Appendix C
Year 8 (2015 Permit)
Stormwater Discharge Monitoring Data, Shallow Groundwater UICs

(Laboratory reports and Excel data spreadsheet are provided electronically)

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Appendix C

Year 8 (2015 Permit), Stormwater Discharge Monitoring Data, Shallow Groundwater UICs

This report presents the stormwater discharge monitoring data collected in Year 8 (July 1, 2022, to June 30, 2023) of the City of Portland (City) 2015 Water Pollution Control Facilities (WPCF) Permit No. 102830 for Class V Stormwater Underground Injection Control Systems (UICs). Year 8 (2015 Permit) sampling was performed in accordance with the City's 2015 *Stormwater Discharge Monitoring Plan* (SDMP). This report is divided into the following sections detailing the locations sampled and the final results from the laboratory analysis:

1. Introduction
2. Sampling Design
    - Year 8 Monitoring Locations
    - Chemical Analysis
3. Results, Exceedances, and Response Actions
4. Analytical Data Validation

As required in Schedule B.5 of the 2015 Permit, data provided in the analytical laboratory reports are included as Table 2. Electronic files of the laboratory reports and an Excel spreadsheet are also included.

Introduction

The City has prepared this report to be included as part of the UIC Management Plan annual report in compliance with Schedule B.5 of its 2015 WPCF Permit.[1] The Oregon Department of Environmental Quality (DEQ) issued the City's second WPCF Permit Number 102830 in June 2015, which approved the City's required March 24, 2015, SDMP. The SDMP describes the stormwater monitoring strategy that the City will use throughout its second WPCF Permit term (June 2015 to May 2025) to evaluate stormwater discharges from public rights-of-way to City-owned UICs in areas of shallow groundwater.[2] Monitoring is conducted to demonstrate that the City's UIC Program protects beneficial uses of groundwater, meets WPCF Permit requirements, and satisfies requirements of the federal Safe Drinking Water Act and state UIC and groundwater regulations.

[1] The full name of the permit is the Water Pollution Facilities Permit for Class V Stormwater Underground Injection Control Systems.

[2] Areas of shallow groundwater refer to locations where UICs have < 5 feet of vertical separation distance between the bottom of the UIC and the seasonal high groundwater level. Seasonal high groundwater is discussed in Snyder's USGS Report 2008-5059, *Estimated Depth to Ground Water and Configuration of the Water Table in the Portland, Oregon, Area* (2008), http://pubs.usgs.gov/sir/2008/5059.

Sampling Design

To comply with the monitoring requirements of the 2015 Permit, the City implements a program to sample stormwater entering the City's UIC system from a subset of UICs located in areas of shallow groundwater and compare stormwater data to permit Action Levels.

There are approximately 120 UICs located in areas of shallow groundwater. Over the length of the 2015 Permit, a sample of 75 UICs will be selected from the list of UICs located in shallow groundwater. The 75 UICs will be broken up into five panels of 15 UICs each. Over the course of the 10-year permit, each panel will be sampled twice to achieve monitoring objectives in the SDMP. With a sample size of 75, approximately 61 percent of the UICs located in shallow groundwater will be sampled at the end of the 10-year period. A finite population correction[3] will reduce the width of confidence intervals associated with this design by almost 50 percent, in comparison to a sample size of 75 UICs selected from a population of 10,000. This design therefore has the equivalent power of a much larger sample from the entire UIC population.

A Generalized Random Tesselation Stratified (GRTS) survey design[4] will be used to select the 75 locations from the list of UICs in areas of shallow groundwater. A GRTS design will result in a random sample that is spatially balanced (i.e., a sample with a spatial distribution that is similar to the spatial distribution of the population).

The GRTS design also allows for simplifying the implementation of a sample design when some UICs are not suitable for sampling. A GRTS sample draw is an ordered list of sample locations that can be evaluated for sampling sequentially. The first 75 UICs on the list that are suitable for sampling are used as the sample, with sequential blocks of 15 UICs making up each of the five panels. For the purpose of choosing 75 UICs to sample, the entire population of UICs located in shallow groundwater areas was placed into random order using the R package survey.[5]

Year 8 Monitoring Locations

Year 8 (2015 Permit) sampling, was developed in accordance with the SDMP. As this is the 2nd permit term, locations were selected to assist in the evaluation of UICs located in shallow groundwater (<5 feet of vertical separation distance). Year 8 (2015 Permit) monitoring includes 15 sites which were previously sampled during the third year of the 2015 Permit. As detailed in the SDMP shallow groundwater sites monitored in years 1 - 5 years under the permit are to be repeated in years 6 - 10. See Table 1 and Figures 1 and 2 for site-specific information.

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[3] When sampling more than approximately 5 percent of a finite population, a finite population correction is applied to the standard error of parameter estimates (e.g., annual trends, means, or population percentiles). This correction increases the precision of parameter estimates when a large proportion of the population is sampled (https://www.sciencedirect.com/topics/mathematics/population-correction-factor).

[4] Stevens, D.L., Jr., and A.R. Olsen. 2004. "Spatially-balanced sampling of natural resources." *Journal of the American Statistical Association*. 99: 262–278. In collaboration with the U.S. Environmental Protection Agency, the City utilized the GRTS design to select its UIC stormwater monitoring program locations sampled for 2005 Permit compliance.

