Appendix D
Year 6 (2015 Permit)
Stormwater Discharge Monitoring Data, Shallow Groundwater UICs

(Laboratory reports and Excel spreadsheet are provided electronically)

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Appendix D

Year 6 (2015 Permit), Stormwater Discharge Monitoring Data, Shallow Groundwater UICs

This report presents the stormwater discharge monitoring data collected in Year 6 (July 1, 2020, to June 30, 2021) 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 6 (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 6 Monitoring Locations
    - Chemical Analysis
3. Results, Exceedances, and Response Actions
4. Analytical Data Validation

Year 6 monitoring locations are provided in Table 1. 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 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. The 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 spsurvey.[5]

Year 6 Monitoring Locations

Year 6 (2015 Permit) sampling was developed in accordance with the SDMP. For this second permit term, locations were selected to assist in evaluating UICs located in shallow groundwater (<5 feet of vertical separation distance). Year 6 (2015 Permit) monitoring includes 15 sites (Panel 1) which were previously sampled during the first year of the 2015 Permit. As detailed in the SDMP shallow groundwater sites monitored in years 1 - 5 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 can significantly increase the precision of parameter estimates when a large proportion of the population is sampled (http://en.wikipedia.org/wiki/Standard_error#Correction_for_finite_population).

[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 (http://www.epa.gov/nheerl/arm).

During Year 6 sampling, one UIC location was replaced. Since the original sampling of site SG-15 (6245 NE 80th Ave.) in Year 1, green infrastructure was placed upstream reducing flow to the UIC. Due to this change the sampling crew was not able to sample a storm with large enough flows to allow for sample collection. After multiple attempts to collect a sample it was determined that a replacement site would be used. SG-109 (5906 SE 122nd Ave.) was chosen as a replacement and subsequently sampled during the Year 6 monitoring. Site information for this location is included in Table 1.

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 this report. 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.

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 6 (2015 Permit) UIC Monitoring Location Information
- Table 2 - Year 6 (2015 Permit) Monitoring Results
- Figures 1 and 2 - Year 6 (2015 Permit) UIC Monitoring Location Site Maps
- Data Usability Report
- Flash drive containing lab data sheets and Microsoft Excel database

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Table 1: Year 6 (2015 Permit) UIC Monitoring Location Information

Location Code	Approximate Address[a]	Traffic Category[b]	Predominant Land Use[c]	BES UIC ID[d]	DEQ UIC ID	Latitude	Longitude	UIC Depth (feet)	Pretreatment System[e]	Vertical Separation Distance[f]	Distance to Nearest Well (feet)[g]	Within Two-year Time of Travel from Public Drinking Water Well?
SG-001	2542 SE 18th Ave	Residential	SFR	APR303	10102-9640	45.50400	-122.6480	23	No Pretreatment	2	2635	No
SG-002	12140 SE Ramona St	Collector	POS	ADT716	10102-5319	45.48055	-122.5376	28	Sed MH	-11	1482	No
SG-004	5031 SE 128th Ave	Residential	SFR	ADU738	10102-5921	45.48539	-122.5322	30	Sed MH	-11	761	No
SG-005	12524 SE Schiller St	Residential	SFR	ADU744	10102-5925	45.48738	-122.5343	16	Sed MH	2	513	No
SG-007	8312 SE 75th Pl	Residential	SFR	ADV951	10102-120	45.46346	-122.5861	30	Sed MH	2	2515	No
SG-008	4332 SE 130th Ave	Collector	SFR	ADT455	10102-822	45.49054	-122.5300	20	Sed MH	1	1256	No
SG-010	10298 SE Ellis St	Residential	SFR	ADV187	10102-5463	45.48182	-122.5573	23.5	Sed MH	0	1427	No
SG-011	11540 SE Foster Rd	Collector	COM	AQT810[h]	10102-5280	45.47639	-122.5445	18	Sed MH	-6	1292	No
SG-012	13250 SE Holgate Blvd	Collector	SFR	ANA590	10102-711	45.48959	-122.5269	10	Sed MH	-1	1024	No
SG-016	13236 SE Cora St	Residential	SFR	ADT463	10102-6324	45.49155	-122.5267	23.3	Sed MH	-1	1543	No
SG-017[i]	5403 SE 122nd Ave	Collector	COM	AQT792[h]	10102-5900	45.48409	-122.5380	20.8	Sed MH	-4	1048	No
SG-019	5905 SE 102nd Ave	Residential	SFR	ADV144	10102-165	45.47945	-122.5586	20.6	Sed MH	4	1961	No
SG-020	13030 SE Mitchell St	Residential	SFR	ADU753	10102-5934	45.48421	-122.5291	30	Sed MH	2	1010	No
SG-021	4754 SE 122nd Ave	Collector	COM	AQT805[h]	10102-5888	45.48746	-122.5377	20.3	Sed MH	1	682	No
SG-109	5906 SE 122nd Ave	Collector	COM	ADV205	10102-5287	45.48746	-122.5377	27	Sed MH	-7	1442	No

Notes:

[a] 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.

