:10:00 AM	0.424				
1/27/2008 2:15:00 AM	0.409				
1/27/2008 2:20:00 AM	0.391				
1/27/2008 2:25:00 AM	0.376				
1/27/2008 2:30:00 AM	0.364				
1/27/2008 2:35:00 AM	0.354				
1/27/2008 2:40:00 AM	0.346				
1/27/2008 2:45:00 AM	0.339				
1/27/2008 2:50:00 AM	0.331				
1/27/2008 2:55:00 AM	0.325				
1/27/2008 3:00:00 AM	0.318				0.02
1/27/2008 3:05:00 AM	0.312				
1/27/2008 3:10:00 AM	0.308				
1/27/2008 3:15:00 AM	0.303				
1/27/2008 3:20:00 AM	0.299				
1/27/2008 3:25:00 AM	0.297				
1/27/2008 3:30:00 AM	0.294				
1/27/2008 3:35:00 AM	0.292				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/27/2008 3:40:00 AM	0.289				
1/27/2008 3:45:00 AM	0.286				
1/27/2008 3:50:00 AM	0.284				
1/27/2008 3:55:00 AM	0.284				
1/27/2008 4:00:00 AM	0.284				0.01
1/27/2008 4:05:00 AM	0.286				
1/27/2008 4:10:00 AM	0.289				
1/27/2008 4:15:00 AM	0.291				
1/27/2008 4:20:00 AM	0.294				
1/27/2008 4:25:00 AM	0.303				
1/27/2008 4:30:00 AM	0.320				
1/27/2008 4:35:00 AM	0.340				
1/27/2008 4:40:00 AM	0.359				
1/27/2008 4:45:00 AM	0.373				
1/27/2008 4:50:00 AM	0.374				
1/27/2008 4:55:00 AM	0.366				
1/27/2008 5:00:00 AM	0.357				0.01
1/27/2008 5:05:00 AM	0.346				
1/27/2008 5:10:00 AM	0.338				
1/27/2008 5:15:00 AM	0.330				
1/27/2008 5:20:00 AM	0.322				
1/27/2008 5:25:00 AM	0.314				
1/27/2008 5:30:00 AM	0.308				
1/27/2008 5:35:00 AM	0.305				
1/27/2008 5:40:00 AM	0.301				
1/27/2008 5:45:00 AM	0.299				
1/27/2008 5:50:00 AM	0.298				
1/27/2008 5:55:00 AM	0.297				
1/27/2008 6:00:00 AM	0.297				0.01
1/27/2008 6:05:00 AM	0.300				
1/27/2008 6:10:00 AM	0.303				
1/27/2008 6:15:00 AM	0.311				
1/27/2008 6:20:00 AM	0.319				
1/27/2008 6:25:00 AM	0.334				
1/27/2008 6:30:00 AM	0.355				
1/27/2008 6:35:00 AM	0.379				
1/27/2008 6:40:00 AM	0.389				
1/27/2008 6:45:00 AM	0.382				
1/27/2008 6:50:00 AM	0.370				
1/27/2008 6:55:00 AM	0.357				
1/27/2008 7:00:00 AM	0.343				0.00
1/27/2008 7:05:00 AM	0.333				
1/27/2008 7:10:00 AM	0.325				
1/27/2008 7:15:00 AM	0.318				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/27/2008 7:20:00 AM	0.312				
1/27/2008 7:25:00 AM	0.307				
1/27/2008 7:30:00 AM	0.303				
1/27/2008 7:35:00 AM	0.300				
1/27/2008 7:40:00 AM	0.297				
1/27/2008 7:45:00 AM	0.294				
1/27/2008 7:50:00 AM	0.292				
1/27/2008 7:55:00 AM	0.290				
1/27/2008 8:00:00 AM	0.288				0.00
1/27/2008 8:05:00 AM	0.286				
1/27/2008 8:10:00 AM	0.284				
1/27/2008 8:15:00 AM	0.282				
1/27/2008 8:20:00 AM	0.280				
1/27/2008 8:25:00 AM	0.278				
1/27/2008 8:30:00 AM	0.275				
1/27/2008 8:35:00 AM	0.274				
1/27/2008 8:40:00 AM	0.272				
1/27/2008 8:45:00 AM	0.271				
1/27/2008 8:50:00 AM	0.269				
1/27/2008 8:55:00 AM	0.267				
1/27/2008 9:00:00 AM	0.267				0.00
1/27/2008 9:05:00 AM	0.265				
1/27/2008 9:10:00 AM	0.264				
1/27/2008 9:15:00 AM	0.264				
1/27/2008 9:20:00 AM	0.263				
1/27/2008 9:25:00 AM	0.261				
1/27/2008 9:30:00 AM	0.261				
1/27/2008 9:35:00 AM	0.259				
1/27/2008 9:40:00 AM	0.258				
1/27/2008 9:45:00 AM	0.258				
1/27/2008 9:50:00 AM	0.256				
1/27/2008 9:55:00 AM	0.255				
1/27/2008 10:00:00 AM	0.254				0.00

Figure X-7 Highway 30 A

January 30th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/28/2008 3:00:00 PM	0.157				0.01
1/28/2008 3:05:00 PM	0.157				
1/28/2008 3:10:00 PM	0.157				
1/28/2008 3:15:00 PM	0.157				
1/28/2008 3:20:00 PM	0.156				
1/28/2008 3:25:00 PM	0.156				
1/28/2008 3:30:00 PM	0.156				
1/28/2008 3:35:00 PM	0.156				
1/28/2008 3:40:00 PM	0.156				
1/28/2008 3:45:00 PM	0.156				
1/28/2008 3:50:00 PM	0.156				
1/28/2008 3:55:00 PM	0.156				
1/28/2008 4:00:00 PM	0.156				0.00
1/28/2008 4:05:00 PM	0.154				
1/28/2008 4:10:00 PM	0.155				
1/28/2008 4:15:00 PM	0.154				
1/28/2008 4:20:00 PM	0.154				
1/28/2008 4:25:00 PM	0.154				
1/28/2008 4:30:00 PM	0.154				
1/28/2008 4:35:00 PM	0.154				
1/28/2008 4:40:00 PM	0.154				
1/28/2008 4:45:00 PM	0.154				
1/28/2008 4:50:00 PM	0.153				
1/28/2008 4:55:00 PM	0.153				
1/28/2008 5:00:00 PM	0.153				0.00
1/28/2008 5:05:00 PM	0.152				
1/28/2008 5:10:00 PM	0.151				
1/28/2008 5:15:00 PM	0.151				
1/28/2008 5:20:00 PM	0.182			1	
1/28/2008 5:25:00 PM	0.311				
1/28/2008 5:30:00 PM	0.308				
1/28/2008 5:34:00 PM				1	
1/28/2008 5:35:00 PM	0.304				
1/28/2008 5:40:00 PM	0.302				
1/28/2008 5:45:00 PM	0.298				
1/28/2008 5:49:00 PM				1	
1/28/2008 5:50:00 PM	0.295				
1/28/2008 5:55:00 PM	0.291				
1/28/2008 6:00:00 PM	0.286				0.00
1/28/2008 6:04:00 PM				1	
1/28/2008 6:05:00 PM	0.283				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/28/2008 6:10:00 PM	0.279				
1/28/2008 6:15:00 PM	0.276				
1/28/2008 6:19:00 PM				1	
1/28/2008 6:20:00 PM	0.272				
1/28/2008 6:25:00 PM	0.268				
1/28/2008 6:30:00 PM	0.266				
1/28/2008 6:34:00 PM				1	
1/28/2008 6:35:00 PM	0.264				
1/28/2008 6:40:00 PM	0.263				
1/28/2008 6:45:00 PM	0.261				
1/28/2008 6:49:00 PM				1	
1/28/2008 6:50:00 PM	0.259				
1/28/2008 6:55:00 PM	0.257				
1/28/2008 7:00:00 PM	0.255				0.00
1/28/2008 7:04:00 PM				1	
1/28/2008 7:05:00 PM	0.253				
1/28/2008 7:10:00 PM	0.252				
1/28/2008 7:15:00 PM	0.251				
1/28/2008 7:19:00 PM				1	
1/28/2008 7:20:00 PM	0.249				
1/28/2008 7:25:00 PM	0.247				
1/28/2008 7:30:00 PM	0.245				
1/28/2008 7:34:00 PM				1	
1/28/2008 7:35:00 PM	0.243				
1/28/2008 7:40:00 PM	0.241				
1/28/2008 7:45:00 PM	0.239				
1/28/2008 7:49:00 PM				2	
1/28/2008 7:50:00 PM	0.236				
1/28/2008 7:55:00 PM	0.232				
1/28/2008 8:00:00 PM	0.229				0.00
1/28/2008 8:04:00 PM				2	
1/28/2008 8:05:00 PM	0.226				
1/28/2008 8:10:00 PM	0.220				
1/28/2008 8:15:00 PM	0.215				
1/28/2008 8:19:00 PM				2	
1/28/2008 8:20:00 PM	0.214				
1/28/2008 8:25:00 PM	0.212				
1/28/2008 8:30:00 PM	0.210				
1/28/2008 8:34:00 PM				2	
1/28/2008 8:35:00 PM	0.209				
1/28/2008 8:40:00 PM	0.207				
1/28/2008 8:45:00 PM	0.203				
1/28/2008 8:49:00 PM				2	
1/28/2008 8:50:00 PM	0.201				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/28/2008 8:55:00 PM	0.200				
1/28/2008 9:00:00 PM	0.196				0.00
1/28/2008 9:04:00 PM				2	
1/28/2008 9:05:00 PM	0.195				
1/28/2008 9:10:00 PM	0.194				
1/28/2008 9:15:00 PM	0.193				
1/28/2008 9:19:00 PM				2	
1/28/2008 9:20:00 PM	0.190				
1/28/2008 9:25:00 PM	0.188				
1/28/2008 9:30:00 PM	0.187				
1/28/2008 9:34:00 PM				2	
1/28/2008 9:35:00 PM	0.184				
1/28/2008 9:40:00 PM	0.184				
1/28/2008 9:45:00 PM	0.180				
1/28/2008 9:50:00 PM	0.178				
1/28/2008 9:55:00 PM	0.177				
1/28/2008 10:00:00 PM	0.175				0.01
1/28/2008 10:05:00 PM	0.176				
1/28/2008 10:10:00 PM	0.175				
1/28/2008 10:15:00 PM	0.174				
1/28/2008 10:20:00 PM	0.174				
1/28/2008 10:25:00 PM	0.172				
1/28/2008 10:30:00 PM	0.169				
1/28/2008 10:35:00 PM	0.167				
1/28/2008 10:40:00 PM	0.168				
1/28/2008 10:45:00 PM	0.166				
1/28/2008 10:50:00 PM	0.167				
1/28/2008 10:55:00 PM	0.165				
1/28/2008 11:00:00 PM	0.164				0.00
1/28/2008 11:05:00 PM	0.163				
1/28/2008 11:10:00 PM	0.163				
1/28/2008 11:15:00 PM	0.164				
1/28/2008 11:20:00 PM	0.163				
1/28/2008 11:25:00 PM	0.162				
1/28/2008 11:30:00 PM	0.162				
1/28/2008 11:35:00 PM	0.162				
1/28/2008 11:40:00 PM	0.161				
1/28/2008 11:45:00 PM	0.161				
1/28/2008 11:50:00 PM	0.161				
1/28/2008 11:55:00 PM	0.161				
1/29/2008 12:00:00 AM	0.160				0.02
1/29/2008 12:05:00 AM	0.159				
1/29/2008 12:10:00 AM	0.159				
1/29/2008 12:15:00 AM	0.161				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 12:20:00 AM	0.161				
1/29/2008 12:25:00 AM	0.159				
1/29/2008 12:30:00 AM	0.159				
1/29/2008 12:35:00 AM	0.167				
1/29/2008 12:36:00 AM				2	
1/29/2008 12:40:00 AM	0.226				
1/29/2008 12:42:00 AM				2	
1/29/2008 12:45:00 AM	0.250				
1/29/2008 12:50:00 AM	0.255				
1/29/2008 12:55:00 AM	0.261				
1/29/2008 12:57:00 AM				3	
1/29/2008 1:00:00 AM	0.268				0.02
1/29/2008 1:05:00 AM	0.269				
1/29/2008 1:10:00 AM	0.269				
1/29/2008 1:12:00 AM				3	
1/29/2008 1:15:00 AM	0.269				
1/29/2008 1:20:00 AM	0.267				
1/29/2008 1:25:00 AM	0.268				
1/29/2008 1:27:00 AM				3	
1/29/2008 1:30:00 AM	0.270				
1/29/2008 1:35:00 AM	0.271				
1/29/2008 1:40:00 AM	0.272				
1/29/2008 1:42:00 AM				3	
1/29/2008 1:45:00 AM	0.275				
1/29/2008 1:50:00 AM	0.280				
1/29/2008 1:55:00 AM	0.289				
1/29/2008 1:57:00 AM				3	
1/29/2008 2:00:00 AM	0.304				0.04
1/29/2008 2:05:00 AM	0.325				
1/29/2008 2:10:00 AM	0.344				
1/29/2008 2:12:00 AM				3	
1/29/2008 2:15:00 AM	0.357				
1/29/2008 2:20:00 AM	0.364				
1/29/2008 2:25:00 AM	0.370				
1/29/2008 2:27:00 AM				3	
1/29/2008 2:30:00 AM	0.367				
1/29/2008 2:35:00 AM	0.362				
1/29/2008 2:40:00 AM	0.357				
1/29/2008 2:42:00 AM				3	
1/29/2008 2:45:00 AM	0.355				
1/29/2008 2:50:00 AM	0.354				
1/29/2008 2:55:00 AM	0.354				
1/29/2008 2:57:00 AM				3	
1/29/2008 3:00:00 AM	0.357				0.04