[5] Kincaid, T. M. and A.R. Olsen. 2013. *spsurvey: Spatial Survey Design and Analysis*. R package version 2.6 (https://cran.r-project.org/src/contrib/Archive/spsurvey/spsurvey_2.6.tar.gz).

Chemical Analysis

As identified in Table 1 of the 2015 Permit, six pollutants are required to be sampled and analyzed for each monitoring location (Benzo[a]pyrene, Pentachlorophenol, Di(2-ethylhexyl)phthalate, total lead, total zinc, and total copper). The list of pollutants and sampling and analytical methods can be found in the SDMP. Monitoring results are summarized below.

Results, Exceedances, and Response Actions

The analytical results from the 15 shallow groundwater monitoring locations are attached in Table 2. All laboratory data sheets are included electronically with the report. A review of the data indicated no Permit Table 1 Action Levels were exceeded, and thus no response actions were required. Collected data were also consistent with UIC monitoring that was conducted in the first WPCF Permit term.

When necessary, additional stormwater monitoring may be conducted to facilitate data interpretation, address stormwater data gaps, or demonstrate groundwater protection. During a review of the first UIC stormwater sample lab reports finalized by the WPCL from the 2022-23 fiscal year monitoring period, it was discovered that pentachlorophenol had not been reported. Upon further investigation, it was determined that samples had been collected for analysis using EPA Method 515.4, the current method for reporting pentachlorophenol; however, EPA Method 515.4 had not been included on the COC, and the samples had not been logged in for this analysis.

Once the oversight was discovered, the laboratory was instructed to add the analyses for all samples. However, the analyses were conducted outside of the method hold time of 14 days for extraction, by an additional 14 to 17 days. The method requires that extracts be analyzed within 21 days of extraction. A total of 13 samples were affected, in addition to two field duplicates, one field blank, and one equipment blank. According to the City, the analysis of pentachlorophenol, when not significantly outside of the method hold time, does not significantly affect data quality, although results may be biased low for other reported analytes that are less stable and not required by the permit, such as 2,4-D.

In response to the holding time exceedance for pentachlorophenol, the City evaluated data collected in 2022 and compared it to samples collected from the same sites in 2017. The specifics of the evaluations are documented in a memo provided to DEQ on March 13. 2023. The results of the evaluation demonstrated that pentachlorophenol 2022 monitoring results were consistent with 2017 results for the sampled locations except for one site (SG-048). All the results were below the permit actions level of 10 ug/L, but SG-048 was the only site that had a significant difference between the 2022 and 2017 collected samples. As a response action, this site was re-sampled for pentachlorophenol. The result (2.07 ug/L) indicated that the site was still below the permit action level and significantly lower than the 2022 result of 6.82 ug/L. As a result, no further action was deemed necessary. The City excluded the sample concentration with the holding time exceedance from the data evaluation presented in the tables and figures presented in this year's Annual Report.

Analytical Data Validation

Analytical results were reviewed to ensure that the data quality objectives defined in the Quality Assurance Project Plan were achieved, and they were determined to be acceptable and usable. A data usability report is attached.

Attachments:

- Table 1 - Year 8 (2015 Permit) UIC Monitoring Location Information
- Table 2 - Year 8 (2015 Permit) Monitoring Results
- Figures 1 and 2 - Year 8 (2015 Permit) UIC Monitoring Location Site Maps
- Data Usability Report
- Flash drive containing lab data sheets and Microsoft Excel database

Table 1: Year 8 (2015 Permit) UIC Monitoring Locations

Location Code	Approximate Address[1]	Traffic Category[2]	BES UIC ID[3]	DEQ UIC ID	Latitude	Longitude	UIC Depth (feet)	Pretreatment System[4]	Vertical Separation Distance (ft)[5]	Distance to Nearest Well (ft)[6]	Within Two-year Time of Travel from public drinking water well?
SG-018	5803 SE 122ND AVE	Collector	ADT682	10102-5288	45.48019409	-122.53735351	27	Sed MH	-11	1615	NO
SG-028	13515 SE HOLGATE BLVD	Collector	AMR622	10102-1908	45.48900985	-122.52449035	21	Sed MH	2	960	NO
SG-030	10402 SE ELLIS ST	Residential	ADV190	10102-169	45.48177337	-122.55564880	21	Bioswale, Sed MH	-1	1003	NO
SG-034	12319 SE RAMONA ST	Collector	ADT696	10102-5300	45.48014068	-122.53573608	20.2	Sed MH	0	1545	NO
SG-047	4022 NE 142ND AVE	Residential	AQT762	10102-9789	45.55225198	-122.51690281	29.2	Sed MH	3	684	NO
SG-048	4241 SE 136TH AVE	Collector	ADT475	10102-6335	45.49134826	-122.52353668	27	Sed MH	-8	798	NO
SG-049	5211 SE 122ND AVE	Collector	AQT796	10102-9784	45.48487472	-122.53798675	22	Sed MH	-1	1321	NO
SG-053	4919 SE 122ND AVE	Collector	AQT800	10102-9273	45.48637067	-122.53793747	16.6	Sed MH	4	958	NO
SG-054	5440 SE 111TH AVE	Collector	AQT767	10102-9791	45.48305865	-122.54922324	30.2	Sed MH	-9	621	NO
SG-055	11741 SE FOSTER RD	Collector	AQT811	10102-9814	45.47651054	-122.54310090	26.6	Sed MH	-7	1268	NO
SG-057	5500 SE 122ND AVE	Collector	AQT785	10102-9797	45.48308830	-122.53786675	20.8	Sed MH	0	1217	NO
SG-059	4656 NE 118TH AVE	Residential	ADQ418	10102-3576	45.55727005	-122.54135131	30.1	No Sed MH	3	1472	NO
SG-060	4144 SE 132ND AVE	Residential	ADT426	10102-6287	45.49193954	-122.52745056	30	Sed MH	-2	1399	NO
SG-061	12246 SE ELLIS ST	Residential	ADT687	10102-5292	45.48254776	-122.53687286	25	Sed MH	-4	1463	NO
SG-063	13820 SE GLADSTONE ST	Residential	ADT473	10102-6333	45.49227905	-122.52095794	20.9	Sed MH	4	520	NO