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

[c] COM = commerical; POS = Parks and Open Space; SFR = Single Family Residential; MFR = Multifamily Residential; IND = Industrial

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

[e] Sed MH = Sedimentation manhole

[f] 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).

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

[h] A new sump was installed in 2015; the old sump was converted to a sedimentation manhole.

[i] Site SG-017 sample was taken from the Sed MH ADW271 instead of sump AQT805, due to the Sed MH leaking and not allowing enough flow into the sump.

Table 2: Year 6 (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-001	2542 SE 18th Ave (<1000)	<1000	APR303	11/18/20 11:27	=	0.068	=	1	<	0.01	=	2.45	=	1.44	=	17.3
SG-002	12140 SE Ramona St	>1000	ADT716	10/13/20 8:50	=	0.936	=	3.8	=	0.023	=	9.21	=	2.39	=	52.8
SG-004	5031 SE 128th Ave (<1000)	<1000	ADU738	10/13/20 9:31	=	0.508	=	1.6	=	0.018	=	6.74	=	2.03	=	40.4
SG-005	12524 SE Schiller St	<1000	ADU744	12/20/20 11:02	=	0.028	<	0.5	<	0.01	=	3.69	=	1.86	=	13
SG-007	8312 SE 75th Pl (<1000)	<1000	ADV951	10/13/20 9:27	=	0.094	<	0.5	<	0.01	=	4.3	=	0.896	=	13
SG-008	4332 SE 130th Ave (>1000)	>1000	ADT455	11/14/20 13:15	=	0.189	=	0.76	<	0.01	=	6.88	=	2.65	=	20.9
SG-010	10298 SE Ellis St (<1000)	<1000	ADV187	11/14/20 16:09	=	0.107	=	1.3	<	0.01	=	3.73	=	3.19	=	25.1
SG-011	11540 SE Foster Rd (>1000)	>1000	ADW312	11/13/20 8:50	=	0.639	=	2.1	<	0.01	=	15.4	=	6.21	=	68.7
SG-012	13250 SE Holgate Blvd	>1000	ANA590	10/13/20 10:00	=	0.839	=	2.4	=	0.019	=	9.58	=	3.96	=	48.3
SG-016	13236 SE Cora St (<1000)	<1000	ADT463	11/14/20 15:34	=	0.15	=	0.65	<	0.01	=	3.16	=	1.09	=	15.1
SG-016	Field Duplicate	<1000	ADT463	11/14/20 15:34	=	0.154	=	0.72	<	0.01	=	3.14	=	1.05	=	14.7
SG-017	5403 SE 122nd Ave	>1000	ADW271	11/14/20 14:29	=	0.893	=	4.1	=	0.011	=	8.72	=	1.88	=	47.9
SG-019	5905 SE 122nd Ave	<1000	ADV144	11/13/20 8:18	=	0.064	<	0.5	<	0.01	=	1.78	=	0.337	=	8.49
SG-020	13030 SE Mitchell St	<1000	ADU753	12/20/20 10:24	=	0.044	<	0.5	<	0.01	=	1.35	=	0.22	=	6.56
SG-020	Field Duplicate	<1000	ADU753	12/20/20 10:24	=	0.05	<	0.5	<	0.01	=	1.34	=	0.204	=	5.86
SG-021	12205 SE Schiller St	>1000	AQT805	11/14/20 13:48	=	0.267	=	3.9	=	0.011	=	10.6	=	2.39	=	45.7
SG-109	5906 SE 122nd Ave	>1000	ADV205	1/4/21 11:23	=	0.757	=	2.3	<	0.01	=	4.1	=	2.22	=	24.1

Note:

All concentrations in micrograms/per liter (ug/l)

