CITY OF PORTLAND
ENVIRONMENTAL SERVICES
1120 SW Fifth Avenue, Room 1000, Portland, Oregon 97204 ▪ Ted Wheeler, Mayor ▪ Michael Jordan, Director

August 20, 2020

Ms. Christine Svetkovich

Department of Environmental Quality
Northwest Region Portland Office/Water Quality
700 NE Multnomah Street, Suite 600
Portland, OR 97232-4100

Subject: · Downtown Portland, Oregon Riot Control Agent
2020 Stormwater Sampling and Analysis Plan and Sampling Event Summary

Dear Christine:

This letter presents the project-specific Sampling and Analysis Plan (SAP) for conducting stormwater monitoring to evaluate potential impacts to the storm system from Riot Control Agents (RCAs) used approximately from May through early August 2020 by the Portland Police Bureau (PPB) and Federal Agents in the vicinity of the Multnomah County Justice Center ("Justice Center") and Mark O. Hatfield US District Courthouse ("US Courthouse") located at 1120 and 1000 SW 3rd Avenue in downtown Portland, Oregon. The four square city blocks contributing to flow along SW 3rd Avenue from SW Madison St. to SW Salmon St is referred to here as the "RCA Use Study Area" (Maps 1 & 2).

This SAP was developed in response to DEQ's letter dated July 30, 2020 (Svetkovich 2020) and in accordance with the Stormwater Monitoring Plan (MP, BES 2016) prepared for compliance with requirements included in the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separated Storm Sewer System (MS4) Permit #101314 (BES 2016). An August 20, 2020 deadline was provided for completion of this SAP; however, before the SAP was completed, a small storm was forecasted and successfully sampled by City of Portland Bureau of Environmental Services (BES) Field Operations (FO) team members on the morning of August 6, 2020. Therefore, this letter also includes a summary of storm sampling activities. Stormwater sample analytical results will be provided in a separate letter report within two weeks of receipt of analytical data.

Background

RCAs including tear gas, smoke bombs, and non-lethal rounds were deployed in response to protests at, and in the vicinity of, the Justice Center and US Courthouse in downtown Portland from approximately May 29 through the end of July 2020 (Maps 1 and 2). Beginning on July 28, 2020, unidentified personnel were observed hosing off the sidewalks and streets by the US Courthouse

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(Powers and Blumenauer, 2020), potentially discharging RCA residuals to the City's storm sewer system which leads to City of Portland Outfall 8A on the Willamette River just south of the Hawthorne Bridge (Map 1). In response to unauthorized non-stormwater discharges to the MS4, BES initiated an investigation in accordance with the MS4 permit Schedule A.4.a requirements and performed storm sewer catch basin cleaning on July 31, 2020 for six inlets located in proximity of the Justice Center and US Courthouse.

Plan Objectives

Stormwater monitoring is intended to represent a seasonal first flush event and is targeted for the first storm event that produces sufficient runoff in late Summer/early Fall 2020. Specific objectives of this monitoring effort include answering the following questions:

- Do remaining residuals from RCA use in the downtown area have the potential to enter the City's MS4 and be conveyed to the Willamette River via stormwater?
- Is further action required to prevent or minimize the transport of RCA residuals to receiving waters?

All analytical results collected under this SAP will be evaluated by comparing stormwater data to existing datasets for stormwater collected in the Portland area.

Limitations of this monitoring effort are summarized below:

- Monitoring is not intended to evaluate human health risk from direct exposure to RCAs where applied in accordance with manufacturer's specifications;
- Characterization of stormwater is conducted with incomplete knowledge of the nature of RCAs used recently in Portland as identity of some ingredients in RCAs and their respective percentages of product volume are listed as trade secrets in the available Material Safety Data Sheets (MSDSs);
- Standard laboratory analytical methods are not available for most active ingredients in RCAs, therefore data analysis and interpretation rely primarily on metals present in RCA compounds as surrogates for other constituents.

Outfall Basin Selection

Though recent RCA use in downtown Portland has been well-documented through the news and social media, the City also evaluated citizen-generated Geographical Information System (GIS) data to confirm the approximate geographical extent of RCA use (Brumbaugh-Smith 2020). GIS data were generated through video footage from local journalists and not collected by the City, therefore, accuracy of the data cannot be assessed or confirmed, but based on news reports, data appeared to be of sufficient quality to set approximate boundaries for the project area.

RCA use in downtown Portland appeared to be confined to two basins, MS4 outfall basin 8A and an adjacent combined sewer basin to the north (Map 1). Based on location of the protests and GIS data, the majority of RCA use appears to have been in basin 8A. The combined sewer basin area discharges to the Columbia Boulevard Wastewater Treatment Plant, is outside the MS4 system, and not covered by the DEQ directive for this monitoring plan.

Basin 8A is part of the downtown Portland core and is comprised mostly of impervious surfaces with some open space adjacent to the Justice Center and in the Park Blocks. Land use is primarily commercial with some public property, multi-family residential, high traffic streets, and mass transit

corridors (see Map 1).