Notes:

[1] Addresses should not be considered precise location information and are subject to change as City staff better describe the physical UIC locations relative to nearby properties. UIC street addresses are assigned relative to nearby properties for general locating purposes. Latitude and longitude should be relied upon for accurate locating of UICs.

[2] Traffic Category (Residential <1000; Collector or greater >1000 Trips per day).

[3] BES UIC number is obtained from the BES Hansen database.

[4] Sed MH = Sediment manhole

[5] The estimated separation distance is defined as the approximate depth in feet from the bottom-most perforation in the UIC to the approximate seasonal-high groundwater level. The bottom-most perforation is defined as the bottom of the UIC – 2 feet. Two feet were added to all separation distance calculations to account for the standard depth of the sediment trap ring on standard City UIC design. This information is reported to DEQ by the City as "Depth to groundwater" (UIC Database Report) for inclusion in DEQ's UIC database. Reported to nearest foot. Separation distances are based on December 2008 USGS depth to groundwater data (Snyder, D.T., 2008, Estimated depth to ground water and configuration of the water table in the Portland, Oregon area: U.S. Geological Survey Scientific Investigations Report 2008-5095, 40p. Available at http://pubs.usgs.cov/sir/2008/5059).

[6] Horizontal distance to nearest groundwater drinking water well (e.g., muncipal, domestic, irrigation).

Table 2: Year 8 (2015 Permit) Monitoring Results

				Analyte	Pentachlorophenol		DEHP		Benzo(a)pyrene		Copper		Lead		Zinc	
				MADL (ug/L)	10		300		2.0		1,300		500		50,000	
				Method	EPA 515.4		EPA 8270-SIM		EPA 8270-SIM		EPA 200.8		EPA 200.8		EPA 200.8	
Site id	**Location Description**	**Traffic**	**Node**	**Date**												
SG-018	5803 SE 122nd Ave	Collector	ADT682	11/04/2022 13:20	H5	0.128	=	2	<	<0.010	=	12.9	=	3.02	=	47.2
SG-028	13515 SE Holgate Blvd	Collector	AMR622	11/04/2022 10:40	H5	0.131	<	<0.50	<	<0.010	=	7.34	=	3.55	=	54.5
SG-028 DUP	13515 SE Holgate Blvd	Collector	AMR622	11/04/2022 10:40	H5	0.138	<	<0.50	<	<0.010	=	7.59	=	3.42	=	53
SG-030	10402 SE Ellis St	Residential	ADV190	11/04/2022 14:39	H5	0.124	=	1.1	=	0.015	=	6.27	=	2.66	=	36.1
SG-034	12319 SE Ramona St	Collector	ADT696	11/04/2022 09:47	H5	3.15	J	0.85	=	0.022	=	11.4	=	2.75	=	57.6
SG-047	4022 NE 142nd St	Residential	AQT762	11/04/2022 13:43	H5	<0.0200	<	<0.50	<	<0.010	=	4.49	=	0.729	=	17.9
SG-048	4241 SE 136th Ave	Collector	ADT475	11/04/2022 09:18	H5	6.82	=	1.1	=	0.012	=	7.52	=	2.38	=	60.9
SG-048 RE	4241 SE 136th Ave	Collector	ADT475	02/28/2023 10:40	=	2.07	J+	2.5	=	0.024	=	13.2	=	4.62	=	177
SG-049	5211 SE 122nd Ave	Collector	AQT796	11/04/2022 11:10	H5	0.546	J	0.61	<	<0.010	=	5.28	=	1.18	=	22.8
SG-053	4919 SE 122nd Ave	Collector	AQT800	11/04/2022 10:49	H5	0.242	J	0.89	<	<0.010	=	5.12	=	1.08	=	22.1
SG-054	5440 SE 111th Ave	Collector	AQT767	01/18/2023 09:06	=	0.0881	J+	4.3	=	0.04	=	9.67	=	4.91	=	62.7
SG-055	11741 SE Foster Rd	Collector	AQT811	11/04/2022 14:11	H5	0.281	=	4.4	<	<0.033	=	18.6	=	8.46	=	82
SG-055 DUP	11741 SE Foster Rd	Collector	AQT811	11/04/2022 14:11	H5	0.289	=	5.1	=	0.044	=	18	=	8.32	=	79.3
SG-057	5500 SE 122nd Ave	Collector	AQT785	11/04/2022 13:44	H5	1.6	=	2.9	<	<0.033	=	13.9	=	7.43	=	66.1
SG-059	4656 NE 188th Ave	Residential	ADQ418	11/04/2022 14:03	H5	0.339	=	1.1	=	0.012	=	13.8	=	7.26	=	50.5
SG-060	4144 SE 132nd Ave	Residential	ADT426	11/04/2022 11:09	H5	0.256	<	<0.50	<	<0.010	=	2.11	=	0.662	=	14.9
SG-061	12246 SE Ellis St	Residential	ADT687	01/18/2023 10:10	=	0.167	J+	0.57	<	<0.010	=	2.34	=	0.645	=	14.9
SG-063	13820 SE Gladstone St	Residential	ADT473	11/04/2022 09:48	H5	0.149	<	<0.50	<	<0.010	=	2.68	=	0.814	=	12.4