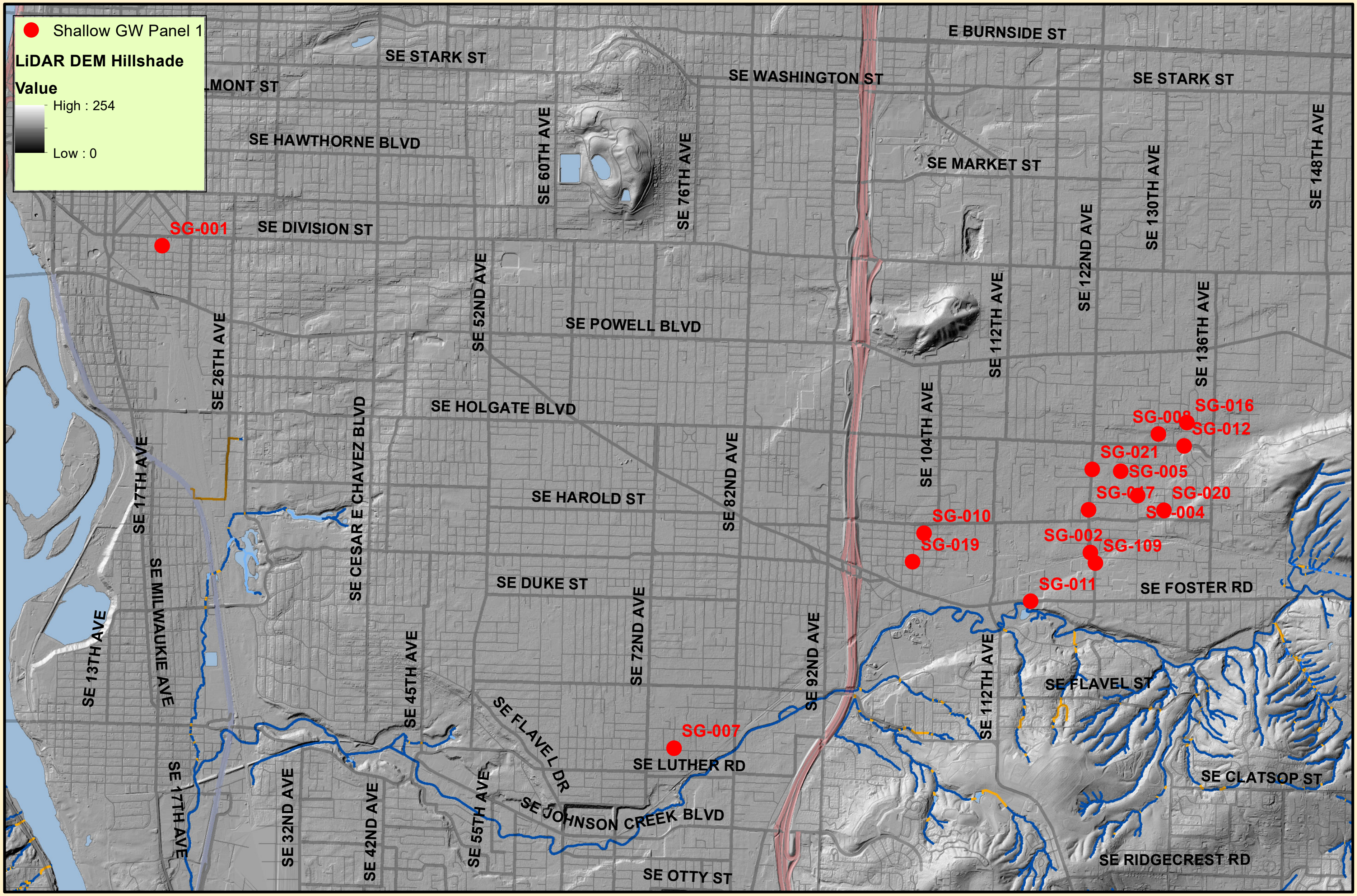

Figure 1
2020-21 Year 6 (2015 Permit) UIC Monitoring Locations

Environmental Services
City of Portland

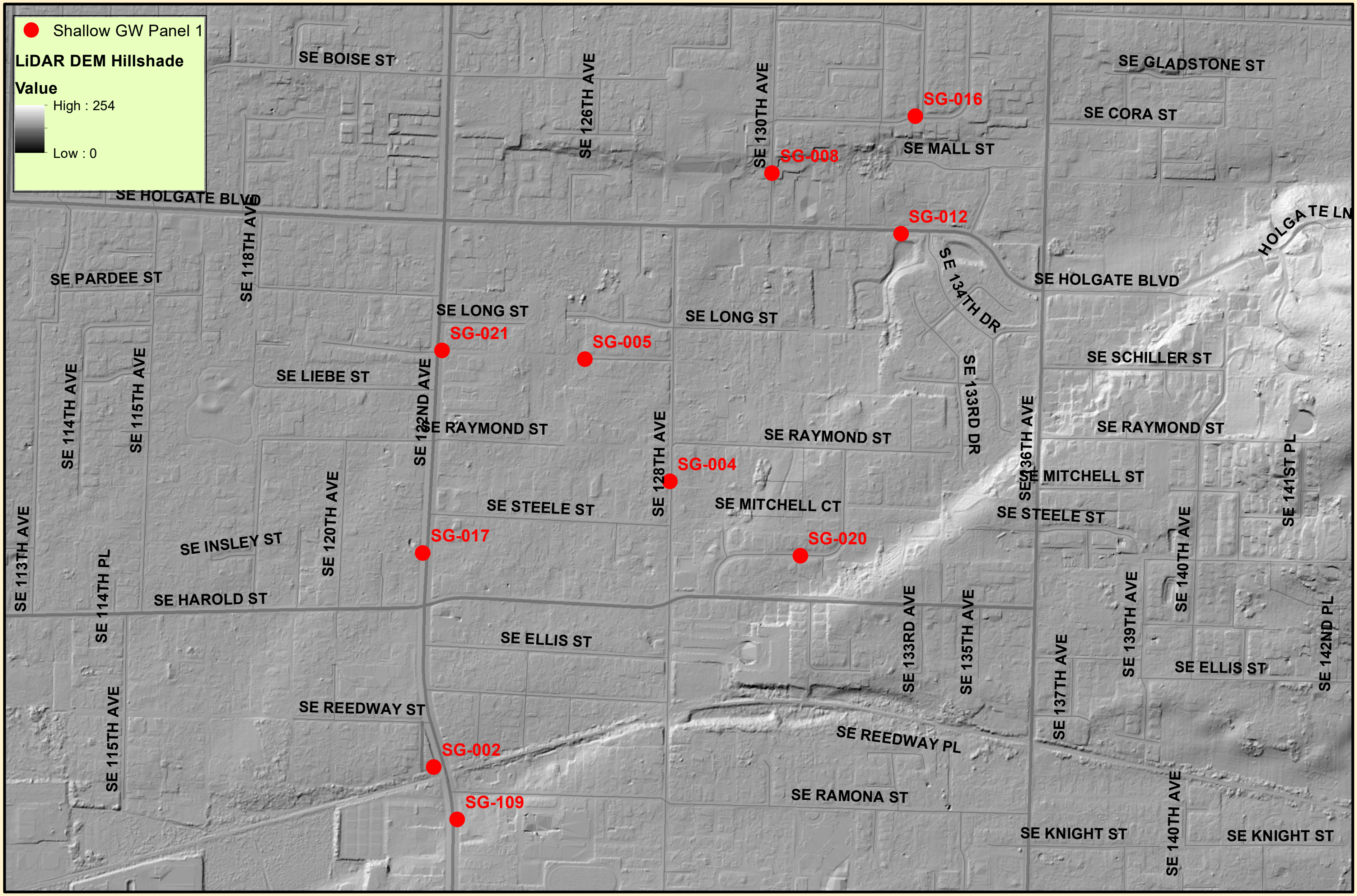

Figure 2
2020-21 Year 6 (2015 Permit) UIC SE Monitoring Locations

ENVIRONMENTAL SERVICES
CITY OF PORTLAND

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

YEAR 16 MONITORING
OCTOBER 2020 – JANUARY 2021

1.0 INTRODUCTION

Analytical results for stormwater samples collected during Permit Year 6 of the 2015 Water Pollution Control Facilities (WPCF) Permit (PY 16) 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) 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 chain of custody (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 “events” from October 13, 2020 through January 4, 2021. Sample locations are summarized in Table 1 attached to this summary.

Samples were collected in general accordance with the *Sampling and Analyses Plan* (SAP) 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 PY 16. Laboratory procedures were performed in general accordance with the QAPP except as noted below. The permit-required analytes measured during PY16 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 Investigation & Monitoring Services (IMS) conducted an independent data usability assessment to ensure the data are usable. Findings are summarized below.

4.1 Field Practices

Daily Activity Logs
Daily activity logs consist of field data sheets (FDSs) which 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 IMS for completeness and consistency. No significant issues were identified during 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 PY16 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 quality control (QC) analyses. Typically, a laboratory will choose samples at random for matrix spike / matrix spike duplicate (MS/MSD) analyses; however, for this project there is an interest in evaluating potential matrix effects specific to stormwater discharged to publicly-owned UICs. Results of field and laboratory QC samples are discussed in respective sections below.