Monitoring Locations

Three monitoring locations and one alternate location were selected for sampling to characterize outfall stormwater, stormwater from the immediate vicinity of the US Courthouse, and a control point outside and up-the-pipe from the area of heaviest documented RCA use. In accordance with DEQ's letter dated July 30, 2020 stormwater sampling was attempted at the outfall to characterize stormwater discharge directly to receiving waters. Outfall 8A, like most major stormwater outfalls within the City, is partially to completely submerged during much of the year. At some lower elevation locations within the MS4, river water backs up into the system and may prevent sample collection even at relatively low river levels. Sampling was unsuccessful at the outfall as the outfall was submerged and insufficient positive flow was observed by field team members; sampling was successful at the first alternate location (See field notes in Attachment 1 and photographs in Attachment 2).

In addition, each sampling location, including the outfall alternate location, includes some dry-weather baseflow from groundwater intrusion into the storm sewer system and from permitted non-contact cooling water discharges. Sampling locations were inspected prior to sampling to observe baseflow conditions and to judge during storm sampling when flows in the pipes had increased sufficiently to ensure that samples collected represent primarily stormwater discharge.

Sampling locations for basin 8A are depicted on Maps 1 and 2 and are described below.

Basin	Sampling Location	Description
8A	Outfall ABQ663	Samples to be collected directly from the outfall, which is a 72" line. This is a primary sampling location but may be submerged even at relatively low river levels. An alternate sampling location is provided as the first accessible manhole (ABQ608) upstream from the outfall. This sampling location is intended to be representative of potentially RCA-impacted stormwater discharging directly to the Willamette River.
	Manhole ABQ608 (Outfall alternate)	Alternate location if outfall 8A (ABQ663) is inaccessible due to high river levels. Samples to be collected of the outflow of the 72" line located at the intersection of SW 1st and Jefferson. This location represents the entire outfall basin except for a two-block segment along SW Naito Parkway south of the outfall.
	Manhole ABQ484	Located in front of the US Courthouse and intended to represent the area of heaviest RCA use. The manhole is located on the storm sewer branch in SW 3rd flowing north-northeast to the intersection of SW 3rd and Salmon.
	Manhole ABQ669	Located up-the-pipe from areas where RCA discharges may have occurred in the outfall 8A basin. Samples to be collected from the 18" line discharging from this manhole. Located at the intersection of SW Park and Salmon Streets.

Sampling Approach

Storm sampling for this project is intended to represent seasonal first flush conditions; i.e., the Pacific Northwest tends to experience long summer dry periods with little rainfall and seasonal first flush conditions can represent significantly greater dry periods than 24- or 72-hour dry periods typically used for storm targeting. Due to the varying complexity and size of the City's conveyance systems, first flush will be defined as being within the first three hours of observed runoff to ensure that samples represent contributions from the entire drainage basin and represent stormwater, rather than solely observed dry-weather flows. Three stormwater grab samples were collected from the

designated monitoring locations during first flush conditions of a single storm event on August 6, 2020.

The BES MS4 stormwater monitoring plan establishes target storm criteria as follows (BES 2016):

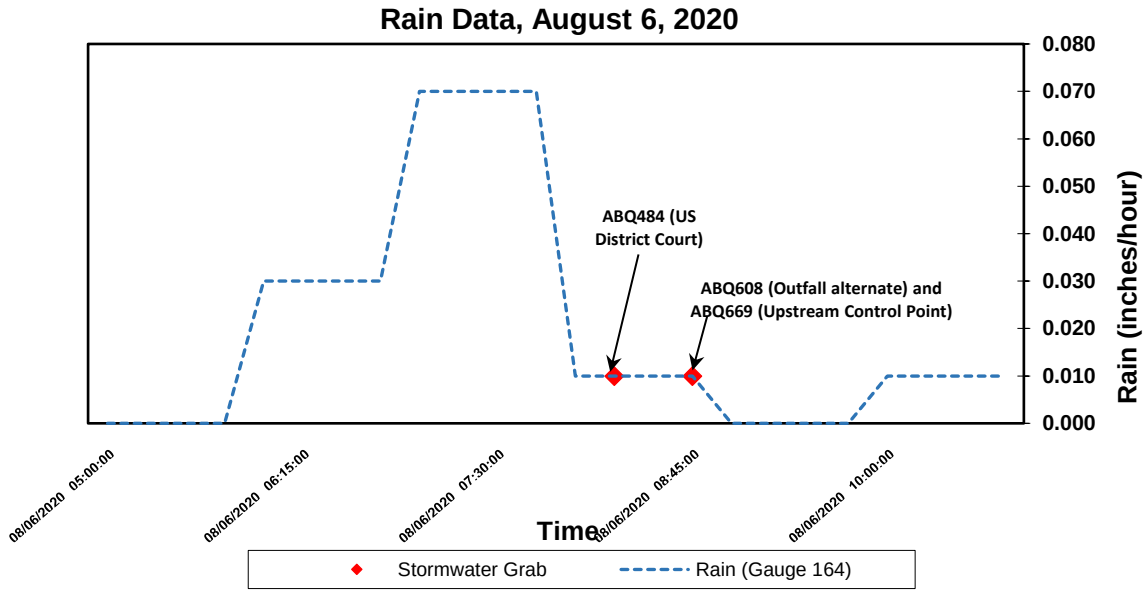
- Antecedent dry period of at least 24 hours (as defined by < 0.1" over the previous 24 hours);
- Minimum predicted rainfall volume of > 0.1" per event; and
- Expected duration of storm event of at least 6 hours.