Notes:

All concentrations in micrograms/per liter (ug/l)
MADL = Maximum Allowable Discharge Limit
DUP = Field Duplicate
RE = Resample
H5 = analyzed slightly outside of method holding time, data quality not affected, see Data Usability Report
J = estimated
J+ = estimated, possible high bias
[1]Traffic Category (Residential <1000; Collector or greater >1000 Trips per day).

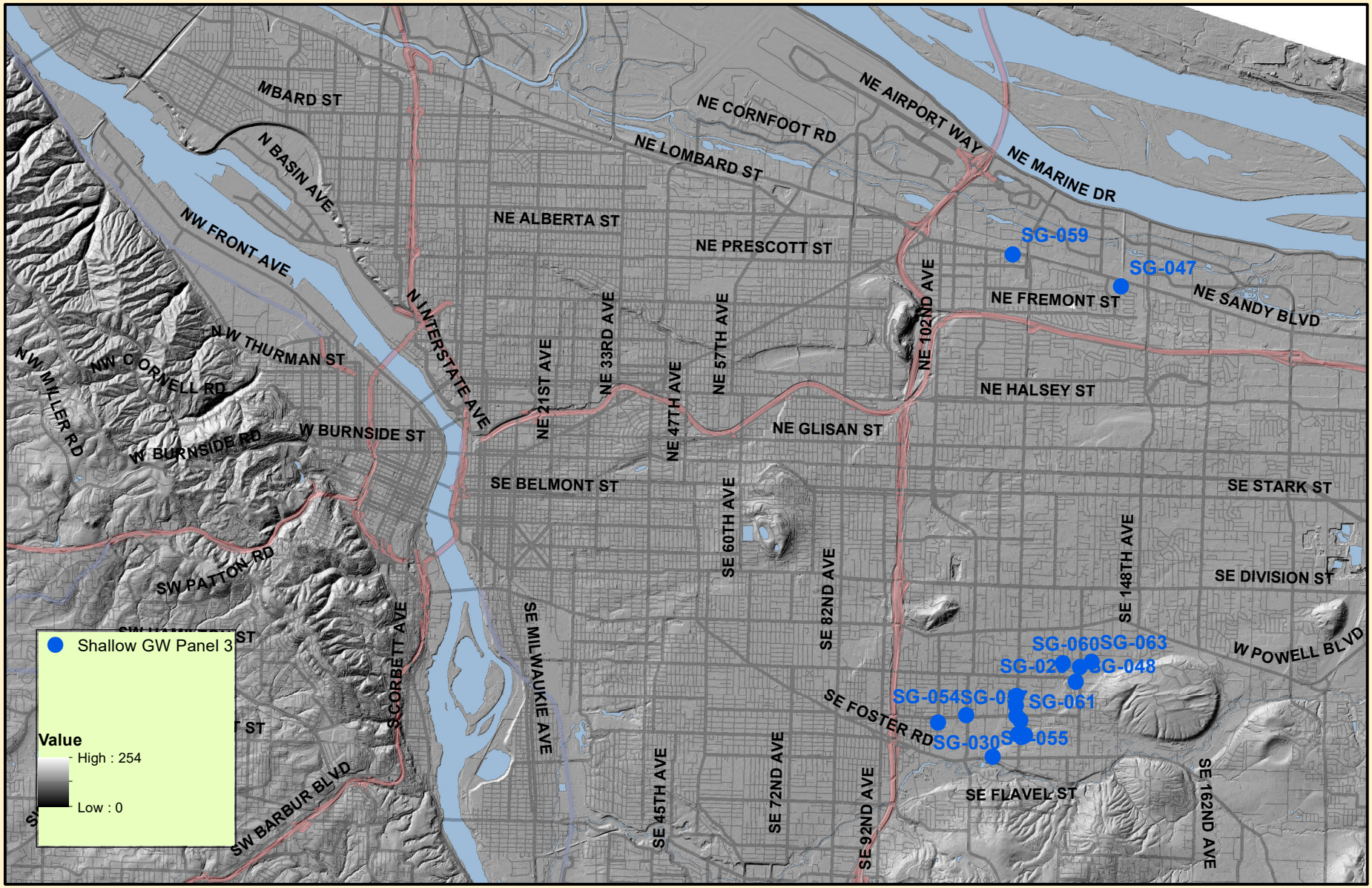

Figure 1
2022-23 Year 8 (2015 Permit) UIC Monitoring Locations

Monitoring Coordination & Analysis
Bureau of Environmental Services
City of Portland, Oregon