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 3:05:00 AM	0.361				
1/29/2008 3:10:00 AM	0.367				
1/29/2008 3:12:00 AM				3	
1/29/2008 3:15:00 AM	0.375				
1/29/2008 3:20:00 AM	0.384				
1/29/2008 3:25:00 AM	0.395				
1/29/2008 3:27:00 AM				4	
1/29/2008 3:30:00 AM	0.406				
1/29/2008 3:35:00 AM	0.415				
1/29/2008 3:40:00 AM	0.411				
1/29/2008 3:42:00 AM				4	
1/29/2008 3:45:00 AM	0.408				
1/29/2008 3:50:00 AM	0.406				
1/29/2008 3:55:00 AM	0.412				
1/29/2008 3:57:00 AM				4	
1/29/2008 4:00:00 AM	0.419				0.06
1/29/2008 4:05:00 AM	0.420				
1/29/2008 4:10:00 AM	0.418				
1/29/2008 4:12:00 AM				4	
1/29/2008 4:15:00 AM	0.416				
1/29/2008 4:20:00 AM	0.417				
1/29/2008 4:25:00 AM	0.420				
1/29/2008 4:27:00 AM				4	
1/29/2008 4:30:00 AM	0.431				
1/29/2008 4:35:00 AM	0.442				
1/29/2008 4:40:00 AM	0.442				
1/29/2008 4:42:00 AM				4	
1/29/2008 4:45:00 AM	0.444				
1/29/2008 4:50:00 AM	0.447				
1/29/2008 4:55:00 AM	0.450				
1/29/2008 4:57:00 AM				4	
1/29/2008 5:00:00 AM	0.447				0.05
1/29/2008 5:05:00 AM	0.444				
1/29/2008 5:10:00 AM	0.444				
1/29/2008 5:12:00 AM				4	
1/29/2008 5:15:00 AM	0.446				
1/29/2008 5:20:00 AM	0.444				
1/29/2008 5:25:00 AM	0.438				
1/29/2008 5:27:00 AM				4	
1/29/2008 5:30:00 AM	0.433				
1/29/2008 5:35:00 AM	0.424				
1/29/2008 5:40:00 AM	0.416				
1/29/2008 5:42:00 AM				4	
1/29/2008 5:45:00 AM	0.422				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 5:50:00 AM	0.440				
1/29/2008 5:55:00 AM	0.464				
1/29/2008 5:57:00 AM				5	
1/29/2008 6:00:00 AM	0.487				0.07
1/29/2008 6:05:00 AM	0.513				
1/29/2008 6:10:00 AM	0.544				
1/29/2008 6:12:00 AM				5	
1/29/2008 6:15:00 AM	0.564				
1/29/2008 6:20:00 AM	0.561				
1/29/2008 6:25:00 AM	0.553				
1/29/2008 6:27:00 AM				5	
1/29/2008 6:30:00 AM	0.538				
1/29/2008 6:35:00 AM	0.521				
1/29/2008 6:40:00 AM	0.509				
1/29/2008 6:42:00 AM				5	
1/29/2008 6:45:00 AM	0.495				
1/29/2008 6:50:00 AM	0.482				
1/29/2008 6:55:00 AM	0.460				
1/29/2008 6:57:00 AM				5	
1/29/2008 7:00:00 AM	0.448				0.01
1/29/2008 7:05:00 AM	0.438				
1/29/2008 7:10:00 AM	0.428				
1/29/2008 7:12:00 AM				5	
1/29/2008 7:15:00 AM	0.419				
1/29/2008 7:20:00 AM	0.403				
1/29/2008 7:25:00 AM	0.391				
1/29/2008 7:27:00 AM				5	
1/29/2008 7:30:00 AM	0.416				
1/29/2008 7:35:00 AM	0.555				
1/29/2008 7:40:00 AM	0.711				
1/29/2008 7:42:00 AM				5	
1/29/2008 7:45:00 AM	0.721				
1/29/2008 7:50:00 AM	0.639				
1/29/2008 7:55:00 AM	0.555				
1/29/2008 7:57:00 AM				5	
1/29/2008 8:00:00 AM	0.492				0.02
1/29/2008 8:05:00 AM	0.447				
1/29/2008 8:10:00 AM	0.412				
1/29/2008 8:12:00 AM				5	
1/29/2008 8:15:00 AM	0.387				
1/29/2008 8:20:00 AM	0.370				
1/29/2008 8:25:00 AM	0.357				
1/29/2008 8:27:00 AM				6	
1/29/2008 8:30:00 AM	0.349				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 8:35:00 AM	0.344				
1/29/2008 8:40:00 AM	0.342				
1/29/2008 8:42:00 AM				6	
1/29/2008 8:45:00 AM	0.340				
1/29/2008 8:50:00 AM	0.339				
1/29/2008 8:55:00 AM	0.334				
1/29/2008 8:57:00 AM				6	
1/29/2008 9:00:00 AM	0.328				0.00
1/29/2008 9:05:00 AM	0.320				
1/29/2008 9:10:00 AM	0.312				
1/29/2008 9:12:00 AM				6	
1/29/2008 9:15:00 AM	0.303				
1/29/2008 9:20:00 AM	0.298				
1/29/2008 9:25:00 AM	0.294				
1/29/2008 9:27:00 AM				6	
1/29/2008 9:30:00 AM	0.289				
1/29/2008 9:35:00 AM	0.285				
1/29/2008 9:40:00 AM	0.282				
1/29/2008 9:42:00 AM				6	
1/29/2008 9:45:00 AM	0.283				
1/29/2008 9:50:00 AM	0.319				
1/29/2008 9:55:00 AM	0.379				
1/29/2008 9:57:00 AM				6	
1/29/2008 10:00:00 AM	0.401				0.00
1/29/2008 10:05:00 AM	0.390				
1/29/2008 10:10:00 AM	0.379				
1/29/2008 10:12:00 AM				6	
1/29/2008 10:15:00 AM	0.371				
1/29/2008 10:20:00 AM	0.365				
1/29/2008 10:25:00 AM	0.356				
1/29/2008 10:27:00 AM				6	
1/29/2008 10:30:00 AM	0.343				
1/29/2008 10:35:00 AM	0.333				
1/29/2008 10:40:00 AM	0.324				
1/29/2008 10:42:00 AM				6	
1/29/2008 10:45:00 AM	0.315				
1/29/2008 10:50:00 AM	0.308				
1/29/2008 10:55:00 AM	0.303				
1/29/2008 10:57:00 AM				7	
1/29/2008 11:00:00 AM	0.297				0.00
1/29/2008 11:05:00 AM	0.292				
1/29/2008 11:10:00 AM	0.287				
1/29/2008 11:12:00 AM				7	
1/29/2008 11:15:00 AM	0.283				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 11:20:00 AM	0.280				
1/29/2008 11:25:00 AM	0.277				
1/29/2008 11:27:00 AM				7	
1/29/2008 11:30:00 AM	0.274				
1/29/2008 11:35:00 AM	0.271				
1/29/2008 11:40:00 AM	0.269				
1/29/2008 11:42:00 AM				7	
1/29/2008 11:45:00 AM	0.266				
1/29/2008 11:50:00 AM	0.264				
1/29/2008 11:55:00 AM	0.263				
1/29/2008 11:57:00 AM				7	
1/29/2008 12:00:00 PM	0.261				0.01
1/29/2008 12:05:00 PM	0.259				
1/29/2008 12:10:00 PM	0.258				
1/29/2008 12:12:00 PM				7	
1/29/2008 12:15:00 PM	0.256				
1/29/2008 12:20:00 PM	0.254				
1/29/2008 12:25:00 PM	0.252				
1/29/2008 12:27:00 PM				7	
1/29/2008 12:30:00 PM	0.252				
1/29/2008 12:35:00 PM	0.250				
1/29/2008 12:40:00 PM	0.249				
1/29/2008 12:42:00 PM				7	
1/29/2008 12:45:00 PM	0.249				
1/29/2008 12:50:00 PM	0.248				
1/29/2008 12:55:00 PM	0.247				
1/29/2008 12:57:00 PM				7	
1/29/2008 1:00:00 PM	0.246				0.03
1/29/2008 1:05:00 PM	0.247				
1/29/2008 1:10:00 PM	0.244				
1/29/2008 1:12:00 PM				7	
1/29/2008 1:15:00 PM	0.246				
1/29/2008 1:20:00 PM	0.248				
1/29/2008 1:25:00 PM	0.280				
1/29/2008 1:30:00 PM	0.303				
1/29/2008 1:35:00 PM	0.320				
1/29/2008 1:40:00 PM	0.329				
1/29/2008 1:45:00 PM	0.326				
1/29/2008 1:50:00 PM	0.319				
1/29/2008 1:55:00 PM	0.313				
1/29/2008 2:00:00 PM	0.307				0.04
1/29/2008 2:05:00 PM	0.301				
1/29/2008 2:10:00 PM	0.295				
1/29/2008 2:15:00 PM	0.292				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 2:20:00 PM	0.291				
1/29/2008 2:25:00 PM	0.292				
1/29/2008 2:30:00 PM	0.294				
1/29/2008 2:35:00 PM	0.299				
1/29/2008 2:40:00 PM	0.313				
1/29/2008 2:45:00 PM	0.326				
1/29/2008 2:50:00 PM	0.331				
1/29/2008 2:55:00 PM	0.336				
1/29/2008 3:00:00 PM	0.337				0.05

Figure Y-4 Highway 30 B

November 27th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/26/2007 3:00:00 PM					0.00
11/26/2007 3:40:00 PM	0.201				
11/26/2007 3:45:00 PM	0.201				
11/26/2007 3:50:00 PM	0.201				
11/26/2007 3:55:00 PM	0.201				
11/26/2007 4:00:00 PM	0.201				0.10
11/26/2007 4:05:00 PM	0.201				
11/26/2007 4:10:00 PM	0.201				
11/26/2007 4:15:00 PM	0.201				
11/26/2007 4:20:00 PM	0.201				
11/26/2007 4:25:00 PM	0.201				
11/26/2007 4:30:00 PM	0.201				
11/26/2007 4:35:00 PM	0.201				
11/26/2007 4:40:00 PM	0.201				
11/26/2007 4:45:00 PM	0.201				
11/26/2007 4:50:00 PM	0.201				
11/26/2007 4:55:00 PM	0.201				
11/26/2007 5:00:00 PM	0.201				0.13
11/26/2007 5:05:00 PM	0.201				
11/26/2007 5:10:00 PM	0.201				
11/26/2007 5:15:00 PM	0.201				
11/26/2007 5:20:00 PM	0.201				
11/26/2007 5:25:00 PM	0.201				
11/26/2007 5:30:00 PM	0.201				
11/26/2007 5:35:00 PM	0.201	0.16	13.35		
11/26/2007 5:38:00 PM				1	
11/26/2007 5:40:00 PM	0.273	0.15	19.57		
11/26/2007 5:45:00 PM	0.391	0.03	6.16		
11/26/2007 5:47:00 PM				1	
11/26/2007 5:50:00 PM	0.544	0.63	223.07		
11/26/2007 5:55:00 PM	0.656	1.11	510.36		
11/26/2007 5:57:00 PM				1	
11/26/2007 6:00:00 PM	0.700	1.33	671.81		0.08
11/26/2007 6:05:00 PM	0.705	0.94	479.17		
11/26/2007 6:07:00 PM				1	
11/26/2007 6:10:00 PM	0.689	1.09	541.19		
11/26/2007 6:15:00 PM	0.670	1.17	554.32		
11/26/2007 6:17:00 PM				1	
11/26/2007 6:20:00 PM	0.657	1.04	480.13		
11/26/2007 6:25:00 PM	0.644	1.11	496.49		
11/26/2007 6:27:00 PM				1	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/26/2007 6:30:00 PM	0.631	0.96	420.33		
11/26/2007 6:35:00 PM	0.617	1.21	510.67		
11/26/2007 6:37:00 PM				1	
11/26/2007 6:40:00 PM	0.611	1.12	466.64		
11/26/2007 6:45:00 PM	0.610	1.02	425.37		
11/26/2007 6:47:00 PM				1	
11/26/2007 6:50:00 PM	0.605	0.88	361.06		
11/26/2007 6:55:00 PM	0.611	1.00	416.13		
11/26/2007 6:57:00 PM				1	
11/26/2007 7:00:00 PM	0.606	1.24	509.66		0.01
11/26/2007 7:05:00 PM	0.589	1.53	605.41		
11/26/2007 7:07:00 PM				1	
11/26/2007 7:10:00 PM	0.566	1.61	602.60		
11/26/2007 7:15:00 PM	0.550	1.58	567.15		
11/26/2007 7:17:00 PM				2	
11/26/2007 7:20:00 PM	0.536	1.41	488.58		
11/26/2007 7:25:00 PM	0.521	1.61	537.77		
11/26/2007 7:27:00 PM				2	
11/26/2007 7:30:00 PM	0.504	1.62	515.34		
11/26/2007 7:35:00 PM	0.493	1.15	353.98		
11/26/2007 7:37:00 PM				2	
11/26/2007 7:40:00 PM	0.504	1.15	365.15		
11/26/2007 7:45:00 PM	0.537	1.20	416.54		
11/26/2007 7:47:00 PM				2	
11/26/2007 7:50:00 PM	0.551	1.22	438.32		
11/26/2007 7:55:00 PM	0.547	1.04	372.88		
11/26/2007 7:57:00 PM				2	
11/26/2007 8:00:00 PM	0.550	1.31	471.71		0.00
11/26/2007 8:05:00 PM	0.555	1.39	505.08		
11/26/2007 8:07:00 PM				2	
11/26/2007 8:10:00 PM	0.548	1.67	597.99		
11/26/2007 8:15:00 PM	0.527	1.54	520.64		
11/26/2007 8:17:00 PM				2	
11/26/2007 8:20:00 PM	0.499	1.69	527.08		
11/26/2007 8:25:00 PM	0.468	1.30	369.51		
11/26/2007 8:27:00 PM				2	
11/26/2007 8:30:00 PM	0.436	0.93	239.66		
11/26/2007 8:35:00 PM	0.409	0.93	218.62		
11/26/2007 8:37:00 PM				2	
11/26/2007 8:40:00 PM	0.385	-0.34	-74.32		