No issues were encountered that required resampling.

4.2 Data Usability Assessment

General
Discrete samples were collected at 15 sample locations, in addition to three field duplicates, two field decontamination blanks, and one equipment blank. Site SG-015 was replaced with site SG-109 as sampling was unsuccessful due to insufficient flow despite several attempts. There are multiple green streets connected to Site SG-015 and the site was previously sampled in Year 11 following a week of wet weather culminating with a >2” storm event.

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 all container labels matched the COC documentation.

Some data were flagged as estimated using various flags to illustrate specific laboratory QC failures. Following 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 PY 16 Event reporting are listed below:

J	Estimated concentration
J+	Estimated, potential/probable high bias
JB	Estimated due to blank contamination
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, relative percent differences (RPDs) for field duplicates are only calculated for UIC permit-required analytes. This review also includes parameters collected for municipal separate storm sewer system (MS4) permit compliance. 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 Permit action levels 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 PY16 permit compliance.

4.2.2 Blanks

In accordance with EPA guidelines, positive sample results should be reported unless the concentration of the target 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, except for the following:

Analysis	Sample	Analyte	Concentration (μg/L)	Samples Affected, Comments
WPCL SOP10	Field blank (B20J215)	Mercury, dissolved	0.000854	SG-002, SG-004, SG-007, SG-012, and P1_4 results JB-qualified for sample results < 10x blank result.
WPCL SOP10	Method blank (B20K292)	Mercury, dissolved	> ½ MRL	SG-011 and SG-019 detects JB-qualified for sample result < 10x blank result.

4.2.3 System Monitoring Compounds

System monitoring/surrogate compounds are added to each sample prior to 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.

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 except for the following:

Analysis	Batch	Samples Affected	Comments
8270-SIM	B20J298	SG-002, SG-004, SG-012	Benzo(a)anthracene (136%) recovery above laboratory acceptance limit, detects qualified with "J+" for estimated, probable high bias.

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 RPDs were within the acceptance limits for accuracy specified in the QAPP except as noted below:

Analysis	Batch	Samples Affected	Comments
8270-SIM	B20J298	none	Naphthalene MS/MSD results (145%/152%) slightly above laboratory acceptance limit, RPD acceptable, analyte not detected, no action taken.
515.4	B20J332	none	Acifluorfen (160%) and Dinoseb (156%) MS1 results above laboratory acceptance limits, analytes not detected, no action taken.
8270-SIM	B20K266	none	Acenaphthylene (144%/140%) MS/MSD results above laboratory acceptance limit, RPD acceptable, no action taken.
515.4	B20K289	none	Acifluorfen (150%) and Dinoseb (183%) MS1 results above laboratory acceptance limits, analytes not detected, no action taken.
8270-SIM	B20K314	none	Benzo(a)anthracene (132%) and Indeno(1,2,3-cd)pyrene 140% MSD results slightly above laboratory acceptance limits, MS results and RPDs acceptable, no action taken.
515.4	B20K290	none	Dinoseb (134%) MS1 results above laboratory acceptance limits, analytes not detected, no action taken.
200.8	B20K336	none	Calcium and Magnesium (725%/695%) MS/MSD results exceeded acceptance limits, spike amount too low relative to sample concentrations, no action taken.
515.4	B20L002	none	3,5-Dichlorobenzoic acid MS1 result (162%) above laboratory acceptance limit, analyte not detected, no action taken.

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, Batch	Analyte	Concentration (µg/L)	Samples Affected, Comments
SM2540D	P1_14, B20K315	TSS	8/6 (29%)	Laboratory duplicate RPD failed, results < 5x MRL, no action taken.
WPCL SOP10	P1_7, B20K294	Mercury, dissolved	0.00225/0.00158 (35%)	Laboratory duplicate RPD failed, results < 5x MRL, no action taken.
WPCL SOP10	P1_13, B20K411	Mercury, dissolved	0.00110/0.00140 (25%)	Laboratory duplicate RPD failed, results < 5x MRL, no action taken.
WPCL SOP10	B20L323	Mercury	0.0137/0.0100 (30%)	Laboratory duplicate RPD failed, results < 5x MRL, no action taken.
WPCL SOP10	P1_14	Mercury	<0.003/0.0037 (21.2%)	Field duplicate RPD failed, results < 5x MRL, no action taken.
WPCL SOP10	P1_13, P1_14	Mercury, dissolved	0.0011/0.0008, (31%), 0.00148/0/0018 (20.6%)	Field duplicate RPD failed, results < 5x MRL, no action taken.