Source: ESRI Data & Maps CD
Created in ArcGIS 10.2 using ArcMap

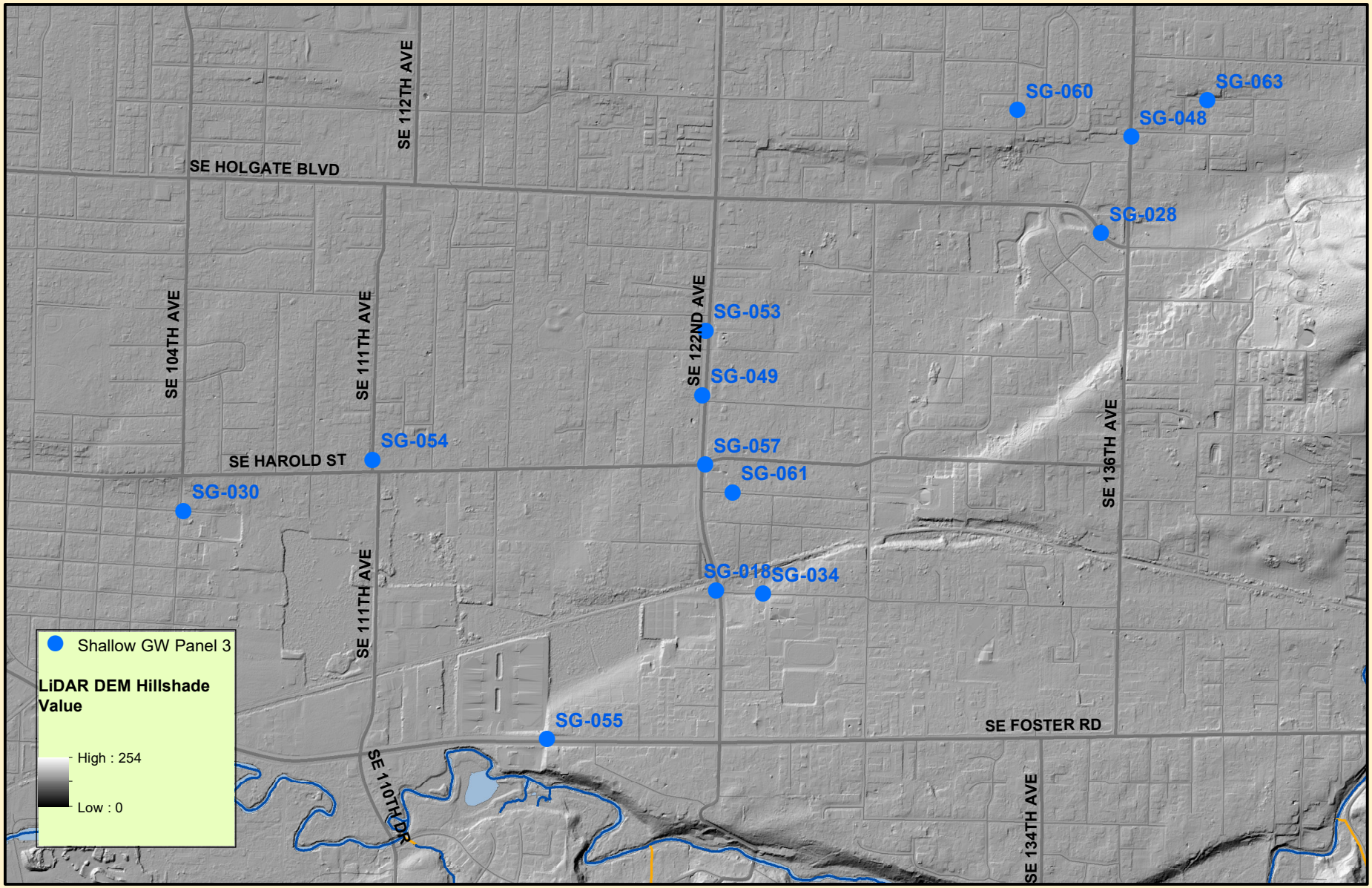

Figure 2
2022-23 Year 8 (2015 Permit) UIC Locations SE

Monitoring Coordination & Analysis
Bureau of Environmental Services
City of Portland, Oregon

Source: ESRI Data & Maps CD
Created in ArcGIS 10.2 using ArcMap

CITY OF PORTLAND BUREAU OF ENVIRONMENTAL SERVICES
UIC PROGRAM STORMWATER MONITORING
DATA USABILITY REPORT

YEAR 8 (2015 PERMIT) MONITORING
NOVEMBER 2022 – FEBRUARY 2023

1.0 INTRODUCTION

Analytical results for stormwater samples collected during Permit Year 8 (2015 Permit) were reviewed to evaluate data usability and adherence to project data quality objectives (DQOs). All data were evaluated using the project *Quality Assurance Project Plan* (QAPP-BES 2015) and *U.S. EPA Contract Laboratory Program National Functional Guidelines* (NFGs) *for Data Review* (BES 2015, EPA 2017a, 2017b) for guidance in evaluating the following:

- Field practices, field quality control (QC) samples, daily activity logs, and sample collection logs;
- Sample COC and receipt documentation, preparation and analytical holding times, and reporting and detection limits for chemicals of interest; and
- Laboratory data quality, in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC) as described in Section 2.5 of the QAPP.