11/26/2007 8:45:00 PM	0.364	-0.25	-49.59		
11/26/2007 8:47:00 PM				2	
11/26/2007 8:50:00 PM	0.350	0.26	48.82		
11/26/2007 8:55:00 PM	0.336	-0.21	-38.03		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/26/2007 8:57:00 PM				3	
11/26/2007 9:00:00 PM	0.323	-0.16	-26.67		0.00
11/26/2007 9:05:00 PM	0.312	-0.06	-9.04		
11/26/2007 9:07:00 PM				3	
11/26/2007 9:10:00 PM	0.304	-0.13	-19.86		
11/26/2007 9:15:00 PM	0.297	-0.10	-15.02		
11/26/2007 9:17:00 PM				3	
11/26/2007 9:20:00 PM	0.290	-0.09	-12.83		
11/26/2007 9:25:00 PM	0.284	-0.09	-12.43		
11/26/2007 9:27:00 PM				3	
11/26/2007 9:30:00 PM	0.277	-0.09	-12.01		
11/26/2007 9:35:00 PM	0.273	-0.09	-11.74		
11/26/2007 9:37:00 PM				3	
11/26/2007 9:40:00 PM	0.269	-0.09	-11.49		
11/26/2007 9:45:00 PM	0.265	-0.09	-11.23		
11/26/2007 9:47:00 PM				3	
11/26/2007 9:50:00 PM	0.261	-0.09	-11.02		
11/26/2007 9:55:00 PM	0.259	-0.09	-10.84		
11/26/2007 9:57:00 PM				3	
11/26/2007 10:00:00 PM	0.256	-0.09	-10.70		0.00
11/26/2007 10:05:00 PM	0.254	-0.09	-10.54		
11/26/2007 10:07:00 PM				3	
11/26/2007 10:10:00 PM	0.252	0.46	53.25		
11/26/2007 10:15:00 PM	0.249	0.46	52.54		
11/26/2007 10:20:00 PM	0.248	0.46	52.04		
11/26/2007 10:25:00 PM	0.246	0.46	51.63		
11/26/2007 10:30:00 PM	0.246	0.46	51.43		
11/26/2007 10:35:00 PM	0.244	0.46	50.93		
11/26/2007 10:40:00 PM	0.243	0.46	50.62		
11/26/2007 10:45:00 PM	0.242	0.46	50.42		
11/26/2007 10:50:00 PM	0.241	0.46	50.02		
11/26/2007 10:55:00 PM	0.241	0.46	49.92		
11/26/2007 11:00:00 PM	0.240	0.46	49.72		0.00
11/26/2007 11:05:00 PM	0.239	0.46	49.42		
11/26/2007 11:10:00 PM	0.239	0.46	49.23		
11/26/2007 11:15:00 PM	0.237	0.46	48.83		
11/26/2007 11:20:00 PM	0.237	0.46	48.83		
11/26/2007 11:25:00 PM	0.236	0.46	48.53		
11/26/2007 11:30:00 PM	0.236	0.46	48.33		
11/26/2007 11:35:00 PM	0.235	0.46	48.13		
11/26/2007 11:40:00 PM	0.234	0.46	47.84		
11/26/2007 11:45:00 PM	0.234	0.46	47.84		
11/26/2007 11:50:00 PM	0.234	0.46	47.84		
11/26/2007 11:55:00 PM	0.233	0.46	47.64		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/27/2007 12:00:00 AM	0.232	0.46	47.35		0.00
11/27/2007 12:05:00 AM	0.232	0.46	47.35		
11/27/2007 12:10:00 AM	0.232	0.46	47.35		
11/27/2007 12:15:00 AM	0.231	0.46	46.95		
11/27/2007 12:20:00 AM	0.231	0.46	46.86		
11/27/2007 12:25:00 AM	0.231	0.46	46.86		
11/27/2007 12:30:00 AM	0.231	0.46	46.86		
11/27/2007 12:35:00 AM	0.231	0.46	46.86		
11/27/2007 12:40:00 AM	0.229	0.46	46.37		
11/27/2007 12:45:00 AM	0.229	0.46	46.37		
11/27/2007 12:50:00 AM	0.229	0.46	46.37		
11/27/2007 12:55:00 AM	0.229	0.46	46.37		
11/27/2007 1:00:00 AM	0.228	0.46	45.98		0.00
11/27/2007 1:05:00 AM	0.227	0.46	45.88		
11/27/2007 1:10:00 AM	0.227	0.46	45.88		
11/27/2007 1:15:00 AM	0.227	0.46	45.88		
11/27/2007 1:20:00 AM	0.227	0.46	45.88		
11/27/2007 1:25:00 AM	0.227	0.46	45.88		
11/27/2007 1:30:00 AM	0.227	0.46	45.78		
11/27/2007 1:35:00 AM	0.226	0.46	45.39		
11/27/2007 1:40:00 AM	0.226	0.46	45.39		
11/27/2007 1:45:00 AM	0.226	0.46	45.39		
11/27/2007 1:50:00 AM	0.226	0.46	45.39		
11/27/2007 1:55:00 AM	0.226	0.46	45.39		
11/27/2007 2:00:00 AM	0.226	0.46	45.39		0.00
11/27/2007 2:05:00 AM	0.226	0.46	45.39		
11/27/2007 2:10:00 AM	0.226	0.46	45.39		
11/27/2007 2:15:00 AM	0.226	0.46	45.39		
11/27/2007 2:20:00 AM	0.226	0.46	45.39		
11/27/2007 2:25:00 AM	0.226	0.46	45.39		
11/27/2007 2:30:00 AM	0.226	0.46	45.39		
11/27/2007 2:35:00 AM	0.224	0.46	44.91		
11/27/2007 2:40:00 AM	0.224	0.46	44.91		
11/27/2007 2:45:00 AM	0.224	0.46	44.91		
11/27/2007 2:50:00 AM	0.224	0.46	44.91		
11/27/2007 2:55:00 AM	0.224	0.46	44.91		
11/27/2007 3:00:00 AM	0.224	0.46	44.91		0.00
11/27/2007 3:05:00 AM	0.224	0.46	44.91		
11/27/2007 3:10:00 AM	0.224	0.46	44.91		
11/27/2007 3:15:00 AM	0.224	0.46	44.91		
11/27/2007 3:20:00 AM	0.224	0.46	44.91		
11/27/2007 3:25:00 AM	0.224	0.46	44.91		
11/27/2007 3:30:00 AM	0.223	0.46	44.62		
11/27/2007 3:35:00 AM	0.222	0.46	44.42		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/27/2007 3:40:00 AM	0.222	0.46	44.42		
11/27/2007 3:45:00 AM	0.222	0.46	44.42		
11/27/2007 3:50:00 AM	0.223	0.46	44.52		
11/27/2007 3:55:00 AM	0.224	0.46	44.91		
11/27/2007 4:00:00 AM	0.224	0.46	44.91		0.00
11/27/2007 4:05:00 AM	0.224	0.46	44.91		
11/27/2007 4:10:00 AM	0.224	0.46	44.91		
11/27/2007 4:15:00 AM	0.224	0.46	44.91		
11/27/2007 4:20:00 AM	0.223	0.46	44.62		
11/27/2007 4:25:00 AM	0.223	0.46	44.52		
11/27/2007 4:30:00 AM	0.222	0.46	44.42		
11/27/2007 4:35:00 AM	0.222	0.46	44.42		
11/27/2007 4:40:00 AM	0.222	0.46	44.42		
11/27/2007 4:45:00 AM	0.222	0.46	44.42		
11/27/2007 4:50:00 AM	0.222	0.46	44.42		
11/27/2007 4:55:00 AM	0.223	0.46	44.52		
11/27/2007 5:00:00 AM	0.222	0.46	44.42		0.00
11/27/2007 5:05:00 AM	0.223	0.46	44.52		
11/27/2007 5:10:00 AM	0.222	0.46	44.42		
11/27/2007 5:15:00 AM	0.222	0.46	44.42		
11/27/2007 5:20:00 AM	0.222	0.46	44.42		
11/27/2007 5:25:00 AM	0.222	0.46	44.42		
11/27/2007 5:30:00 AM	0.222	0.46	44.42		
11/27/2007 5:35:00 AM	0.222	0.46	44.42		
11/27/2007 5:40:00 AM	0.222	0.46	44.42		
11/27/2007 5:45:00 AM	0.222	0.46	44.42		
11/27/2007 5:50:00 AM	0.222	0.46	44.42		
11/27/2007 5:55:00 AM	0.222	0.46	44.42		
11/27/2007 6:00:00 AM	0.222	0.46	44.42		0.00
11/27/2007 6:05:00 AM	0.222	0.46	44.42		
11/27/2007 6:10:00 AM	0.222	0.46	44.42		
11/27/2007 6:15:00 AM	0.222	0.46	44.42		
11/27/2007 6:20:00 AM	0.222	0.46	44.42		
11/27/2007 6:25:00 AM	0.222	0.46	44.42		
11/27/2007 6:30:00 AM	0.222	0.46	44.42		
11/27/2007 6:35:00 AM	0.222	0.46	44.42		
11/27/2007 6:40:00 AM	0.222	0.46	44.42		
11/27/2007 6:45:00 AM	0.222	0.46	44.42		
11/27/2007 6:50:00 AM	0.222	0.46	44.42		
11/27/2007 6:55:00 AM	0.222	0.46	44.42		
11/27/2007 7:00:00 AM	0.222	0.46	44.42		0.01
11/27/2007 7:05:00 AM	0.222	0.46	44.42		
11/27/2007 7:10:00 AM	0.222	0.46	44.42		
11/27/2007 7:15:00 AM	0.222	0.46	44.42		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/27/2007 7:20:00 AM	0.222	0.46	44.42		
11/27/2007 7:25:00 AM	0.222	0.46	44.42		
11/27/2007 7:30:00 AM	0.222	0.46	44.42		
11/27/2007 7:35:00 AM	0.222	0.46	44.42		
11/27/2007 7:40:00 AM	0.222	0.46	44.42		
11/27/2007 7:45:00 AM	0.222	0.46	44.42		
11/27/2007 7:50:00 AM	0.222	0.46	44.42		
11/27/2007 7:55:00 AM	0.222	0.46	44.42		
11/27/2007 8:00:00 AM	0.222	0.46	44.42		0.01
11/27/2007 8:05:00 AM	0.222	0.46	44.42		
11/27/2007 8:10:00 AM	0.222	0.46	44.42		
11/27/2007 8:15:00 AM	0.222	0.46	44.42		
11/27/2007 8:20:00 AM	0.222	0.46	44.42		
11/27/2007 8:25:00 AM	0.222	0.46	44.42		
11/27/2007 8:30:00 AM	0.222	0.46	44.42		
11/27/2007 8:35:00 AM	0.222	0.46	44.42		
11/27/2007 8:40:00 AM	0.222	0.46	44.42		
11/27/2007 8:45:00 AM	0.222	0.46	44.42		
11/27/2007 8:50:00 AM	0.222	0.46	44.42		
11/27/2007 8:55:00 AM	0.222	0.46	44.42		
11/27/2007 9:00:00 AM	0.222	0.46	44.42		0.00
11/27/2007 9:05:00 AM	0.222	0.46	44.42		
11/27/2007 9:10:00 AM	0.222	0.46	44.42		
11/27/2007 9:15:00 AM	0.222	0.46	44.42		
11/27/2007 9:20:00 AM	0.222	0.46	44.42		
11/27/2007 9:25:00 AM	0.222	0.46	44.42		
11/27/2007 9:30:00 AM	0.222	0.46	44.42		
11/27/2007 9:35:00 AM	0.223	0.46	44.71		
11/27/2007 9:40:00 AM	0.229	0.46	46.46		
11/27/2007 9:45:00 AM	0.233	0.46	47.64		
11/27/2007 9:50:00 AM	0.236	0.46	48.33		
11/27/2007 9:55:00 AM	0.237	0.46	48.83		
11/27/2007 10:00:00 AM	0.239	0.46	49.42		0.00
11/27/2007 10:05:00 AM	0.239	0.46	49.42		
11/27/2007 10:10:00 AM	0.239	0.46	49.42		
11/27/2007 10:14:00 AM				3	
11/27/2007 10:15:00 AM	0.245	0.46	51.33		
11/27/2007 10:20:00 AM	0.252	0.46	53.46		
11/27/2007 10:24:00 AM				3	
11/27/2007 10:25:00 AM	0.252	0.46	53.46		
11/27/2007 10:30:00 AM	0.261	0.46	56.13		
11/27/2007 10:34:00 AM				4	
11/27/2007 10:35:00 AM	0.267	0.46	58.21		
11/27/2007 10:40:00 AM	0.266	0.46	57.90		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
11/27/2007 10:44:00 AM				4	
11/27/2007 10:45:00 AM	0.265	0.46	57.38		
11/27/2007 10:50:00 AM	0.263	0.46	56.75		
11/27/2007 10:54:00 AM				4	
11/27/2007 10:55:00 AM	0.261	0.46	56.23		
11/27/2007 11:00:00 AM	0.259	0.46	55.61		0.00
11/27/2007 11:04:00 AM				4	
11/27/2007 11:05:00 AM	0.257	0.46	54.99		
11/27/2007 11:10:00 AM	0.256	0.46	54.48		
11/27/2007 11:14:00 AM				4	
11/27/2007 11:15:00 AM	0.254	0.46	53.97		
11/27/2007 11:20:00 AM	0.252	0.46	53.46		
11/27/2007 11:24:00 AM				4	
11/27/2007 11:25:00 AM	0.251	0.46	52.95		
11/27/2007 11:30:00 AM	0.249	0.46	52.54		
11/27/2007 11:35:00 AM	0.248	0.46	52.14		
11/27/2007 11:40:00 AM	0.247	0.46	51.93		
11/27/2007 11:45:00 AM	0.246	0.46	51.43		
11/27/2007 11:50:00 AM	0.244	0.46	51.03		
11/27/2007 11:55:00 AM	0.244	0.46	50.93		
11/27/2007 12:00:00 PM	0.243	0.46	50.52		0.00
11/27/2007 12:05:00 PM	0.242	0.46	50.42		
11/27/2007 12:10:00 PM	0.241	0.46	49.92		
11/27/2007 12:15:00 PM	0.241	0.46	49.92		
11/27/2007 12:20:00 PM	0.240	0.46	49.52		
11/27/2007 12:25:00 PM	0.239	0.46	49.42		
11/27/2007 12:30:00 PM	0.238	0.46	49.13		
11/27/2007 12:35:00 PM	0.237	0.46	48.83		
11/27/2007 12:40:00 PM	0.237	0.46	48.83		
11/27/2007 12:45:00 PM	0.236	0.46	48.53		
11/27/2007 12:50:00 PM	0.236	0.46	48.33		
11/27/2007 12:55:00 PM	0.236	0.46	48.33		
11/27/2007 1:00:00 PM	0.236	0.46	48.33		0.01