4.2.7 Other QC Issues

Continuing calibration verification (CCV) results were high for the following analyses:

Analysis	Batch	Samples Affected	Comments
8270-SIM	B20J298	none	Di-n-octyl phthalate CCV results were above laboratory acceptance limits, analyte not detected, no action taken.
8270-SIM	B20K314	SG-001	Di-n-butyl phthalate, diethyl phthalate, di-n-octyl phthalate, and bis(2-ethylhexyl)phthalate CCV results were above laboratory acceptance limits, detects were qualified with J+ for estimated, potential high bias.
8270-SIM	B20L344	none	Di-n-butyl phthalate, di-n-octyl phthalate, and bis(2-ethylhexyl)phthalate CCV results were above laboratory acceptance limits, analytes not detected, no action taken.
8270-SIM	B21A046	none	Di-n-octyl phthalate CCV results were above laboratory acceptance limits, analyte not detected, no action taken.

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.

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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.

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6.0 GENERAL

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

Date of Final Report: August 2, 2021

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

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

TABLE 1: UIC Program Year 16 Monitoring Locations

Location Code	Location Address	Traffic	Node
SG-001	2542 SE 18th Ave	<1000	APR303
SG-002	12140 SE Ramona St	>1000	ADT716
SG-004	5031 SE 128th Ave	<1000	ADU738
SG-005	12524 SE Schiller St	<1000	ADU744
SG-007	8312 SE 75th Pl	<1000	ADV951
SG-008	4332 SE 130th Ave	>1000	ADT455
SG-010	10298 SE Ellis St	<1000	ADV187
SG-011	11540 SE Foster Rd	>1000	ADW312
SG-012	13250 SE Holgate Blvd	>1000	ANA59
SG-016	13236 SE Cora St	<1000	ADT463
SG-017	5403 SE 122nd Ave	>1000	ADW271
SG-019	5905 SE 122nd Ave	<1000	ADV144
SG-020	13030 SE Mitchell St	<1000	ADU753
SG-021	12205 SE Schiller St	>1000	AQT805
SG-109	5906 SE 122nd Ave	>1000	ADV205

TABLE 2: UIC Program Year 16 Field Duplicate Precision

UIC Permit Monitoring Year 16 Event 1 October 13, 2020 - January 4, 2021 Field Duplicate Precision								
Constituent	**Units**	**Precision DQO**	**SG-016**					
			Primary		**DUP**		**RPD**	
2,4-D	µg/L	30	<	0.2	<	0.2	**0.0**	
Benzo(a)pyrene	µg/L	50	<	0.01	<	0.01	**0.0**	
DEHP	µg/L	50		0.72		0.65	**10.2**	
Calcium	mg/L	20		1.5		1.53	**2.0**	
Carbon, total organic	mg/L	20		11		11	**0.0**	
Copper	µg/L	20		3.14		3.16	**0.6**	
Copper, dissolved	µg/L	20		1.37		1.36	**0.7**	
Hardness, total	mg/L	20		4.99		5.06	**1.4**	
Lead	µg/L	20		1.05		1.09	**3.7**	
Lead, dissolved	mg/L	20	<	0.106	<	0.106	**0.0**	
Magnesium	mg/L	20		0.304		0.299	**1.7**	
Mercury	µg/L	20		0.00413		0.00367	**11.8**	
Mercury, dissolved	µg/L	20		0.00128		0.00149	**15.2**	
Nitrogen - ammonia	mg/L	20	<	0.02	<	0.02	**0.0**	
Nitrogen - nitrate	mg/L	20	<	0.1	<	0.1	**0.0**	
Pentachlorophenol	µg/L	30		0.154		0.15	**2.6**	
Ortho-phosphate	mg/L	20		0.085		0.08	**6.1**	
Phosphorus, total	mg/L	20		0.162		0.164	**1.2**	
TSS	mg/L	20		17		16	**6.1**	
Zinc	µg/L	20		14.7		15.1	**2.7**	
Zinc, dissolved	µg/L	20		6.46		6.46	**0.0**	

Notes:

Yellow values exceed precision data quality objective (DQO) but are < 5x the MRL

RPD = Relative Percent Difference

DEHP = bis 2-ethylhexyl phthalate

TSS = total suspended solids