2.0 SAMPLING SUMMARY

The City Bureau of Environmental Services (BES) Field Operations section performed sample collection and field parameter measurements for all compliance monitoring. Samples were collected from 15 locations during one "event" from November 4, 2022, through February 28, 2023. Sample locations are summarized in Table 1 attached to this summary.

Samples were collected in general accordance with the *Sampling and Analyses Plan* (SAP-BES 2015) and QAPP, contained in the final UIC *Stormwater Discharge Monitoring Plan* (SDMP). The SDMP includes all stormwater monitoring conducted at City UICs for UIC permit compliance.

3.0 ANALYTICAL SUMMARY

WPCL performed analyses for all compliance samples collected for Permit Year 8 (2015 Permit). Laboratory procedures were performed in general accordance with the QAPP except as noted below. The permit-required and PPS analytes measured during Permit Year 8 (2015 Permit) are listed below.

Analyte	Method	MRL (µg/L)	MADL (µg/L)	Lab
Pentachlorophenol	EPA 515.4	0.04	10	WPCL
Di(2-ethylhexyl)phthalate	EPA 8270-SIM	1.0	60	WPCL

Analyte	Method	MRL (µg/L)	MADL (µg/L)	Lab
Benzo(a)pyrene	EPA 8270-SIM	0.01	2.0	WPCL
Total Copper	EPA 200.8	0.2	1,300	WPCL
Total Lead	EPA 200.8	0.1	500	WPCL
Total Zinc	EPA 200.8	0.5	5,000	WPCL

MRL = method reporting limit
MADL = maximum allowable discharge limit

4.0 QAPP COMPLIANCE AND DATA USABILITY

BES Monitoring Coordination & Analysis (MCA) conducted an independent data usability assessment to ensure the data are usable. The findings are summarized below.

4.1 Field Practices

Field Data Sheets

Field data sheets (FDSs) are included in this report as Attachment 1. FDSs are used to record general and sample-specific information regarding site conditions, time of sample collection, visual stormwater observations, sample collection difficulties, deviations from the SDMP, and any information relating to potential pollutant sources. These logs were reviewed by both the Field Operations team leader and by MCA for completeness and consistency. No significant issues were identified during a review of field documents.

Field measurements including temperature, conductivity, and pH are recorded on WPCL COCs so that field data can be entered into the LIMS by the WPCL sample custodian. COCs are included with the analytical laboratory reports in Appendix E of the Permit Year 8 (2015 Permit) Annual Report.

Field and Lab QC Samples

One equipment blank per year and one field decontamination blank per event were collected and analyzed for the same parameters as stormwater samples. Field duplicate samples are collected at a frequency of one duplicate for every 10 locations sampled. Extra sample volume is also collected by field teams at selected locations to provide enough volume to perform matrix QC analyses. Typically, a laboratory will choose samples at random for MS/MSD analyses; however, for this project, there is an interest in evaluating potential matrix effects specific to stormwater discharged to publicly owned UICs. The results of field and laboratory QC samples are discussed in the respective sections below.

No issues were encountered that required resampling except as noted below in Section 4.2.1.

4.2 Data Usability Assessment

General

Discrete samples were collected at 15 sample locations, in addition to two field duplicates, one field decontamination blanks, and one equipment blank. Samples were delivered to WPCL on the same business day that they were collected. Laboratory sample receipt forms indicate that all sample containers arrived intact and that all container labels matched the COC documentation.

Some data were flagged as estimated using various flags to illustrate specific laboratory QC failures. Following a review of laboratory reports, case narratives, and field QC data by IMS, some of these flags were carried through as appropriate, and replaced with qualifiers presented below. Additional qualifiers were added, where necessary. Qualified data are still considered valid and usable (though should be used with caution), except for results that may have been qualified with an "R" (rejected). Qualifiers used for Permit Year 8 (2015 Permit) Event reporting are listed below:

J	Estimated concentration
J+	Estimated, possible/potential high bias
U	Not detected above MDL

Note that laboratory PARCC review for this report is generally limited to permit-required analytes and analyses necessary for reporting. For example, laboratory QC is reviewed for all samples analyzed by EPA Method 8270-SIM; however, RPDs for field duplicates are only calculated for UIC permit-required analytes. Additional review may be conducted where laboratory QC issues indicate more pervasive issues that may impact data quality for analytes not required for permit compliance monitoring.

Method Detection Limits

All method reporting limit (MRL) and detection limit (MDL) targets for permit-required analytes were met as specified in the QAPP (BES 2015).

MRLs were increased for selected analytes on individual samples where dilution was required in order to quantify analytes detected that were outside initial instrument calibration. Several samples required dilutions due to matrix interference for individual analytes. MRLs and MDLs did not exceed MADLs for any "non-detect" sample analytical results.