Figure Y-5 Highway 30 B

January 11th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/9/2008 2:00:00 PM	0.234				0.00
1/9/2008 2:05:00 PM	0.234				
1/9/2008 2:10:00 PM	0.234				
1/9/2008 2:15:00 PM	0.234				
1/9/2008 2:20:00 PM	0.234				
1/9/2008 2:25:00 PM	0.234				
1/9/2008 2:30:00 PM	0.234				
1/9/2008 2:35:00 PM	0.234				
1/9/2008 2:40:00 PM	0.234				
1/9/2008 2:45:00 PM	0.234				
1/9/2008 2:50:00 PM	0.234				
1/9/2008 2:55:00 PM	0.234				
1/9/2008 3:00:00 PM	0.234				0.00
1/9/2008 3:05:00 PM	0.234				
1/9/2008 3:10:00 PM	0.235				
1/9/2008 3:15:00 PM	0.235				
1/9/2008 3:20:00 PM	0.234				
1/9/2008 3:25:00 PM	0.235				
1/9/2008 3:30:00 PM	0.235				
1/9/2008 3:35:00 PM	0.235				
1/9/2008 3:40:00 PM	0.234				
1/9/2008 3:45:00 PM	0.234				
1/9/2008 3:50:00 PM	0.236				
1/9/2008 3:55:00 PM	0.236				
1/9/2008 4:00:00 PM	0.236				0.01
1/9/2008 4:05:00 PM	0.237				
1/9/2008 4:10:00 PM	0.237				
1/9/2008 4:15:00 PM	0.237				
1/9/2008 4:20:00 PM	0.237				
1/9/2008 4:25:00 PM	0.237				
1/9/2008 4:30:00 PM	0.239				
1/9/2008 4:35:00 PM	0.239				
1/9/2008 4:40:00 PM	0.239				
1/9/2008 4:45:00 PM	0.239				
1/9/2008 4:50:00 PM	0.239				
1/9/2008 4:55:00 PM	0.239				
1/9/2008 5:00:00 PM	0.239				0.01
1/9/2008 5:05:00 PM	0.239				
1/9/2008 5:10:00 PM	0.239				
1/9/2008 5:15:00 PM	0.239				
1/9/2008 5:20:00 PM	0.239				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/9/2008 5:25:00 PM	0.239				
1/9/2008 5:30:00 PM	0.244				
1/9/2008 5:35:00 PM	0.241				
1/9/2008 5:40:00 PM	0.239				
1/9/2008 5:45:00 PM	0.240				
1/9/2008 5:50:00 PM	0.239				
1/9/2008 5:55:00 PM	0.239				
1/9/2008 6:00:00 PM	0.239				0.03
1/9/2008 6:05:00 PM	0.239				
1/9/2008 6:10:00 PM	0.239				
1/9/2008 6:15:00 PM	0.239				
1/9/2008 6:20:00 PM	0.241				
1/9/2008 6:25:00 PM	0.242				
1/9/2008 6:30:00 PM	0.243				
1/9/2008 6:35:00 PM	0.244				
1/9/2008 6:40:00 PM	0.245				
1/9/2008 6:42:00 PM				1	
1/9/2008 6:45:00 PM	0.256				
1/9/2008 6:50:00 PM	0.259				
1/9/2008 6:55:00 PM	0.264				
1/9/2008 6:56:00 PM				1	
1/9/2008 7:00:00 PM	0.285				0.04
1/9/2008 7:05:00 PM	0.292				
1/9/2008 7:10:00 PM	0.301				
1/9/2008 7:11:00 PM				1	
1/9/2008 7:15:00 PM	0.326	0.15	25.84		
1/9/2008 7:20:00 PM	0.338	0.16	29.04		
1/9/2008 7:25:00 PM	0.347	0.27	50.01		
1/9/2008 7:26:00 PM				1	
1/9/2008 7:30:00 PM	0.350	0.27	50.26		
1/9/2008 7:35:00 PM	0.361	0.39	76.45		
1/9/2008 7:40:00 PM	0.361	0.31	60.18		
1/9/2008 7:41:00 PM				1	
1/9/2008 7:45:00 PM	0.364	0.52	103.28		
1/9/2008 7:50:00 PM	0.369	0.23	47.59		
1/9/2008 7:55:00 PM	0.377	0.27	56.31		
1/9/2008 7:56:00 PM				1	
1/9/2008 8:00:00 PM	0.386	0.27	58.38		0.03
1/9/2008 8:05:00 PM	0.394	-0.07	-15.60		
1/9/2008 8:10:00 PM	0.405	0.64	148.01		
1/9/2008 8:11:00 PM				1	
1/9/2008 8:15:00 PM	0.417	0.64	154.47		
1/9/2008 8:20:00 PM	0.433	-0.12	-30.62		
1/9/2008 8:25:00 PM	0.444	-0.12	-31.70		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/9/2008 8:26:00 PM				1	
1/9/2008 8:30:00 PM	0.436	-0.08	-20.62		
1/9/2008 8:35:00 PM	0.426	-0.08	-19.90		
1/9/2008 8:40:00 PM	0.413	-0.08	-19.07		
1/9/2008 8:41:00 PM				1	
1/9/2008 8:45:00 PM	0.407	-0.08	-18.68		
1/9/2008 8:50:00 PM	0.407	-0.08	-18.70		
1/9/2008 8:55:00 PM	0.410	-0.07	-16.53		
1/9/2008 8:56:00 PM				1	
1/9/2008 9:00:00 PM	0.419	-0.11	-26.79		0.05
1/9/2008 9:05:00 PM	0.429	-0.08	-20.15		
1/9/2008 9:10:00 PM	0.426	-0.08	-19.93		
1/9/2008 9:11:00 PM				2	
1/9/2008 9:15:00 PM	0.424	-0.07	-17.30		
1/9/2008 9:20:00 PM	0.422	-0.07	-17.18		
1/9/2008 9:25:00 PM	0.418	-0.08	-19.42		
1/9/2008 9:26:00 PM				2	
1/9/2008 9:30:00 PM	0.409	-0.08	-18.81		
1/9/2008 9:35:00 PM	0.396	-0.06	-13.45		
1/9/2008 9:40:00 PM	0.385	-0.06	-12.89		
1/9/2008 9:41:00 PM				2	
1/9/2008 9:45:00 PM	0.372	-0.06	-12.29		
1/9/2008 9:50:00 PM	0.364	-0.06	-11.92		
1/9/2008 9:55:00 PM	0.362	-0.06	-11.79		
1/9/2008 9:56:00 PM				2	
1/9/2008 10:00:00 PM	0.362	-0.06	-11.79		0.03
1/9/2008 10:05:00 PM	0.369	-0.06	-12.15		
1/9/2008 10:10:00 PM	0.383	-0.06	-12.80		
1/9/2008 10:11:00 PM				2	
1/9/2008 10:15:00 PM	0.403	-0.09	-20.69		
1/9/2008 10:20:00 PM	0.430	-0.09	-22.72		
1/9/2008 10:25:00 PM	0.445	-0.09	-22.52		
1/9/2008 10:26:00 PM				2	
1/9/2008 10:30:00 PM	0.441	-0.08	-20.93		
1/9/2008 10:35:00 PM	0.453	-0.08	-21.76		
1/9/2008 10:40:00 PM	0.474	-0.13	-37.82		
1/9/2008 10:41:00 PM				2	
1/9/2008 10:45:00 PM	0.465	-0.13	-36.78		
1/9/2008 10:50:00 PM	0.438	-0.08	-20.77		
1/9/2008 10:55:00 PM	0.412	-0.08	-18.98		
1/9/2008 10:56:00 PM				2	
1/9/2008 11:00:00 PM	0.390	-0.07	-15.38		0.05
1/9/2008 11:05:00 PM	0.377	-0.07	-14.60		
1/9/2008 11:10:00 PM	0.369	-0.07	-14.16		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/9/2008 11:11:00 PM				2	
1/9/2008 11:15:00 PM	0.366	-0.07	-14.01		
1/9/2008 11:20:00 PM	0.366	-0.07	-13.99		
1/9/2008 11:25:00 PM	0.364	-0.07	-13.88		
1/9/2008 11:26:00 PM				2	
1/9/2008 11:30:00 PM	0.363	-0.07	-13.81		
1/9/2008 11:35:00 PM	0.362	-0.07	-13.79		
1/9/2008 11:40:00 PM	0.367	-0.07	-14.05		
1/9/2008 11:41:00 PM				3	
1/9/2008 11:45:00 PM	0.375	-0.07	-14.52		
1/9/2008 11:50:00 PM	0.380	-0.07	-13.73		
1/9/2008 11:55:00 PM	0.393	-0.07	-14.44		
1/9/2008 11:56:00 PM				3	
1/10/2008 12:00:00 AM	0.403	-0.07	-14.94		0.03
1/10/2008 12:05:00 AM	0.410	-0.07	-15.32		
1/10/2008 12:10:00 AM	0.415	-0.08	-19.18		
1/10/2008 12:11:00 AM				3	
1/10/2008 12:15:00 AM	0.417	-0.07	-16.90		
1/10/2008 12:20:00 AM	0.419	-0.07	-17.05		
1/10/2008 12:25:00 AM	0.429	-0.07	-17.63		
1/10/2008 12:26:00 AM				3	
1/10/2008 12:30:00 AM	0.450	-0.10	-27.01		
1/10/2008 12:35:00 AM	0.458	-0.10	-27.69		
1/10/2008 12:40:00 AM	0.451	-0.10	-27.04		
1/10/2008 12:41:00 AM				3	
1/10/2008 12:45:00 AM	0.445	-0.10	-26.56		
1/10/2008 12:50:00 AM	0.461	-0.10	-27.95		
1/10/2008 12:55:00 AM	0.476	-0.10	-29.21		
1/10/2008 12:56:00 AM				3	
1/10/2008 1:00:00 AM	0.470	-0.10	-28.69		0.01
1/10/2008 1:05:00 AM	0.453	-0.11	-29.96		
1/10/2008 1:10:00 AM	0.448	-0.11	-29.43		
1/10/2008 1:11:00 AM				3	
1/10/2008 1:15:00 AM	0.450	-0.13	-35.04		
1/10/2008 1:20:00 AM	0.447	-0.10	-26.70		
1/10/2008 1:25:00 AM	0.429	-0.08	-20.15		
1/10/2008 1:26:00 AM				3	
1/10/2008 1:30:00 AM	0.410	-0.09	-21.21		
1/10/2008 1:35:00 AM	0.392	-0.07	-15.45		
1/10/2008 1:40:00 AM	0.381	-0.07	-14.86		
1/10/2008 1:41:00 AM				3	
1/10/2008 1:45:00 AM	0.373	-0.07	-14.41		
1/10/2008 1:50:00 AM	0.370	-0.07	-14.25		
1/10/2008 1:55:00 AM	0.371	-0.07	-14.30		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 1:56:00 AM				3	
1/10/2008 2:00:00 AM	0.371	-0.06	-12.26		0.00
1/10/2008 2:05:00 AM	0.370	-0.06	-12.21		
1/10/2008 2:10:00 AM	0.373	-0.06	-11.33		
1/10/2008 2:11:00 AM				4	
1/10/2008 2:15:00 AM	0.381	-0.06	-11.67		
1/10/2008 2:20:00 AM	0.386	-0.06	-11.89		
1/10/2008 2:25:00 AM	0.388	-0.06	-11.99		
1/10/2008 2:26:00 AM				4	
1/10/2008 2:30:00 AM	0.383	-0.06	-11.76		
1/10/2008 2:35:00 AM	0.370	-0.06	-11.20		
1/10/2008 2:40:00 AM	0.361	-0.06	-10.77		
1/10/2008 2:41:00 AM				4	
1/10/2008 2:45:00 AM	0.352	-0.06	-10.40		
1/10/2008 2:50:00 AM	0.342	-0.06	-9.98		
1/10/2008 2:55:00 AM	0.333	-0.06	-9.60		
1/10/2008 2:56:00 AM				4	
1/10/2008 3:00:00 AM	0.327	-0.06	-9.33		0.00
1/10/2008 3:05:00 AM	0.319	-0.06	-9.02		
1/10/2008 3:10:00 AM	0.314	-0.06	-8.79		
1/10/2008 3:11:00 AM				4	
1/10/2008 3:15:00 AM	0.310	-0.06	-8.64		
1/10/2008 3:20:00 AM	0.306	-0.06	-8.48		
1/10/2008 3:25:00 AM	0.303	-0.06	-8.35		
1/10/2008 3:26:00 AM				4	
1/10/2008 3:30:00 AM	0.300	-0.06	-8.24		
1/10/2008 3:35:00 AM	0.299	-0.06	-8.21		
1/10/2008 3:40:00 AM	0.298	-0.06	-8.14		
1/10/2008 3:41:00 AM				4	
1/10/2008 3:45:00 AM	0.295	-0.06	-8.03		
1/10/2008 3:50:00 AM	0.292	-0.06	-7.90		
1/10/2008 3:55:00 AM	0.289	-0.06	-7.79		
1/10/2008 3:56:00 AM				4	
1/10/2008 4:00:00 AM	0.285	-0.06	-7.63		0.01
1/10/2008 4:05:00 AM	0.281	-0.06	-7.50		
1/10/2008 4:10:00 AM	0.278	-0.06	-7.38		
1/10/2008 4:11:00 AM				4	
1/10/2008 4:15:00 AM	0.276	-0.06	-7.30		
1/10/2008 4:20:00 AM	0.274	-0.06	-7.20		
1/10/2008 4:25:00 AM	0.272	-0.06	-7.12		
1/10/2008 4:26:00 AM				4	
1/10/2008 4:30:00 AM	0.269	-0.06	-7.04		
1/10/2008 4:35:00 AM	0.267	-0.06	-6.96		
1/10/2008 4:40:00 AM	0.266	-0.06	-6.90		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 4:41:00 AM				5	
1/10/2008 4:45:00 AM	0.264	-0.06	-6.84		
1/10/2008 4:50:00 AM	0.262	-0.06	-6.77		
1/10/2008 4:55:00 AM	0.261	-0.06	-6.71		
1/10/2008 4:56:00 AM				5	
1/10/2008 5:00:00 AM	0.259	-0.06	-6.65		0.07
1/10/2008 5:05:00 AM	0.258	-0.06	-6.60		
1/10/2008 5:10:00 AM	0.257	-0.06	-6.58		
1/10/2008 5:11:00 AM				5	
1/10/2008 5:15:00 AM	0.256	-0.06	-6.54		
1/10/2008 5:20:00 AM	0.255	-0.06	-6.49		
1/10/2008 5:25:00 AM	0.254	-0.06	-6.45		
1/10/2008 5:26:00 AM				5	
1/10/2008 5:30:00 AM	0.252	-0.06	-6.39		
1/10/2008 5:35:00 AM	0.252	-0.06	-6.38		
1/10/2008 5:40:00 AM	0.251	-0.06	-6.33		
1/10/2008 5:41:00 AM				5	
1/10/2008 5:45:00 AM	0.251	-0.06	-6.33		
1/10/2008 5:50:00 AM	0.249	-0.06	-6.27		
1/10/2008 5:55:00 AM	0.249	-0.06	-6.27		
1/10/2008 6:00:00 AM	0.248	-0.06	-6.22		0.01
1/10/2008 6:05:00 AM	0.247	-0.06	-6.21		
1/10/2008 6:08:00 AM				5	
1/10/2008 6:10:00 AM	0.250	-0.06	-6.32		
1/10/2008 6:15:00 AM	0.279	0.10	13.44		
1/10/2008 6:20:00 AM	0.380	0.10	21.12		
1/10/2008 6:23:00 AM				5	
1/10/2008 6:25:00 AM	0.455	0.10	27.40		
1/10/2008 6:30:00 AM	0.487	-0.09	-25.69		
1/10/2008 6:35:00 AM	0.443	-0.09	-22.40		
1/10/2008 6:38:00 AM				5	
1/10/2008 6:40:00 AM	0.409	-0.09	-19.98		
1/10/2008 6:45:00 AM	0.401	-0.09	-19.43		
1/10/2008 6:50:00 AM	0.429	0.14	35.22		
1/10/2008 6:53:00 AM				5	
1/10/2008 6:55:00 AM	0.469	-0.13	-37.15		
1/10/2008 7:00:00 AM	0.472	-0.09	-25.98		0.01
1/10/2008 7:05:00 AM	0.441	-0.10	-27.50		
1/10/2008 7:08:00 AM				5	
1/10/2008 7:10:00 AM	0.409	-0.08	-18.78		
1/10/2008 7:15:00 AM	0.384	-0.08	-17.15		
1/10/2008 7:20:00 AM	0.358	-0.08	-15.47		
1/10/2008 7:23:00 AM				6	
1/10/2008 7:25:00 AM	0.345	-0.08	-14.72		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 7:30:00 AM	0.338	-0.08	-14.27		
1/10/2008 7:35:00 AM	0.338	-0.08	-14.23		
1/10/2008 7:38:00 AM				6	
1/10/2008 7:40:00 AM	0.346	-0.08	-14.76		
1/10/2008 7:45:00 AM	0.345	-0.08	-14.70		
1/10/2008 7:50:00 AM	0.342	-0.08	-14.47		
1/10/2008 7:53:00 AM				6	
1/10/2008 7:55:00 AM	0.339	-0.08	-14.29		
1/10/2008 8:00:00 AM	0.327	-0.08	-13.59		0.00
1/10/2008 8:05:00 AM	0.319	-0.08	-13.08		
1/10/2008 8:08:00 AM				6	
1/10/2008 8:10:00 AM	0.311	-0.08	-12.65		
1/10/2008 8:15:00 AM	0.304	-0.08	-12.22		
1/10/2008 8:20:00 AM	0.297	-0.08	-11.78		
1/10/2008 8:23:00 AM				6	
1/10/2008 8:25:00 AM	0.292	-0.08	-11.50		
1/10/2008 8:30:00 AM	0.289	-0.08	-11.37		
1/10/2008 8:35:00 AM	0.283	-0.08	-11.01		
1/10/2008 8:38:00 AM				6	
1/10/2008 8:40:00 AM	0.281	-0.08	-10.90		
1/10/2008 8:45:00 AM	0.280	-0.08	-10.84		
1/10/2008 8:50:00 AM	0.277	-0.08	-10.67		
1/10/2008 8:53:00 AM				6	
1/10/2008 8:55:00 AM	0.281	-0.08	-10.88		
1/10/2008 9:00:00 AM	0.289	-0.08	-11.37		0.00
1/10/2008 9:05:00 AM	0.306	-0.08	-12.34		
1/10/2008 9:08:00 AM				6	
1/10/2008 9:10:00 AM	0.319	-0.08	-13.12		
1/10/2008 9:15:00 AM	0.327	0.13	22.09		
1/10/2008 9:20:00 AM	0.330	0.15	25.82		
1/10/2008 9:23:00 AM				6	
1/10/2008 9:25:00 AM	0.321	0.12	19.82		
1/10/2008 9:30:00 AM	0.312	0.11	17.42		
1/10/2008 9:35:00 AM	0.302	0.11	16.67		
1/10/2008 9:38:00 AM				6	
1/10/2008 9:40:00 AM	0.297	0.11	16.23		
1/10/2008 9:45:00 AM	0.290	0.11	15.68		
1/10/2008 9:50:00 AM	0.284	0.11	15.21		
1/10/2008 9:53:00 AM				7	
1/10/2008 9:55:00 AM	0.281	0.11	14.96		
1/10/2008 10:00:00 AM	0.276	0.11	14.60		0.01
1/10/2008 10:05:00 AM	0.272	0.11	14.30		
1/10/2008 10:08:00 AM				7	
1/10/2008 10:10:00 AM	0.268	0.11	14.00		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 10:15:00 AM	0.265	0.11	13.72		
1/10/2008 10:20:00 AM	0.264	0.11	13.65		
1/10/2008 10:23:00 AM				7	
1/10/2008 10:25:00 AM	0.261	0.11	13.42		
1/10/2008 10:30:00 AM	0.258	0.11	13.22		
1/10/2008 10:35:00 AM	0.256	0.11	13.08		
1/10/2008 10:38:00 AM				7	
1/10/2008 10:40:00 AM	0.255	0.11	12.95		
1/10/2008 10:45:00 AM	0.253	0.11	12.81		
1/10/2008 10:50:00 AM	0.251	0.11	12.69		
1/10/2008 10:55:00 AM	0.249	0.11	12.56		
1/10/2008 11:00:00 AM	0.248	0.11	12.44		0.00
1/10/2008 11:05:00 AM	0.247	0.11	12.39		
1/10/2008 11:10:00 AM	0.246	0.11	12.30		
1/10/2008 11:15:00 AM	0.244	0.11	12.20		
1/10/2008 11:20:00 AM	0.243	0.11	12.11		
1/10/2008 11:25:00 AM	0.242	0.11	12.06		
1/10/2008 11:30:00 AM	0.241	0.11	11.99		
1/10/2008 11:35:00 AM	0.241	0.11	11.94		
1/10/2008 11:40:00 AM	0.241	0.11	11.94		
1/10/2008 11:45:00 AM	0.239	0.11	11.82		
1/10/2008 11:50:00 AM	0.239	0.11	11.82		
1/10/2008 11:55:00 AM	0.239	0.11	11.82		
1/10/2008 12:00:00 PM	0.240	0.11	11.87		0.02
1/10/2008 12:03:00 PM				7	
1/10/2008 12:05:00 PM	0.250	0.11	12.61		
1/10/2008 12:10:00 PM	0.269	0.11	14.02		
1/10/2008 12:15:00 PM	0.305	0.12	17.99		
1/10/2008 12:18:00 PM				7	
1/10/2008 12:20:00 PM	0.313	0.12	19.15		
1/10/2008 12:25:00 PM	0.316	0.09	14.56		
1/10/2008 12:30:00 PM	0.332	0.17	29.17		
1/10/2008 12:33:00 PM				7	
1/10/2008 12:35:00 PM	0.322	0.10	16.62		
1/10/2008 12:40:00 PM	0.312	0.07	11.08		
1/10/2008 12:45:00 PM	0.303	0.07	10.64		
1/10/2008 12:48:00 PM				7	
1/10/2008 12:50:00 PM	0.295	0.07	10.23		
1/10/2008 12:55:00 PM	0.288	0.07	9.90		
1/10/2008 1:00:00 PM	0.282	0.07	9.57		0.03
1/10/2008 1:03:00 PM				7	
1/10/2008 1:05:00 PM	0.277	0.07	9.31		
1/10/2008 1:10:00 PM	0.272	0.07	9.10		
1/10/2008 1:15:00 PM	0.268	0.07	8.91		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 1:18:00 PM				7	
1/10/2008 1:20:00 PM	0.264	0.07	8.72		
1/10/2008 1:25:00 PM	0.262	0.07	8.59		
1/10/2008 1:30:00 PM	0.260	0.07	8.48		
1/10/2008 1:35:00 PM	0.257	0.07	8.34		
1/10/2008 1:40:00 PM	0.254	0.07	8.20		
1/10/2008 1:45:00 PM	0.252	0.07	8.10		
1/10/2008 1:50:00 PM	0.250	0.07	8.03		
1/10/2008 1:55:00 PM	0.249	0.07	8.00		
1/10/2008 2:00:00 PM	0.252	0.07	8.13		0.00
1/10/2008 2:05:00 PM	0.259	0.07	8.46		
1/10/2008 2:10:00 PM	0.265	0.07	8.73		
1/10/2008 2:15:00 PM	0.271	0.07	9.02		
1/10/2008 2:20:00 PM	0.298	0.11	16.28		
1/10/2008 2:25:00 PM	0.316	0.11	17.79		
1/10/2008 2:30:00 PM	0.358	0.35	67.79		
1/10/2008 2:35:00 PM	0.370	0.35	71.25		
1/10/2008 2:40:00 PM	0.368	0.33	66.49		
1/10/2008 2:45:00 PM	0.358	0.23	44.55		
1/10/2008 2:50:00 PM	0.347	0.27	50.08		
1/10/2008 2:55:00 PM	0.342	0.27	48.85		
1/10/2008 3:00:00 PM	0.335	0.09	15.81		0.00
1/10/2008 3:05:00 PM	0.323	0.09	15.00		
1/10/2008 3:10:00 PM	0.317	0.09	14.58		
1/10/2008 3:15:00 PM	0.309	0.09	14.08		
1/10/2008 3:20:00 PM	0.301	0.09	13.56		
1/10/2008 3:25:00 PM	0.295	0.09	13.13		
1/10/2008 3:30:00 PM	0.288	0.09	12.72		
1/10/2008 3:35:00 PM	0.283	0.09	12.36		
1/10/2008 3:40:00 PM	0.277	0.09	12.01		
1/10/2008 3:45:00 PM	0.273	0.09	11.76		
1/10/2008 3:50:00 PM	0.270	0.09	11.55		
1/10/2008 3:55:00 PM	0.266	0.09	11.29		
1/10/2008 4:00:00 PM	0.263	0.09	11.10		0.00
1/10/2008 4:05:00 PM	0.260	0.09	10.92		
1/10/2008 4:10:00 PM	0.257	0.09	10.74		
1/10/2008 4:15:00 PM	0.255	0.09	10.60		
1/10/2008 4:20:00 PM	0.252	0.09	10.46		
1/10/2008 4:25:00 PM	0.250	0.09	10.34		
1/10/2008 4:30:00 PM	0.249	0.09	10.26		
1/10/2008 4:35:00 PM	0.247	0.09	10.16		
1/10/2008 4:40:00 PM	0.246	0.09	10.06		
1/10/2008 4:45:00 PM	0.244	0.09	9.98		
1/10/2008 4:50:00 PM	0.243	0.09	9.92		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/10/2008 4:55:00 PM	0.242	0.09	9.87		
1/10/2008 5:00:00 PM	0.241	0.09	9.77		0.00
1/10/2008 5:05:00 PM	0.240	0.09	9.73		
1/10/2008 5:10:00 PM	0.239	0.09	9.67		
1/10/2008 5:15:00 PM	0.239	0.09	9.67		
1/10/2008 5:20:00 PM	0.237	0.09	9.55		
1/10/2008 5:25:00 PM	0.237	0.09	9.55		
1/10/2008 5:30:00 PM	0.236	0.09	9.46		
1/10/2008 5:35:00 PM	0.236	0.09	9.46		
1/10/2008 5:40:00 PM	0.236	0.09	9.46		
1/10/2008 5:45:00 PM	0.234	0.09	9.36		
1/10/2008 5:50:00 PM	0.234	0.09	9.36		
1/10/2008 5:55:00 PM	0.234	0.09	9.36		
1/10/2008 6:00:00 PM	0.234	0.09	9.36		0.00