Matrix Spikes

Extra sample volume is collected by field crews at one out of every ten sample locations so that matrix QC can be performed on matrices specific to this monitoring effort. Where the laboratory does not have sufficient volume, a laboratory control sample (LCS) duplicate is analyzed in accordance with the respective methods.

4.2.1 Holding Times

Maximum allowable holding times, measured from the time of sample collection to the time of preparation or analysis, were met for each project sample collected for Permit Year 8 (2015 Permit) permit compliance except for the following:

Analysis	Sample	Samples Affected, Comments
515.4	SG-018, SG-028 (+DUP), SG-030, SG-034, SG-048, SG-049, SG-053, SG-055 (+DUP), SG-057, SG-059, SG-060, SG-063, FDBlank (11/4/23), EQBlank	Samples were analyzed approximately 2 weeks past the hold time due to EPA 515.4 being inadvertently left off the COC. Samples had been collected for 515.4 but not logged in, samples were run once the error was discovered.

Pentachlorophenol degradation and holding time studies were researched and the findings were included in a tech memo prepared and submitted to DEQ (BES 2023). Conclusions were that pentachlorophenol data were not likely affected as pentachlorophenol is more stable than other constituents in the environment that are reported by EPA Method 515.4, though results for analytes such as 2,4-D which have shorter half-lives may be biased low. SG-048 had the highest pentachlorophenol result at 6.82 ug/l which is close to the MADL of 10 ug/l. SG-048 was resampled to further evaluate the potential effect of missed holding times, the sample was analyzed within hold time and the resampled result was 2.08 ug/l which was significantly less than the original result analyzed outside of hold time.

Internal project work orders and COCs are typically prepared prior to the beginning of the wet season; however, these documents had not undergone peer review prior to being provided to field and lab staff. A corrective action was implemented to include peer review of all internal drafts including pre-prepared COCs prior to sharing final documents.

4.2.2 Blanks

In accordance with EPA guidelines, positive sample results should be reported unless the concentration of the compound in the project sample is less than or equal to 10 times (10x) the amount in any blank for metals and the common organic laboratory contaminants (methylene chloride, acetone, 2-butanone, cyclohexane, and phthalate esters), or 5 times (5x) the amount for other target compounds. Target compounds were not detected in associated blank samples (trip, equipment, method) prepared and analyzed concurrently with the project samples.

4.2.3 System Monitoring Compounds

System monitoring/surrogate compounds are added to each sample prior to the analysis of organic parameters by EPA methods 8270-SIM and 515.4 to confirm the efficiency of the sample preparation procedure. The calculated recovery for each surrogate compound was evaluated to confirm the accuracy of the reported results. All surrogate recoveries were within the acceptance limits specified in the QAPP except as noted below:

Analysis	Batch	Samples Affected	Comments
8270-SIM	B23A269	MSD	Fluoranthene-d10 results (146%) were slightly above the laboratory acceptance limit, three MSD results were slightly high, no other data appeared to be affected, no action taken.

4.2.4 Laboratory Control Samples

For Laboratory Control Samples (LCSs), samples of deionized water are analyzed following the addition of a known amount of analyte in order to confirm the ability of the analytical instrument to accurately quantify target compounds. LCSs were analyzed at the appropriate QAPP-specified frequency. Additionally, all LCS recoveries were within the acceptance limits for accuracy specified in the QAPP.

4.2.5 Matrix Spike/Matrix Spike Duplicates

For Matrix Spikes (MS)/Matrix Spike Duplicates (MSD), stormwater samples are analyzed following the addition of a known amount of analyte in order to evaluate any matrix effects that interfere with the ability of the analytical instrument to accurately quantify target compounds. Typically, results are not qualified based on MS/MSD results alone unless recoveries are well outside control limits. MS/MSDs were analyzed at the appropriate QAPP-specified frequency. Additionally, all MS recoveries and MS/MSD relative percent differences (RPDs) were within the acceptance limits for accuracy specified in the QAPP except as noted below:

Analysis	Batch	Samples Affected	Comments
8270-SIM	B22K143	none	Five MS/MSD results were slightly low, RPDs were acceptable, results generally within NFG criteria, no other QC issues for those analytes, no action taken.
8270-SIM	B22K407	none	Eight MS/MSD results were slightly low, RPDs were acceptable, results generally within NFG criteria, no other QC issues for those analytes, no action taken.
8270-SIM	B22L174	none	Eight MS/MSD results were slightly low, RPDs were acceptable, results generally within NFG criteria, no other QC issues for those analytes, no action taken.
8270-SIM	B23A269	none	Three MSD results were slightly high, RPDs were acceptable, results generally within NFG criteria, MSD surrogate recovery was slightly high, no action taken.
200.8	B23C103	none	Zinc (48%) MS result slightly above laboratory acceptance limit, spike amount too low relative to sample concentration, no other QC issues, no action taken.

No action was taken where MS/MSD results were above acceptance limits and all associated sample results were non-detect, or where spike amounts were too low relative to sample concentrations.

4.2.6 Duplicates

Field and laboratory duplicate samples were analyzed at the appropriate frequency and all recoveries were within the range specified in the QAPP except as noted below:

Analysis	Sample	Analyte	Concentration (µg/L)	Samples Affected, Comments
200.8	Other project	Zinc	4.99/3.75 (28%)	Laboratory duplicate RPD failed, source sample from different project, results from laboratory duplicate from this project acceptable, no action taken.