Figure Y-6 Highway 30 B

January 15th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/14/2008 12:00:00 PM	0.226				0.00
1/14/2008 12:05:00 PM	0.226				
1/14/2008 12:10:00 PM	0.226				
1/14/2008 12:15:00 PM	0.226				
1/14/2008 12:20:00 PM	0.226				
1/14/2008 12:25:00 PM	0.226				
1/14/2008 12:30:00 PM	0.226				
1/14/2008 12:35:00 PM	0.226				
1/14/2008 12:40:00 PM	0.226				
1/14/2008 12:45:00 PM	0.226				
1/14/2008 12:50:00 PM	0.226				
1/14/2008 12:55:00 PM	0.226				
1/14/2008 1:00:00 PM	0.226				0.00
1/14/2008 1:05:00 PM	0.226				
1/14/2008 1:10:00 PM	0.226				
1/14/2008 1:15:00 PM	0.226				
1/14/2008 1:20:00 PM	0.226				
1/14/2008 1:25:00 PM	0.226				
1/14/2008 1:30:00 PM	0.226				
1/14/2008 1:35:00 PM	0.226				
1/14/2008 1:40:00 PM	0.226				
1/14/2008 1:45:00 PM	0.226				
1/14/2008 1:50:00 PM	0.226				
1/14/2008 1:55:00 PM	0.226				
1/14/2008 2:00:00 PM	0.227				0.09
1/14/2008 2:05:00 PM	0.227				
1/14/2008 2:10:00 PM	0.227				
1/14/2008 2:15:00 PM	0.227				
1/14/2008 2:20:00 PM	0.227				
1/14/2008 2:25:00 PM	0.227				
1/14/2008 2:30:00 PM	0.227				
1/14/2008 2:35:00 PM	0.227				
1/14/2008 2:40:00 PM	0.227				
1/14/2008 2:45:00 PM	0.227				
1/14/2008 2:50:00 PM	0.227				
1/14/2008 2:55:00 PM	0.227				
1/14/2008 3:00:00 PM	0.227				0.17
1/14/2008 3:05:00 PM	0.227				
1/14/2008 3:10:00 PM	0.227				
1/14/2008 3:15:00 PM	0.227				
1/14/2008 3:20:00 PM	0.227				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/14/2008 3:25:00 PM	0.230				
1/14/2008 3:27:00 PM				1	
1/14/2008 3:30:00 PM	0.296	0.13	19.11		
1/14/2008 3:35:00 PM	0.390	0.26	55.95		
1/14/2008 3:36:00 PM				1	
1/14/2008 3:40:00 PM	0.460	0.58	161.42		
1/14/2008 3:45:00 PM	0.478	0.53	155.88		
1/14/2008 3:46:00 PM				1	
1/14/2008 3:50:00 PM	0.469	0.45	127.16		
1/14/2008 3:55:00 PM	0.470	0.49	140.87		
1/14/2008 3:56:00 PM				1	
1/14/2008 4:00:00 PM	0.522	0.79	264.53		0.05
1/14/2008 4:05:00 PM	0.635	0.82	361.06		
1/14/2008 4:06:00 PM				1	
1/14/2008 4:10:00 PM	0.644	0.78	350.46		
1/14/2008 4:15:00 PM	0.631	0.91	395.30		
1/14/2008 4:16:00 PM				1	
1/14/2008 4:20:00 PM	0.624	0.97	415.59		
1/14/2008 4:25:00 PM	0.607	1.00	412.96		
1/14/2008 4:26:00 PM				1	
1/14/2008 4:30:00 PM	0.619	0.91	386.46		
1/14/2008 4:35:00 PM	0.657	0.93	429.88		
1/14/2008 4:36:00 PM				1	
1/14/2008 4:40:00 PM	0.710	-0.99	-510.24		
1/14/2008 4:45:00 PM	0.731	-0.99	-531.04		
1/14/2008 4:46:00 PM				1	
1/14/2008 4:50:00 PM	0.677	-0.99	-476.63		
1/14/2008 4:55:00 PM	0.648	1.02	459.98		
1/14/2008 4:56:00 PM				1	
1/14/2008 5:00:00 PM	0.671	0.96	458.60		0.00
1/14/2008 5:05:00 PM	0.670	0.92	434.54		
1/14/2008 5:06:00 PM				2	
1/14/2008 5:10:00 PM	0.632	0.92	399.96		
1/14/2008 5:15:00 PM	0.603	0.82	337.27		
1/14/2008 5:16:00 PM				2	
1/14/2008 5:20:00 PM	0.568	1.18	444.20		
1/14/2008 5:25:00 PM	0.520	0.78	259.03		
1/14/2008 5:26:00 PM				2	
1/14/2008 5:30:00 PM	0.469	0.78	223.11		
1/14/2008 5:35:00 PM	0.425	-0.09	-22.32		
1/14/2008 5:36:00 PM				2	
1/14/2008 5:40:00 PM	0.388	-0.08	-17.45		
1/14/2008 5:45:00 PM	0.362	-0.08	-15.76		
1/14/2008 5:46:00 PM				2	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/14/2008 5:50:00 PM	0.343	0.04	7.27		
1/14/2008 5:55:00 PM	0.328	0.04	6.82		
1/14/2008 5:56:00 PM				2	
1/14/2008 6:00:00 PM	0.317	0.04	6.48		0.00
1/14/2008 6:05:00 PM	0.308	0.04	6.24		
1/14/2008 6:06:00 PM				2	
1/14/2008 6:10:00 PM	0.302	0.04	6.06		
1/14/2008 6:15:00 PM	0.297	0.04	5.89		
1/14/2008 6:16:00 PM				2	
1/14/2008 6:20:00 PM	0.290	0.04	5.70		
1/14/2008 6:25:00 PM	0.284	0.04	5.53		
1/14/2008 6:26:00 PM				2	
1/14/2008 6:30:00 PM	0.280	0.04	5.41		
1/14/2008 6:35:00 PM	0.276	0.04	5.29		
1/14/2008 6:36:00 PM				2	
1/14/2008 6:40:00 PM	0.272	0.04	5.19		
1/14/2008 6:45:00 PM	0.268	0.04	5.09		
1/14/2008 6:46:00 PM				3	
1/14/2008 6:50:00 PM	0.265	0.04	5.01		
1/14/2008 6:55:00 PM	0.263	0.04	4.93		
1/14/2008 6:56:00 PM				3	
1/14/2008 7:00:00 PM	0.260	0.04	4.86		0.01
1/14/2008 7:05:00 PM	0.258	0.04	4.81		
1/14/2008 7:06:00 PM				3	
1/14/2008 7:10:00 PM	0.257	0.04	4.77		
1/14/2008 7:15:00 PM	0.255	0.04	4.72		
1/14/2008 7:16:00 PM				3	
1/14/2008 7:20:00 PM	0.253	0.04	4.66		
1/14/2008 7:25:00 PM	0.251	0.04	4.60		
1/14/2008 7:26:00 PM				3	
1/14/2008 7:30:00 PM	0.249	0.04	4.56		
1/14/2008 7:35:00 PM	0.247	0.04	4.52		
1/14/2008 7:40:00 PM	0.246	0.04	4.47		
1/14/2008 7:45:00 PM	0.244	0.04	4.43		
1/14/2008 7:50:00 PM	0.243	0.04	4.39		
1/14/2008 7:55:00 PM	0.242	0.04	4.38		
1/14/2008 8:00:00 PM	0.242	0.04	4.38		0.02
1/14/2008 8:05:00 PM	0.241	0.04	4.35		
1/14/2008 8:10:00 PM	0.240	0.04	4.32		
1/14/2008 8:15:00 PM	0.239	0.04	4.30		
1/14/2008 8:20:00 PM	0.238	0.04	4.27		
1/14/2008 8:25:00 PM	0.238	0.04	4.27		
1/14/2008 8:30:00 PM	0.239	0.04	4.30		
1/14/2008 8:35:00 PM	0.239	0.04	4.28		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/14/2008 8:40:00 PM	0.238	0.04	4.26		
1/14/2008 8:45:00 PM	0.237	0.04	4.25		
1/14/2008 8:50:00 PM	0.242	0.04	4.38		
1/14/2008 8:51:00 PM				3	
1/14/2008 8:55:00 PM	0.260	0.04	4.84		
1/14/2008 9:00:00 PM	0.285	0.04	5.57		0.00
1/14/2008 9:01:00 PM				3	
1/14/2008 9:05:00 PM	0.338	0.18	32.11		
1/14/2008 9:10:00 PM	0.344	0.20	36.54		
1/14/2008 9:11:00 PM				3	
1/14/2008 9:15:00 PM	0.363	0.28	54.92		
1/14/2008 9:20:00 PM	0.353	0.24	45.56		
1/14/2008 9:21:00 PM				3	
1/14/2008 9:25:00 PM	0.344	0.21	38.37		
1/14/2008 9:30:00 PM	0.338	0.18	32.55		
1/14/2008 9:31:00 PM				3	
1/14/2008 9:35:00 PM	0.339	0.19	34.48		
1/14/2008 9:40:00 PM	0.340	0.21	38.27		
1/14/2008 9:41:00 PM				4	
1/14/2008 9:45:00 PM	0.344	0.21	38.37		
1/14/2008 9:50:00 PM	0.342	0.21	37.45		
1/14/2008 9:51:00 PM				4	
1/14/2008 9:55:00 PM	0.329	0.16	26.95		
1/14/2008 10:00:00 PM	0.320	0.14	22.99		0.00
1/14/2008 10:01:00 PM				4	
1/14/2008 10:05:00 PM	0.310	0.14	22.00		
1/14/2008 10:10:00 PM	0.303	0.14	21.29		
1/14/2008 10:11:00 PM				4	
1/14/2008 10:15:00 PM	0.296	0.14	20.59		
1/14/2008 10:20:00 PM	0.291	0.14	20.02		
1/14/2008 10:21:00 PM				4	
1/14/2008 10:25:00 PM	0.287	0.14	19.66		
1/14/2008 10:30:00 PM	0.282	0.14	19.20		
1/14/2008 10:31:00 PM				4	
1/14/2008 10:35:00 PM	0.280	0.14	18.97		
1/14/2008 10:40:00 PM	0.278	0.14	18.74		
1/14/2008 10:41:00 PM				4	
1/14/2008 10:45:00 PM	0.281	0.14	19.07		
1/14/2008 10:50:00 PM	0.274	0.14	18.36		
1/14/2008 10:51:00 PM				4	
1/14/2008 10:55:00 PM	0.269	0.14	17.84		
1/14/2008 11:00:00 PM	0.267	0.14	17.72		0.00
1/14/2008 11:01:00 PM				4	
1/14/2008 11:05:00 PM	0.265	0.14	17.53		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/14/2008 11:10:00 PM	0.263	0.14	17.27		
1/14/2008 11:11:00 PM				4	
1/14/2008 11:15:00 PM	0.260	0.14	16.96		
1/14/2008 11:20:00 PM	0.258	0.14	16.83		
1/14/2008 11:21:00 PM				5	
1/14/2008 11:25:00 PM	0.255	0.14	16.55		
1/14/2008 11:30:00 PM	0.252	0.14	16.27		
1/14/2008 11:31:00 PM				5	
1/14/2008 11:35:00 PM	0.249	0.14	15.99		
1/14/2008 11:40:00 PM	0.247	0.14	15.81		
1/14/2008 11:45:00 PM	0.246	0.14	15.65		
1/14/2008 11:50:00 PM	0.244	0.14	15.50		
1/14/2008 11:55:00 PM	0.242	0.14	15.35		
1/15/2008 12:00:00 AM	0.241	0.14	15.19		0.00
1/15/2008 12:05:00 AM	0.240	0.14	15.07		
1/15/2008 12:10:00 AM	0.238	0.14	14.92		
1/15/2008 12:15:00 AM	0.237	0.14	14.80		
1/15/2008 12:20:00 AM	0.236	0.14	14.71		
1/15/2008 12:25:00 AM	0.235	0.14	14.68		
1/15/2008 12:30:00 AM	0.234	0.14	14.56		
1/15/2008 12:35:00 AM	0.234	0.14	14.56		
1/15/2008 12:40:00 AM	0.233	0.14	14.50		
1/15/2008 12:45:00 AM	0.232	0.14	14.41		
1/15/2008 12:50:00 AM	0.232	0.14	14.35		
1/15/2008 12:55:00 AM	0.231	0.14	14.26		
1/15/2008 1:00:00 AM	0.230	0.14	14.20		0.00

Figure Y-7 Highway 30 B

January 28th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 8:00:00 AM	0.163				0.00
1/26/2008 8:05:00 AM	0.163				
1/26/2008 8:10:00 AM	0.163				
1/26/2008 8:15:00 AM	0.163				
1/26/2008 8:20:00 AM	0.163				
1/26/2008 8:25:00 AM	0.163				
1/26/2008 8:30:00 AM	0.163				
1/26/2008 8:35:00 AM	0.164				
1/26/2008 8:40:00 AM	0.163				
1/26/2008 8:45:00 AM	0.163				
1/26/2008 8:50:00 AM	0.163				
1/26/2008 8:55:00 AM	0.163				
1/26/2008 9:00:00 AM	0.163				0.02
1/26/2008 9:05:00 AM	0.162				
1/26/2008 9:10:00 AM	0.162				
1/26/2008 9:15:00 AM	0.163				
1/26/2008 9:20:00 AM	0.162				
1/26/2008 9:25:00 AM	0.163				
1/26/2008 9:30:00 AM	0.162				
1/26/2008 9:35:00 AM	0.162				
1/26/2008 9:40:00 AM	0.163				
1/26/2008 9:45:00 AM	0.162				
1/26/2008 9:50:00 AM	0.162				
1/26/2008 9:55:00 AM	0.162				
1/26/2008 10:00:00 AM	0.162				0.05
1/26/2008 10:05:00 AM	0.162				
1/26/2008 10:10:00 AM	0.162				
1/26/2008 10:15:00 AM	0.162				
1/26/2008 10:20:00 AM	0.162				
1/26/2008 10:25:00 AM	0.162				
1/26/2008 10:30:00 AM	0.162				
1/26/2008 10:35:00 AM	0.162				
1/26/2008 10:40:00 AM	0.163				
1/26/2008 10:45:00 AM	0.186				
1/26/2008 10:47:00 AM				1	
1/26/2008 10:50:00 AM	0.218				
1/26/2008 10:55:00 AM	0.259				
1/26/2008 10:56:00 AM				1	
1/26/2008 11:00:00 AM	0.310	0.08	12.57		0.05
1/26/2008 11:05:00 AM	0.335	0.18	32.23		
1/26/2008 11:06:00 AM				1	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 11:10:00 AM	0.364	0.20	39.67		
1/26/2008 11:15:00 AM	0.375	0.21	43.57		
1/26/2008 11:16:00 AM				1	
1/26/2008 11:20:00 AM	0.393	0.31	68.85		
1/26/2008 11:25:00 AM	0.391	0.36	79.19		
1/26/2008 11:26:00 AM				1	
1/26/2008 11:30:00 AM	0.400	0.44	100.09		
1/26/2008 11:35:00 AM	0.416	0.97	233.59		
1/26/2008 11:36:00 AM				1	
1/26/2008 11:40:00 AM	0.439	0.89	231.84		
1/26/2008 11:45:00 AM	0.444	0.85	225.00		
1/26/2008 11:46:00 AM				1	
1/26/2008 11:50:00 AM	0.437	0.83	214.35		
1/26/2008 11:55:00 AM	0.424	1.16	286.69		
1/26/2008 11:56:00 AM				1	
1/26/2008 12:00:00 PM	0.422	1.16	284.77		0.05
1/26/2008 12:05:00 PM	0.426	1.19	295.33		
1/26/2008 12:06:00 PM				1	
1/26/2008 12:10:00 PM	0.428	1.22	305.32		
1/26/2008 12:15:00 PM	0.426	1.64	408.04		
1/26/2008 12:16:00 PM				1	
1/26/2008 12:20:00 PM	0.416	1.28	309.45		
1/26/2008 12:25:00 PM	0.407	0.40	93.38		
1/26/2008 12:26:00 PM				2	
1/26/2008 12:30:00 PM	0.392	1.10	242.84		
1/26/2008 12:35:00 PM	0.378	0.86	180.03		
1/26/2008 12:36:00 PM				2	
1/26/2008 12:40:00 PM	0.370	0.80	163.46		
1/26/2008 12:45:00 PM	0.368	0.65	131.96		
1/26/2008 12:46:00 PM				2	
1/26/2008 12:50:00 PM	0.367	0.83	167.79		
1/26/2008 12:55:00 PM	0.373	1.09	224.45		
1/26/2008 12:56:00 PM				2	
1/26/2008 1:00:00 PM	0.379	1.05	220.77		0.06
1/26/2008 1:05:00 PM	0.383	1.10	235.57		
1/26/2008 1:06:00 PM				2	
1/26/2008 1:10:00 PM	0.386	1.18	255.48		
1/26/2008 1:15:00 PM	0.385	1.11	239.77		
1/26/2008 1:16:00 PM				2	
1/26/2008 1:20:00 PM	0.384	1.07	229.66		
1/26/2008 1:25:00 PM	0.381	1.22	258.93		
1/26/2008 1:26:00 PM				2	
1/26/2008 1:30:00 PM	0.378	1.21	253.62		
1/26/2008 1:35:00 PM	0.378	1.17	245.24		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 1:36:00 PM				2	
1/26/2008 1:40:00 PM	0.378	1.06	222.18		
1/26/2008 1:45:00 PM	0.395	1.19	265.55		
1/26/2008 1:46:00 PM				2	
1/26/2008 1:50:00 PM	0.420	1.38	336.14		
1/26/2008 1:55:00 PM	0.448	1.19	320.37		
1/26/2008 1:56:00 PM				2	
1/26/2008 2:00:00 PM	0.467	1.26	357.03		0.06
1/26/2008 2:05:00 PM	0.465	0.91	257.43		
1/26/2008 2:06:00 PM				3	
1/26/2008 2:10:00 PM	0.458	0.93	258.34		
1/26/2008 2:15:00 PM	0.451	1.57	424.46		
1/26/2008 2:16:00 PM				3	
1/26/2008 2:20:00 PM	0.449	0.96	257.91		
1/26/2008 2:25:00 PM	0.458	0.98	272.18		
1/26/2008 2:26:00 PM				3	
1/26/2008 2:30:00 PM	0.465	1.35	380.48		
1/26/2008 2:35:00 PM	0.452	1.17	318.46		
1/26/2008 2:36:00 PM				3	
1/26/2008 2:40:00 PM	0.434	1.10	281.32		
1/26/2008 2:45:00 PM	0.413	1.11	263.85		
1/26/2008 2:46:00 PM				3	
1/26/2008 2:50:00 PM	0.398	1.33	299.27		
1/26/2008 2:55:00 PM	0.379	0.78	163.26		
1/26/2008 2:56:00 PM				3	
1/26/2008 3:00:00 PM	0.366	0.91	181.92		0.07
1/26/2008 3:05:00 PM	0.358	0.85	164.42		
1/26/2008 3:06:00 PM				3	
1/26/2008 3:10:00 PM	0.354	0.56	106.59		
1/26/2008 3:15:00 PM	0.363	0.79	156.86		
1/26/2008 3:16:00 PM				3	
1/26/2008 3:20:00 PM	0.363	0.98	194.61		
1/26/2008 3:25:00 PM	0.365	0.84	168.70		
1/26/2008 3:26:00 PM				3	
1/26/2008 3:30:00 PM	0.366	0.77	154.73		
1/26/2008 3:35:00 PM	0.376	0.90	186.80		
1/26/2008 3:36:00 PM				3	
1/26/2008 3:40:00 PM	0.390	1.19	260.14		
1/26/2008 3:45:00 PM	0.409	1.09	256.23		
1/26/2008 3:46:00 PM				4	
1/26/2008 3:50:00 PM	0.423	0.78	192.13		
1/26/2008 3:55:00 PM	0.432	1.62	412.05		
1/26/2008 3:56:00 PM				4	
1/26/2008 4:00:00 PM	0.448	1.60	428.95		0.05

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 4:05:00 PM	0.469	1.73	495.35		
1/26/2008 4:06:00 PM				4	
1/26/2008 4:10:00 PM	0.473	1.38	401.35		
1/26/2008 4:15:00 PM	0.472	1.13	325.04		
1/26/2008 4:16:00 PM				4	
1/26/2008 4:20:00 PM	0.469	1.13	322.12		
1/26/2008 4:25:00 PM	0.467	1.60	456.79		
1/26/2008 4:26:00 PM				4	
1/26/2008 4:30:00 PM	0.455	1.66	453.54		
1/26/2008 4:35:00 PM	0.437	1.66	427.42		
1/26/2008 4:36:00 PM				4	
1/26/2008 4:40:00 PM	0.424	1.54	382.19		
1/26/2008 4:45:00 PM	0.416	1.12	269.71		
1/26/2008 4:46:00 PM				4	
1/26/2008 4:50:00 PM	0.420	1.66	405.22		
1/26/2008 4:55:00 PM	0.426	1.69	420.94		
1/26/2008 4:56:00 PM				4	
1/26/2008 5:00:00 PM	0.431	1.79	452.54		0.11
1/26/2008 5:05:00 PM	0.427	1.78	446.09		
1/26/2008 5:06:00 PM				4	
1/26/2008 5:10:00 PM	0.419	1.78	434.75		
1/26/2008 5:15:00 PM	0.413	1.92	457.11		
1/26/2008 5:16:00 PM				4	
1/26/2008 5:20:00 PM	0.406	1.73	401.28		
1/26/2008 5:25:00 PM	0.402	1.44	329.52		
1/26/2008 5:26:00 PM				5	
1/26/2008 5:30:00 PM	0.404	1.21	280.20		
1/26/2008 5:35:00 PM	0.406	1.63	378.74		
1/26/2008 5:36:00 PM				5	
1/26/2008 5:40:00 PM	0.403	1.69	388.56		
1/26/2008 5:45:00 PM	0.403	1.69	388.10		
1/26/2008 5:46:00 PM				5	
1/26/2008 5:50:00 PM	0.410	1.50	354.25		
1/26/2008 5:55:00 PM	0.417	1.40	338.29		
1/26/2008 5:56:00 PM				5	
1/26/2008 6:00:00 PM	0.421	1.72	421.55		0.08
1/26/2008 6:05:00 PM	0.427	1.34	334.13		
1/26/2008 6:06:00 PM				5	
1/26/2008 6:10:00 PM	0.438	1.52	394.25		
1/26/2008 6:15:00 PM	0.451	1.17	316.32		
1/26/2008 6:16:00 PM				5	
1/26/2008 6:20:00 PM	0.466	1.14	321.40		
1/26/2008 6:25:00 PM	0.480	1.47	434.49		
1/26/2008 6:26:00 PM				5	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 6:30:00 PM	0.488	1.00	302.53		
1/26/2008 6:35:00 PM	0.498	1.13	353.07		
1/26/2008 6:36:00 PM				5	
1/26/2008 6:40:00 PM	0.501	1.05	330.30		
1/26/2008 6:45:00 PM	0.509	1.12	359.29		
1/26/2008 6:46:00 PM				5	
1/26/2008 6:50:00 PM	0.516	1.24	407.34		
1/26/2008 6:55:00 PM	0.520	1.67	555.58		
1/26/2008 6:56:00 PM				5	
1/26/2008 7:00:00 PM	0.526	1.24	416.04		0.04
1/26/2008 7:05:00 PM	0.530	0.87	296.74		
1/26/2008 7:06:00 PM				6	
1/26/2008 7:10:00 PM	0.530	1.47	500.51		
1/26/2008 7:15:00 PM	0.530	1.14	388.49		
1/26/2008 7:16:00 PM				6	
1/26/2008 7:20:00 PM	0.531	0.81	276.52		
1/26/2008 7:25:00 PM	0.535	1.01	347.33		
1/26/2008 7:26:00 PM				6	
1/26/2008 7:30:00 PM	0.557	1.00	365.68		
1/26/2008 7:35:00 PM	0.561	1.00	369.36		
1/26/2008 7:36:00 PM				6	
1/26/2008 7:40:00 PM	0.531	1.90	649.77		
1/26/2008 7:45:00 PM	0.482	1.48	441.77		
1/26/2008 7:46:00 PM				6	
1/26/2008 7:50:00 PM	0.443	1.01	267.01		
1/26/2008 7:55:00 PM	0.412	1.08	256.24		
1/26/2008 7:56:00 PM				6	
1/26/2008 8:00:00 PM	0.389	0.82	180.37		0.02
1/26/2008 8:05:00 PM	0.377	0.62	129.93		
1/26/2008 8:06:00 PM				6	
1/26/2008 8:10:00 PM	0.380	0.74	156.72		
1/26/2008 8:15:00 PM	0.385	0.63	134.81		
1/26/2008 8:16:00 PM				6	
1/26/2008 8:20:00 PM	0.392	0.43	95.04		
1/26/2008 8:25:00 PM	0.390	0.93	203.82		
1/26/2008 8:26:00 PM				6	
1/26/2008 8:30:00 PM	0.388	0.90	196.28		
1/26/2008 8:35:00 PM	0.387	0.65	141.24		
1/26/2008 8:36:00 PM				6	
1/26/2008 8:40:00 PM	0.387	0.82	177.74		
1/26/2008 8:45:00 PM	0.395	1.07	238.41		
1/26/2008 8:46:00 PM				7	
1/26/2008 8:50:00 PM	0.395	1.05	235.57		
1/26/2008 8:55:00 PM	0.387	1.05	228.25		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 8:56:00 PM				7	
1/26/2008 9:00:00 PM	0.368	1.05	212.70		0.00
1/26/2008 9:05:00 PM	0.348	0.51	94.99		
1/26/2008 9:06:00 PM				7	
1/26/2008 9:10:00 PM	0.331	0.07	12.12		
1/26/2008 9:15:00 PM	0.320	-0.07	-11.49		
1/26/2008 9:16:00 PM				7	
1/26/2008 9:20:00 PM	0.313	0.22	35.05		
1/26/2008 9:25:00 PM	0.316	0.31	49.99		
1/26/2008 9:26:00 PM				7	
1/26/2008 9:30:00 PM	0.343	1.22	221.96		
1/26/2008 9:35:00 PM	0.349	0.47	87.66		
1/26/2008 9:36:00 PM				7	
1/26/2008 9:40:00 PM	0.361	0.47	92.01		
1/26/2008 9:45:00 PM	0.342	0.81	146.96		
1/26/2008 9:46:00 PM				7	
1/26/2008 9:50:00 PM	0.326	0.81	136.81		
1/26/2008 9:55:00 PM	0.315	0.81	130.23		
1/26/2008 9:56:00 PM				7	
1/26/2008 10:00:00 PM	0.304	0.81	123.75		0.02
1/26/2008 10:05:00 PM	0.297	0.26	38.29		
1/26/2008 10:06:00 PM				7	
1/26/2008 10:10:00 PM	0.289	0.16	22.65		
1/26/2008 10:15:00 PM	0.283	0.16	22.02		
1/26/2008 10:16:00 PM				7	
1/26/2008 10:20:00 PM	0.279	0.16	21.57		
1/26/2008 10:25:00 PM	0.275	0.16	21.13		
1/26/2008 10:30:00 PM	0.271	0.16	20.65		
1/26/2008 10:35:00 PM	0.268	0.16	20.36		
1/26/2008 10:40:00 PM	0.266	0.16	20.10		
1/26/2008 10:45:00 PM	0.264	0.16	19.92		
1/26/2008 10:50:00 PM	0.264	0.12	14.89		
1/26/2008 10:55:00 PM	0.262	0.12	14.78		
1/26/2008 11:00:00 PM	0.262	0.09	11.08		0.06
1/26/2008 11:05:00 PM	0.262	0.09	11.08		
1/26/2008 11:10:00 PM	0.262	0.09	11.08		
1/26/2008 11:15:00 PM	0.264	0.09	11.21		
1/26/2008 11:20:00 PM	0.267	0.09	11.39		
1/26/2008 11:25:00 PM	0.274	0.09	11.78		
1/26/2008 11:30:00 PM	0.280	0.09	12.15		
1/26/2008 11:35:00 PM	0.285	0.10	13.88		
1/26/2008 11:40:00 PM	0.297	0.10	14.73		
1/26/2008 11:45:00 PM	0.306	0.10	15.42		
1/26/2008 11:50:00 PM	0.315	0.39	62.71		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/26/2008 11:55:00 PM	0.329	0.48	81.75		
1/27/2008 12:00:00 AM	0.347	0.80	147.84		0.04
1/27/2008 12:05:00 AM	0.359	0.86	167.46		
1/27/2008 12:10:00 AM	0.363	0.80	158.84		
1/27/2008 12:15:00 AM	0.356	0.53	102.55		
1/27/2008 12:20:00 AM	0.349	0.63	118.76		
1/27/2008 12:25:00 AM	0.349	0.63	118.60		
1/27/2008 12:30:00 AM	0.355	0.63	121.52		
1/27/2008 12:35:00 AM	0.365	0.62	122.78		
1/27/2008 12:40:00 AM	0.385	1.52	326.64		
1/27/2008 12:45:00 AM	0.404	0.83	191.73		
1/27/2008 12:50:00 AM	0.416	1.19	286.57		
1/27/2008 12:55:00 AM	0.444	1.28	337.32		
1/27/2008 1:00:00 AM	0.466	1.79	506.54		0.00
1/27/2008 1:05:00 AM	0.476	1.61	469.40		
1/27/2008 1:10:00 AM	0.466	1.68	475.36		
1/27/2008 1:15:00 AM	0.451	1.93	520.43		
1/27/2008 1:20:00 AM	0.434	1.68	430.59		
1/27/2008 1:25:00 AM	0.422	1.03	253.42		
1/27/2008 1:30:00 AM	0.419	1.27	308.97		
1/27/2008 1:35:00 AM	0.416	1.69	406.98		
1/27/2008 1:40:00 AM	0.414	1.00	239.44		
1/27/2008 1:45:00 AM	0.407	1.35	315.51		
1/27/2008 1:50:00 AM	0.393	1.10	244.02		
1/27/2008 1:55:00 AM	0.386	1.10	237.56		
1/27/2008 2:00:00 AM	0.382	0.99	210.38		0.00
1/27/2008 2:05:00 AM	0.374	0.93	192.24		
1/27/2008 2:10:00 AM	0.368	0.87	175.73		
1/27/2008 2:15:00 AM	0.358	0.50	96.72		
1/27/2008 2:20:00 AM	0.347	0.50	92.62		
1/27/2008 2:25:00 AM	0.334	0.45	78.70		
1/27/2008 2:30:00 AM	0.323	0.07	11.68		
1/27/2008 2:35:00 AM	0.315	0.07	11.25		
1/27/2008 2:40:00 AM	0.308	0.07	10.88		
1/27/2008 2:45:00 AM	0.303	0.07	10.63		
1/27/2008 2:50:00 AM	0.298	0.07	10.38		
1/27/2008 2:55:00 AM	0.293	0.07	10.14		
1/27/2008 3:00:00 AM	0.288	0.07	9.90		0.02
1/27/2008 3:05:00 AM	0.285	0.07	9.71		
1/27/2008 3:10:00 AM	0.280	0.07	9.49		
1/27/2008 3:15:00 AM	0.276	0.07	9.29		
1/27/2008 3:20:00 AM	0.272	0.07	9.10		
1/27/2008 3:25:00 AM	0.269	0.07	8.92		
1/27/2008 3:30:00 AM	0.266	0.07	8.78		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/27/2008 3:35:00 AM	0.262	0.07	8.62		
1/27/2008 3:40:00 AM	0.260	0.07	8.48		
1/27/2008 3:45:00 AM	0.257	0.07	8.37		
1/27/2008 3:50:00 AM	0.255	0.07	8.26		
1/27/2008 3:55:00 AM	0.253	0.07	8.15		
1/27/2008 4:00:00 AM	0.251	0.07	8.07		0.01
1/27/2008 4:05:00 AM	0.251	0.07	8.06		
1/27/2008 4:10:00 AM	0.249	0.07	7.98		
1/27/2008 4:15:00 AM	0.249	0.07	8.00		
1/27/2008 4:20:00 AM	0.251	0.07	8.07		
1/27/2008 4:25:00 AM	0.254	0.07	8.20		
1/27/2008 4:30:00 AM	0.258	0.07	8.42		
1/27/2008 4:35:00 AM	0.265	0.07	8.73		
1/27/2008 4:40:00 AM	0.273	0.07	9.15		
1/27/2008 4:45:00 AM	0.286	0.22	30.69		
1/27/2008 4:50:00 AM	0.295	0.21	30.73		
1/27/2008 4:55:00 AM	0.298	0.21	31.18		
1/27/2008 5:00:00 AM	0.304	0.20	30.56		0.01
1/27/2008 5:05:00 AM	0.302	0.21	32.59		
1/27/2008 5:10:00 AM	0.298	0.16	22.94		
1/27/2008 5:15:00 AM	0.292	0.16	22.35		
1/27/2008 5:20:00 AM	0.287	0.01	1.41		
1/27/2008 5:25:00 AM	0.283	0.10	13.76		
1/27/2008 5:30:00 AM	0.279	0.08	10.79		
1/27/2008 5:35:00 AM	0.275	0.08	10.55		
1/27/2008 5:40:00 AM	0.273	0.08	10.43		
1/27/2008 5:45:00 AM	0.273	0.08	10.43		
1/27/2008 5:50:00 AM	0.278	0.08	10.73		
1/27/2008 5:55:00 AM	0.284	0.11	15.21		
1/27/2008 6:00:00 AM	0.286	0.13	17.77		0.01
1/27/2008 6:05:00 AM	0.293	0.18	26.81		
1/27/2008 6:10:00 AM	0.305	0.43	65.90		
1/27/2008 6:15:00 AM	0.309	0.78	122.18		
1/27/2008 6:20:00 AM	0.317	0.78	126.56		
1/27/2008 6:25:00 AM	0.323	0.40	65.84		
1/27/2008 6:30:00 AM	0.329	0.41	70.68		
1/27/2008 6:35:00 AM	0.334	0.57	99.30		
1/27/2008 6:40:00 AM	0.333	0.79	137.96		
1/27/2008 6:45:00 AM	0.329	0.46	78.72		
1/27/2008 6:50:00 AM	0.324	0.29	49.53		
1/27/2008 6:55:00 AM	0.318	0.42	68.45		
1/27/2008 7:00:00 AM	0.310	0.41	64.52		0.00
1/27/2008 7:05:00 AM	0.303	0.41	62.34		
1/27/2008 7:10:00 AM	0.298	0.17	25.90		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/27/2008 7:15:00 AM	0.292	0.20	29.22		
1/27/2008 7:20:00 AM	0.287	0.04	4.92		
1/27/2008 7:25:00 AM	0.282	0.04	4.80		
1/27/2008 7:30:00 AM	0.278	0.04	4.69		
1/27/2008 7:35:00 AM	0.275	0.04	4.62		
1/27/2008 7:40:00 AM	0.271	0.04	4.51		
1/27/2008 7:45:00 AM	0.268	0.04	4.44		
1/27/2008 7:50:00 AM	0.265	0.04	4.37		
1/27/2008 7:55:00 AM	0.262	0.04	4.29		
1/27/2008 8:00:00 AM	0.260	0.04	4.24		0.00
1/27/2008 8:05:00 AM	0.257	0.04	4.18		
1/27/2008 8:10:00 AM	0.255	0.04	4.13		
1/27/2008 8:15:00 AM	0.253	0.04	4.08		
1/27/2008 8:20:00 AM	0.251	0.04	4.03		
1/27/2008 8:25:00 AM	0.250	0.04	4.01		
1/27/2008 8:30:00 AM	0.248	0.04	3.96		
1/27/2008 8:35:00 AM	0.246	0.04	3.91		
1/27/2008 8:40:00 AM	0.244	0.04	3.87		
1/27/2008 8:45:00 AM	0.243	0.04	3.85		
1/27/2008 8:50:00 AM	0.241	0.04	3.81		
1/27/2008 8:55:00 AM	0.240	0.04	3.77		
1/27/2008 9:00:00 AM	0.238	0.04	3.74		0.00
1/27/2008 9:05:00 AM	0.237	0.04	3.72		
1/27/2008 9:10:00 AM	0.236	0.04	3.69		
1/27/2008 9:15:00 AM	0.235	0.04	3.67		
1/27/2008 9:20:00 AM	0.234	0.04	3.64		
1/27/2008 9:25:00 AM	0.233	0.04	3.61		
1/27/2008 9:30:00 AM	0.232	0.04	3.59		
1/27/2008 9:35:00 AM	0.231	0.04	3.57		
1/27/2008 9:40:00 AM	0.231	0.04	3.57		
1/27/2008 9:45:00 AM	0.229	0.04	3.53		
1/27/2008 9:50:00 AM	0.229	0.04	3.53		
1/27/2008 9:55:00 AM	0.227	0.04	3.49		
1/27/2008 10:00:00 AM	0.227	0.04	3.49		0.00