4.2.7 Other QC Issues

All continuing calibration verification results were within acceptance limits except as noted below:

Analysis	Batch	Sample(s) Affected	Comments
FO SOPs	B22L126	FDBlank (12/8/23)	Field measurements should be considered estimates as the post-measurement checks were outside of control criteria.
8270-SIM	B23A269	SG-054, SG-061	Bis(2-ethylhexyl)phthalate continuing calibration results were high, detects qualified with J+ for estimated, potential/possible high bias.
8270-SIM	B23C094	SG-048	Bis(2-ethylhexyl)phthalate continuing calibration results were high, detects qualified with J+ for estimated, potential/possible high bias.

No action was taken where CCV results were above acceptance limits and all associated sample results were non-detect.

4.3 Data Usability Summary

Appropriate sample collection and analytical methods were used for all samples and analyses, ensuring good comparability with other data. Analytical accuracy and precision were determined to be generally acceptable, with noted exceptions. Qualifiers were assigned based on other analytical QC results that exceeded project data quality criteria.

All other data reported should be considered valid as reported, representative of the samples collected, and acceptable for further use.

5.0 REFERENCES

City of Portland Bureau of Environmental Services (BES). 2015. *Quality Assurance Project Plan* - Stormwater Underground Injection Control System Monitoring. Prepared for Oregon Department of Environmental Quality (ODEQ). August 2006, revised March 2015.

City of Portland Bureau of Environmental Services (BES). 2015. *Final Stormwater Discharge Monitoring Plan* – consists of *Sampling and Analysis Plan* and *Quality Assurance Project Plan*. Prepared for Oregon Department of Environmental Quality (ODEQ). August 2006, revised March 2015.

City of Portland Bureau of Environmental Services (BES). 2023. Memo to File: *Missed Holding Times for 22/23 UIC Permit Monitoring*. Prepared for Oregon Department of Environmental Quality (ODEQ). March 13, 2023.

EPA 2002. Guidance on Environmental Data Verification and Data Validation. EPA-240-R-02-004 (EPA QA/G-8). Office of Environmental Information. November 2002.

EPA 2017a. USEPA National Functional Guidelines for Superfund Inorganic Methods Data Review. EPA-540-R-2017-001 (OLEM 9335.0-135). Office of Superfund Remediation and Technology Innovation (OSTRI). January 2017.

EPA 2017b. USEPA Contract Laboratory Program National Functional Guidelines for Organic Superfund Data Review. EPA-540-R-2017-002 (OLEM 9335.0-136). Office of Superfund Remediation and Technology Innovation (OSTRI). January 2017.

6.0 GENERAL

This summary report was prepared by the MCA sections of BES. For any questions concerning this report, contact Aaron Wieting at 503-823-5437.

Date of Final Report: August 25, 2023

Prepared by: Aaron B. Wieting, R.G., BES MCA

Reviewed by: Joel Bowker, R.G., BES UIC Program

TABLE 1: UIC Permit Year 8 (2015 Permit) Monitoring Locations

Location Code	Location Address	Traffic	Node
SG-018	5803 SE 122nd Ave	>1000	ADT682
SG-028	13515 SE Holgate Blvd	>1000	AMR622
SG-030	10402 SE Ellis St	<1000	ADV190
SG-034	12319 SE Ramona St	>1000	ADT696
SG-047	4022 NE 142nd Ave	<1000	AQT762
SG-048	4241 SE 136th Ave	>1000	ADT475
SG-049	5211 SE 122nd Ave	>1000	AQT796
SG-053	4919 SE 122nd Ave	>1000	AQT800
SG-054	5440 SE 111th Ave	>1000	AQT767
SG-055	11741 SE Foster Rd	>1000	AQT811
SG-057	5500 SE 122nd Ave	>1000	AQT785
SG-059	4656 NE 118th Ave	<1000	ADQ418
SG-060	4144 SE 132nd Ave	<1000	ADT426
SG-061	12246 SE Ellis St	<1000	ADT687
SG-063	13820 SE Gladstone St	<1000	ADT473

TABLE 2: UIC Permit Year 8 (2015 Permit) Field Duplicate Precision

UIC Permit Monitoring Year 18 Event 1
November 4, 2022 - February 28, 2023
Field Duplicate Precision

Constituent	Units	Precision	SG-028			SG-055		
		DQO	Primary	DUP	RPD	Primary	DUP	RPD
Benzo(a)pyrene	µg/L	30	< 0.01	< 0.01	**0.0**	< 0.033	0.044	**28.6**
Bis(2-ethylhexyl) phthalate	µg/L	30	< 0.5	< 0.5	**0.0**	4.4	5.1	**14.7**
Copper	µg/L	20	7.34	7.59	**3.3**	18.6	18	**3.3**
Lead	µg/L	20	3.55	3.42	**3.7**	8.46	8.32	**1.7**
Pentachlorophenol	µg/L	30	0.131	0.138	**5.2**	0.281	0.289	**2.8**
Zinc	µg/L	20	54.5	53	**2.8**	82	79.3	**3.3**

Notes:

RPD = Relative Percent Difference