Figure Y-8 Highway 30 B

January 30th Sampling Event

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/28/2008 2:00:00 PM	0.216				0.00
1/28/2008 2:05:00 PM	0.216				
1/28/2008 2:10:00 PM	0.216				
1/28/2008 2:15:00 PM	0.216				
1/28/2008 2:20:00 PM	0.216				
1/28/2008 2:25:00 PM	0.216				
1/28/2008 2:30:00 PM	0.216				
1/28/2008 2:35:00 PM	0.216				
1/28/2008 2:40:00 PM	0.216				
1/28/2008 2:45:00 PM	0.215				
1/28/2008 2:50:00 PM	0.215				
1/28/2008 2:55:00 PM	0.214				
1/28/2008 3:00:00 PM	0.214				0.01
1/28/2008 3:05:00 PM	0.214				
1/28/2008 3:10:00 PM	0.214				
1/28/2008 3:15:00 PM	0.214				
1/28/2008 3:20:00 PM	0.214				
1/28/2008 3:25:00 PM	0.214				
1/28/2008 3:30:00 PM	0.214				
1/28/2008 3:35:00 PM	0.214				
1/28/2008 3:40:00 PM	0.214				
1/28/2008 3:45:00 PM	0.214				
1/28/2008 3:50:00 PM	0.214				
1/28/2008 3:55:00 PM	0.214				
1/28/2008 4:00:00 PM	0.214				0.00
1/28/2008 4:05:00 PM	0.214				
1/28/2008 4:10:00 PM	0.214				
1/28/2008 4:15:00 PM	0.214				
1/28/2008 4:20:00 PM	0.214				
1/28/2008 4:25:00 PM	0.214				
1/28/2008 4:30:00 PM	0.214				
1/28/2008 4:35:00 PM	0.214				
1/28/2008 4:40:00 PM	0.214				
1/28/2008 4:45:00 PM	0.213				
1/28/2008 4:50:00 PM	0.212				
1/28/2008 4:55:00 PM	0.213				
1/28/2008 5:00:00 PM	0.212				0.00
1/28/2008 5:05:00 PM	0.212				
1/28/2008 5:10:00 PM	0.212				
1/28/2008 5:15:00 PM	0.212				
1/28/2008 5:20:00 PM	0.217				

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/28/2008 5:25:00 PM	0.224				
1/28/2008 5:27:00 PM				1	
1/28/2008 5:30:00 PM	0.234				
1/28/2008 5:35:00 PM	0.233				
1/28/2008 5:40:00 PM	0.230				
1/28/2008 5:45:00 PM	0.228				
1/28/2008 5:48:00 PM				1	
1/28/2008 5:50:00 PM	0.231				
1/28/2008 5:55:00 PM	0.242	0.08	8.73		
1/28/2008 6:00:00 PM	0.241	0.08	8.70		0.00
1/28/2008 6:03:00 PM				1	
1/28/2008 6:05:00 PM	0.239	0.08	8.56		
1/28/2008 6:10:00 PM	0.237	0.08	8.46		
1/28/2008 6:15:00 PM	0.235	0.08	8.37		
1/28/2008 6:18:00 PM				1	
1/28/2008 6:20:00 PM	0.233	0.08	8.29		
1/28/2008 6:25:00 PM	0.232	0.08	8.22		
1/28/2008 6:30:00 PM	0.231	0.08	8.15		
1/28/2008 6:35:00 PM	0.229	0.08	8.06		
1/28/2008 6:38:00 PM				1	
1/28/2008 6:40:00 PM	0.230	0.08	8.13		
1/28/2008 6:45:00 PM	0.238	0.08	8.54		
1/28/2008 6:50:00 PM	0.239	0.08	8.60		
1/28/2008 6:53:00 PM				1	
1/28/2008 6:55:00 PM	0.239	0.08	8.56		
1/28/2008 7:00:00 PM	0.237	0.08	8.47		0.00
1/28/2008 7:05:00 PM	0.236	0.08	8.41		
1/28/2008 7:08:00 PM				1	
1/28/2008 7:10:00 PM	0.234	0.08	8.32		
1/28/2008 7:15:00 PM	0.233	0.08	8.25		
1/28/2008 7:20:00 PM	0.232	0.08	8.23		
1/28/2008 7:23:00 PM				1	
1/28/2008 7:25:00 PM	0.231	0.08	8.15		
1/28/2008 7:30:00 PM	0.230	0.08	8.11		
1/28/2008 7:35:00 PM	0.229	0.08	8.06		
1/28/2008 7:40:00 PM	0.228	0.08	8.00		
1/28/2008 7:45:00 PM	0.227	0.08	7.98		
1/28/2008 7:50:00 PM	0.227	0.08	7.98		
1/28/2008 7:55:00 PM	0.226	0.08	7.89		
1/28/2008 8:00:00 PM	0.226	0.08	7.89		0.00
1/28/2008 8:05:00 PM	0.225	0.08	7.84		
1/28/2008 8:10:00 PM	0.224	0.08	7.81		
1/28/2008 8:15:00 PM	0.224	0.08	7.81		
1/28/2008 8:20:00 PM	0.224	0.08	7.81		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/28/2008 8:25:00 PM	0.223	0.08	7.74		
1/28/2008 8:30:00 PM	0.222	0.08	7.73		
1/28/2008 8:35:00 PM	0.222	0.08	7.73		
1/28/2008 8:40:00 PM	0.222	0.08	7.73		
1/28/2008 8:45:00 PM	0.222	0.08	7.69		
1/28/2008 8:50:00 PM	0.221	0.08	7.64		
1/28/2008 8:55:00 PM	0.221	0.08	7.64		
1/28/2008 9:00:00 PM	0.221	0.08	7.64		0.00
1/28/2008 9:05:00 PM	0.221	0.08	7.64		
1/28/2008 9:10:00 PM	0.221	0.08	7.64		
1/28/2008 9:15:00 PM	0.221	0.08	7.64		
1/28/2008 9:20:00 PM	0.221	0.08	7.64		
1/28/2008 9:25:00 PM	0.219	0.08	7.58		
1/28/2008 9:30:00 PM	0.219	0.08	7.54		
1/28/2008 9:35:00 PM	0.219	0.08	7.54		
1/28/2008 9:40:00 PM	0.219	0.08	7.54		
1/28/2008 9:45:00 PM	0.219	0.08	7.54		
1/28/2008 9:50:00 PM	0.219	0.08	7.54		
1/28/2008 9:55:00 PM	0.219	0.08	7.54		
1/28/2008 10:00:00 PM	0.219	0.08	7.54		0.01
1/28/2008 10:05:00 PM	0.219	0.08	7.54		
1/28/2008 10:10:00 PM	0.219	0.08	7.54		
1/28/2008 10:15:00 PM	0.219	0.08	7.53		
1/28/2008 10:20:00 PM	0.218	0.08	7.51		
1/28/2008 10:25:00 PM	0.218	0.08	7.51		
1/28/2008 10:30:00 PM	0.219	0.08	7.54		
1/28/2008 10:35:00 PM	0.218	0.08	7.51		
1/28/2008 10:40:00 PM	0.219	0.08	7.54		
1/28/2008 10:45:00 PM	0.219	0.08	7.54		
1/28/2008 10:50:00 PM	0.219	0.08	7.53		
1/28/2008 10:55:00 PM	0.218	0.08	7.49		
1/28/2008 11:00:00 PM	0.217	0.08	7.46		0.00
1/28/2008 11:05:00 PM	0.217	0.08	7.46		
1/28/2008 11:10:00 PM	0.217	0.08	7.46		
1/28/2008 11:15:00 PM	0.217	0.08	7.46		
1/28/2008 11:20:00 PM	0.217	0.08	7.46		
1/28/2008 11:25:00 PM	0.217	0.08	7.46		
1/28/2008 11:30:00 PM	0.217	0.08	7.46		
1/28/2008 11:35:00 PM	0.218	0.08	7.51		
1/28/2008 11:40:00 PM	0.218	0.08	7.49		
1/28/2008 11:45:00 PM	0.217	0.08	7.46		
1/28/2008 11:50:00 PM	0.219	0.08	7.53		
1/28/2008 11:55:00 PM	0.219	0.08	7.54		
1/29/2008 12:00:00 AM	0.221	0.08	7.68		0.02

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 12:05:00 AM	0.225	0.08	7.88		
1/29/2008 12:10:00 AM	0.227	0.08	7.98		
1/29/2008 12:15:00 AM	0.228	0.08	8.00		
1/29/2008 12:17:00 AM				1	
1/29/2008 12:20:00 AM	0.234	0.08	8.30		
1/29/2008 12:25:00 AM	0.249	0.08	9.12		
1/29/2008 12:30:00 AM	0.253	0.08	9.31		
1/29/2008 12:32:00 AM				1	
1/29/2008 12:35:00 AM	0.254	0.08	9.39		
1/29/2008 12:40:00 AM	0.254	0.08	9.39		
1/29/2008 12:45:00 AM	0.253	0.08	9.31		
1/29/2008 12:47:00 AM				2	
1/29/2008 12:50:00 AM	0.257	0.08	9.53		
1/29/2008 12:55:00 AM	0.264	0.08	9.94		
1/29/2008 1:00:00 AM	0.266	0.08	10.03		0.02
1/29/2008 1:02:00 AM				2	
1/29/2008 1:05:00 AM	0.266	0.08	10.03		
1/29/2008 1:10:00 AM	0.266	0.08	10.03		
1/29/2008 1:15:00 AM	0.264	0.09	10.58		
1/29/2008 1:17:00 AM				2	
1/29/2008 1:20:00 AM	0.264	0.08	9.92		
1/29/2008 1:25:00 AM	0.263	0.08	9.87		
1/29/2008 1:30:00 AM	0.264	0.08	9.94		
1/29/2008 1:32:00 AM				2	
1/29/2008 1:35:00 AM	0.266	0.08	10.05		
1/29/2008 1:40:00 AM	0.270	0.10	13.22		
1/29/2008 1:45:00 AM	0.277	0.11	15.05		
1/29/2008 1:47:00 AM				2	
1/29/2008 1:50:00 AM	0.289	0.09	12.76		
1/29/2008 1:55:00 AM	0.302	0.09	13.62		
1/29/2008 2:00:00 AM	0.322	0.27	44.87		0.04
1/29/2008 2:02:00 AM				2	
1/29/2008 2:05:00 AM	0.338	0.23	40.92		
1/29/2008 2:10:00 AM	0.345	0.14	25.72		
1/29/2008 2:15:00 AM	0.349	0.18	34.50		
1/29/2008 2:17:00 AM				2	
1/29/2008 2:20:00 AM	0.347	0.25	46.37		
1/29/2008 2:25:00 AM	0.344	0.22	40.25		
1/29/2008 2:30:00 AM	0.335	0.22	38.75		
1/29/2008 2:32:00 AM				2	
1/29/2008 2:35:00 AM	0.331	-0.09	-15.54		
1/29/2008 2:40:00 AM	0.324	-0.09	-15.07		
1/29/2008 2:45:00 AM	0.320	0.06	9.87		
1/29/2008 2:47:00 AM				2	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 2:50:00 AM	0.319	0.06	9.84		
1/29/2008 2:55:00 AM	0.318	0.24	39.06		
1/29/2008 3:00:00 AM	0.323	0.24	39.94		0.04
1/29/2008 3:02:00 AM				2	
1/29/2008 3:05:00 AM	0.328	-0.10	-17.04		
1/29/2008 3:10:00 AM	0.334	-0.10	-17.49		
1/29/2008 3:15:00 AM	0.341	-0.10	-18.04		
1/29/2008 3:17:00 AM				3	
1/29/2008 3:20:00 AM	0.349	0.20	37.35		
1/29/2008 3:25:00 AM	0.357	0.32	61.73		
1/29/2008 3:30:00 AM	0.364	0.27	53.55		
1/29/2008 3:32:00 AM				3	
1/29/2008 3:35:00 AM	0.366	0.36	71.97		
1/29/2008 3:40:00 AM	0.368	0.16	31.23		
1/29/2008 3:45:00 AM	0.366	0.56	111.95		
1/29/2008 3:47:00 AM				3	
1/29/2008 3:50:00 AM	0.365	0.20	39.88		
1/29/2008 3:55:00 AM	0.370	0.43	87.42		
1/29/2008 4:00:00 AM	0.372	0.43	88.09		0.06
1/29/2008 4:02:00 AM				3	
1/29/2008 4:05:00 AM	0.375	0.37	76.68		
1/29/2008 4:10:00 AM	0.375	0.76	157.70		
1/29/2008 4:15:00 AM	0.379	0.38	79.95		
1/29/2008 4:17:00 AM				3	
1/29/2008 4:20:00 AM	0.377	0.29	61.52		
1/29/2008 4:25:00 AM	0.378	0.38	79.65		
1/29/2008 4:30:00 AM	0.383	0.42	89.06		
1/29/2008 4:32:00 AM				3	
1/29/2008 4:35:00 AM	0.391	0.35	77.65		
1/29/2008 4:40:00 AM	0.396	0.59	132.31		
1/29/2008 4:45:00 AM	0.398	0.28	63.24		
1/29/2008 4:47:00 AM				3	
1/29/2008 4:50:00 AM	0.402	-0.18	-41.19		
1/29/2008 4:55:00 AM	0.400	0.42	94.86		
1/29/2008 5:00:00 AM	0.395	0.36	80.54		0.05
1/29/2008 5:02:00 AM				3	
1/29/2008 5:05:00 AM	0.397	0.43	96.77		
1/29/2008 5:10:00 AM	0.398	0.51	113.93		
1/29/2008 5:15:00 AM	0.401	0.59	135.67		
1/29/2008 5:17:00 AM				3	
1/29/2008 5:20:00 AM	0.401	0.59	135.67		
1/29/2008 5:25:00 AM	0.392	0.43	95.16		
1/29/2008 5:30:00 AM	0.389	0.56	122.28		
1/29/2008 5:32:00 AM				3	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 5:35:00 AM	0.378	0.76	160.14		
1/29/2008 5:40:00 AM	0.372	0.76	156.93		
1/29/2008 5:45:00 AM	0.374	0.27	55.67		
1/29/2008 5:47:00 AM				4	
1/29/2008 5:50:00 AM	0.390	0.39	85.68		
1/29/2008 5:55:00 AM	0.402	0.51	116.52		
1/29/2008 6:00:00 AM	0.426	0.53	132.01		0.07
1/29/2008 6:02:00 AM				4	
1/29/2008 6:05:00 AM	0.446	0.68	179.44		
1/29/2008 6:10:00 AM	0.463	0.46	129.92		
1/29/2008 6:15:00 AM	0.474	0.66	191.06		
1/29/2008 6:17:00 AM				4	
1/29/2008 6:20:00 AM	0.471	0.88	253.74		
1/29/2008 6:25:00 AM	0.459	0.88	244.16		
1/29/2008 6:30:00 AM	0.445	0.55	145.75		
1/29/2008 6:32:00 AM				4	
1/29/2008 6:35:00 AM	0.433	0.58	147.85		
1/29/2008 6:40:00 AM	0.421	0.65	160.43		
1/29/2008 6:45:00 AM	0.415	0.46	110.40		
1/29/2008 6:47:00 AM				4	
1/29/2008 6:50:00 AM	0.412	0.59	140.69		
1/29/2008 6:55:00 AM	0.395	0.45	101.22		
1/29/2008 7:00:00 AM	0.388	0.59	128.67		0.01
1/29/2008 7:02:00 AM				4	
1/29/2008 7:05:00 AM	0.384	0.49	105.04		
1/29/2008 7:10:00 AM	0.373	0.29	58.61		
1/29/2008 7:15:00 AM	0.370	0.30	61.07		
1/29/2008 7:17:00 AM				4	
1/29/2008 7:20:00 AM	0.358	0.30	57.45		
1/29/2008 7:25:00 AM	0.359	0.38	74.58		
1/29/2008 7:30:00 AM	0.387	0.40	86.38		
1/29/2008 7:32:00 AM				4	
1/29/2008 7:35:00 AM	0.476	0.54	157.17		
1/29/2008 7:40:00 AM	0.594	0.83	334.04		
1/29/2008 7:45:00 AM	0.630	1.15	499.60		
1/29/2008 7:47:00 AM				4	
1/29/2008 7:50:00 AM	0.565	0.84	313.88		
1/29/2008 7:55:00 AM	0.489	0.70	212.60		
1/29/2008 8:00:00 AM	0.428	0.67	168.94		0.02
1/29/2008 8:02:00 AM				4	
1/29/2008 8:05:00 AM	0.382	0.59	126.76		
1/29/2008 8:10:00 AM	0.355	0.29	55.50		
1/29/2008 8:15:00 AM	0.333	0.21	36.27		
1/29/2008 8:17:00 AM				5	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 8:20:00 AM	0.320	0.17	27.14		
1/29/2008 8:25:00 AM	0.313	0.20	31.11		
1/29/2008 8:30:00 AM	0.307	0.17	25.53		
1/29/2008 8:32:00 AM				5	
1/29/2008 8:35:00 AM	0.304	0.20	30.30		
1/29/2008 8:40:00 AM	0.305	0.18	28.05		
1/29/2008 8:45:00 AM	0.305	0.19	29.12		
1/29/2008 8:47:00 AM				5	
1/29/2008 8:50:00 AM	0.306	0.21	32.80		
1/29/2008 8:55:00 AM	0.301	0.18	27.11		
1/29/2008 9:00:00 AM	0.293	0.14	20.29		0.00
1/29/2008 9:02:00 AM				5	
1/29/2008 9:05:00 AM	0.287	0.12	16.60		
1/29/2008 9:10:00 AM	0.281	0.10	13.64		
1/29/2008 9:15:00 AM	0.276	0.10	12.83		
1/29/2008 9:17:00 AM				5	
1/29/2008 9:20:00 AM	0.272	0.09	11.66		
1/29/2008 9:25:00 AM	0.266	0.09	11.33		
1/29/2008 9:30:00 AM	0.262	0.09	11.08		
1/29/2008 9:32:00 AM				5	
1/29/2008 9:35:00 AM	0.260	0.09	10.90		
1/29/2008 9:40:00 AM	0.265	0.09	11.27		
1/29/2008 9:45:00 AM	0.286	0.12	16.77		
1/29/2008 9:47:00 AM				5	
1/29/2008 9:50:00 AM	0.337	0.35	61.65		
1/29/2008 9:55:00 AM	0.367	0.33	66.83		
1/29/2008 10:00:00 AM	0.392	0.44	97.14		0.00
1/29/2008 10:02:00 AM				5	
1/29/2008 10:05:00 AM	0.371	0.34	69.30		
1/29/2008 10:10:00 AM	0.352	0.40	75.06		
1/29/2008 10:15:00 AM	0.340	0.24	43.12		
1/29/2008 10:17:00 AM				5	
1/29/2008 10:20:00 AM	0.331	0.23	39.82		
1/29/2008 10:25:00 AM	0.322	0.23	38.11		
1/29/2008 10:30:00 AM	0.311	0.22	35.26		
1/29/2008 10:32:00 AM				5	
1/29/2008 10:35:00 AM	0.302	0.20	30.27		
1/29/2008 10:40:00 AM	0.292	0.15	21.27		
1/29/2008 10:45:00 AM	0.284	0.10	14.22		
1/29/2008 10:47:00 AM				6	
1/29/2008 10:50:00 AM	0.277	0.08	10.67		
1/29/2008 10:55:00 AM	0.272	0.08	10.40		
1/29/2008 11:00:00 AM	0.267	0.08	10.12		0.00
1/29/2008 11:02:00 AM				6	

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 11:05:00 AM	0.264	0.08	9.94		
1/29/2008 11:10:00 AM	0.259	0.08	9.67		
1/29/2008 11:15:00 AM	0.255	0.08	9.46		
1/29/2008 11:17:00 AM				6	
1/29/2008 11:20:00 AM	0.253	0.08	9.31		
1/29/2008 11:25:00 AM	0.249	0.08	9.14		
1/29/2008 11:30:00 AM	0.247	0.08	9.01		
1/29/2008 11:32:00 AM				6	
1/29/2008 11:35:00 AM	0.244	0.08	8.87		
1/29/2008 11:40:00 AM	0.242	0.08	8.73		
1/29/2008 11:45:00 AM	0.240	0.08	8.63		
1/29/2008 11:47:00 AM				6	
1/29/2008 11:50:00 AM	0.238	0.08	8.53		
1/29/2008 11:55:00 AM	0.236	0.08	8.44		
1/29/2008 12:00:00 PM	0.235	0.08	8.35		0.01
1/29/2008 12:02:00 PM				6	
1/29/2008 12:05:00 PM	0.233	0.08	8.25		
1/29/2008 12:10:00 PM	0.231	0.08	8.17		
1/29/2008 12:15:00 PM	0.230	0.08	8.11		
1/29/2008 12:20:00 PM	0.229	0.08	8.06		
1/29/2008 12:25:00 PM	0.227	0.08	7.98		
1/29/2008 12:30:00 PM	0.226	0.08	7.93		
1/29/2008 12:35:00 PM	0.226	0.08	7.89		
1/29/2008 12:40:00 PM	0.224	0.08	7.81		
1/29/2008 12:45:00 PM	0.224	0.08	7.81		
1/29/2008 12:50:00 PM	0.222	0.08	7.73		
1/29/2008 12:55:00 PM	0.222	0.08	7.73		
1/29/2008 1:00:00 PM	0.221	0.08	7.66		0.03
1/29/2008 1:05:00 PM	0.221	0.08	7.66		
1/29/2008 1:09:00 PM				6	
1/29/2008 1:10:00 PM	0.229	0.08	8.06		
1/29/2008 1:15:00 PM	0.248	0.08	9.07		
1/29/2008 1:20:00 PM	0.254	0.08	9.37		
1/29/2008 1:24:00 PM				6	
1/29/2008 1:25:00 PM	0.288	0.11	15.22		
1/29/2008 1:30:00 PM	0.284	0.11	14.91		
1/29/2008 1:35:00 PM	0.281	0.11	14.69		
1/29/2008 1:39:00 PM				6	
1/29/2008 1:40:00 PM	0.299	0.12	17.84		
1/29/2008 1:45:00 PM	0.294	0.08	12.07		
1/29/2008 1:50:00 PM	0.286	0.08	11.20		
1/29/2008 1:54:00 PM				6	
1/29/2008 1:55:00 PM	0.279	0.08	10.79		
1/29/2008 2:00:00 PM	0.274	0.08	10.49		0.04

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 2:05:00 PM	0.269	0.08	10.21		
1/29/2008 2:09:00 PM				7	
1/29/2008 2:10:00 PM	0.266	0.08	10.03		
1/29/2008 2:15:00 PM	0.264	0.08	9.96		
1/29/2008 2:20:00 PM	0.262	0.08	9.85		
1/29/2008 2:24:00 PM				7	
1/29/2008 2:25:00 PM	0.261	0.08	9.76		
1/29/2008 2:30:00 PM	0.264	0.08	9.94		
1/29/2008 2:35:00 PM	0.268	0.06	7.61		
1/29/2008 2:39:00 PM				7	
1/29/2008 2:40:00 PM	0.271	0.06	7.73		
1/29/2008 2:45:00 PM	0.278	0.06	8.05		
1/29/2008 2:50:00 PM	0.284	0.08	11.05		
1/29/2008 2:54:00 PM				7	
1/29/2008 2:55:00 PM	0.284	0.09	12.43		
1/29/2008 3:00:00 PM	0.307	0.19	28.93		0.05
1/29/2008 3:05:00 PM	0.367	0.28	55.94		
1/29/2008 3:09:00 PM				7	
1/29/2008 3:10:00 PM	0.500	0.63	199.00		
1/29/2008 3:15:00 PM	0.612	1.10	460.73		
1/29/2008 3:20:00 PM	0.593	1.11	442.88		
1/29/2008 3:24:00 PM				7	
1/29/2008 3:25:00 PM	0.538	1.01	352.55		
1/29/2008 3:30:00 PM	0.491	1.50	459.08		
1/29/2008 3:35:00 PM	0.444	1.41	374.04		
1/29/2008 3:39:00 PM				7	
1/29/2008 3:40:00 PM	0.404	0.86	198.66		
1/29/2008 3:45:00 PM	0.366	0.68	136.12		
1/29/2008 3:50:00 PM	0.339	0.45	80.62		
1/29/2008 3:54:00 PM				7	
1/29/2008 3:55:00 PM	0.321	0.21	34.69		
1/29/2008 4:00:00 PM	0.307	0.21	32.49		0.09
1/29/2008 4:05:00 PM	0.297	0.21	30.93		
1/29/2008 4:09:00 PM				7	
1/29/2008 4:10:00 PM	0.288	0.21	29.69		
1/29/2008 4:15:00 PM	0.283	0.21	28.90		
1/29/2008 4:20:00 PM	0.289	0.21	29.78		
1/29/2008 4:24:00 PM				7	
1/29/2008 4:25:00 PM	0.323	0.19	31.67		
1/29/2008 4:30:00 PM	0.444	0.48	126.93		
1/29/2008 4:35:00 PM	0.516	0.82	270.11		
1/29/2008 4:40:00 PM	0.500	1.61	505.51		
1/29/2008 4:45:00 PM	0.449	0.95	256.57		
1/29/2008 4:50:00 PM	0.402	0.43	98.63		

Date/Time	Level (ft)	Velocity (ft/s)	Flow Rate (gpm)	Sample Event (SU)	Yeon Rain Gage (in)
1/29/2008 4:55:00 PM	0.367	0.41	82.28		
1/29/2008 5:00:00 PM	0.340	0.41	73.66		0.01
1/29/2008 5:05:00 PM	0.324	-0.10	-16.77		
1/29/2008 5:10:00 PM	0.312	-0.10	-15.86		
1/29/2008 5:15:00 PM	0.302	-0.10	-15.09		
1/29/2008 5:20:00 PM	0.296	-0.10	-14.70		
1/29/2008 5:25:00 PM	0.301	0.09	14.31		
1/29/2008 5:30:00 PM	0.339	0.39	69.87		
1/29/2008 5:35:00 PM	0.406	0.96	223.32		
1/29/2008 5:40:00 PM	0.508	1.15	368.55		
1/29/2008 5:45:00 PM	0.617	0.85	361.74		
1/29/2008 5:50:00 PM	0.641	1.04	462.04		
1/29/2008 5:55:00 PM	0.562	1.03	379.85		
1/29/2008 6:00:00 PM	0.478	1.24	364.35		0.00