Note that these criteria are not used to determine whether or not a storm is "representative", simply to determine if a forecasted storm is of sufficient intensity and duration to warrant mobilization of field storm sampling teams. In order to meet objectives identified in this SAP and DEQ's request dated July 30, 2020, BES FO team members prepared to mobilize for any forecasted storm event that would potentially produce sampleable runoff.

Field crews use best professional judgment to determine whether samples are representative of first flush conditions. Following sample collection, rain gage data, field observations and sample times are evaluated to determine whether first flush conditions were met. Storm characteristics for samples collected on August 6, 2020 are summarized below:

Sample Date	Predicted rainfall[1]	Actual rainfall total	Antecedent dry period[2]	Storm duration	Rainfall intensity
August 6, 2020	0.09" – 0.16"+	0.12"	46 days	5 hours	0.00" – 0.07" /hour
Rain data from City of Portland rain gauge #164 located at SW 12th and Clay Street [1] = Predicted rainfall from Extended Range Forecasting (ERF) [2] = < 0.10" in a 24-hour period					

The August 6, 2020 storm hydrograph with sample collection times is presented below:



In the hydrograph above the samples appear to have been collected on the trailing limb of the storm; however field crews did not observe stormwater flow reaching catch basins until 7:56 am, thus all three samples were collected within one hour of observing storm runoff to the MS4. Typically, there is some lag time between rainfall registering at the rain gauge (Gauge 164 located six to twelve blocks west of the sampling locations), particularly after long dry spells when dry pavement must be "primed" in order to generate runoff and when rainfall intensity is low. Subsequently, all three samples are considered to represent first flush conditions and observed flow volumes increased sufficiently to ensure that samples collected were primarily stormwater and not baseflow.

General Standard Operating Procedures (SOPs) utilized by field crews during sample collection include SOPs for equipment preparation, measurement of field parameters, and chain-of-custody. All relevant SOPs are included in the MS4 Monitoring Plan and specific SOPs utilized for this sampling effort are summarized below:

- SOP 2.02b "Grab Sample Collection with Stainless Steel Beaker"

Analytical Approach

In the letter dated July 30, 2020, DEQ requested that selected total metals, hexavalent chromium, and perchlorate be analyzed on stormwater samples collected in accordance with this monitoring plan. Analytes, analytical methods, and laboratories utilized are summarized below:

Analyte Group	Method	Laboratory
Total Metals (Ba, Cr, Cu, Pb, Zn)	EPA 200.8	Water Pollution Control Lab (WPCL)
Hexavalent Chromium	EPA 218.6	ALS Rochester, NY
Perchlorate	EPA 6850	ALS Houston, TX

BES also reviewed MSDSs for various RCAs used by PPB to evaluate other potential analysis parameters that could indicate the presence of RCA residuals in stormwater. RCA MSDSs were obtained for tear gas (CS and OC gas), smoke bombs, and non-lethal rounds. Additional information was provided by private citizens regarding RCAs used by federal agents, some of which were products not used by PPB. Nearly all appeared to be from the same manufacturers as products used by PPB. Active ingredients in tear gas are well-documented. However, some MSDSs include the following caveat: "For the listed ingredient(s), the identity and exact percentages are being withheld as a trade secret." A list of RCA ingredients was developed but it is unclear how many of the ingredients included in the list are inaccurate due to trade secret claims.

Though most RCA ingredients do not have specific analytical methods available, many ingredients include metals that are reportable by EPA Method 200.8. To supplement the analyses requested by DEQ, BES also selected additional analyses based on readily available analytical methods and/or stormwater and surface water quality screening criteria. Additional methods and rationale for selection are summarized below:

Analyte Group	Method	Laboratory	Rationale
Dissolved Metals (Ba, Cr, Cu, Pb, Zn)	EPA 200.8	WPCL	It is unknown whether metals in RCA ingredients present in stormwater may be in dissolved phase or whether chemical reactions with other RCA ingredients may result in an increase in dissolved metals.
Dissolved Hexavalent Chromium	EPA 218.6	ALS Rochester, NY	
Chloride	EPA 300.0	WPCL	Hydrogen chloride may be produced during high temperature CS gas dispersion (Kluchinsky, et al., 2002). Chlorine is also present in many RCA ingredients.
Cyanide	SM 4500-CN E	WPCL	Hydrogen cyanide (HCN) and particulate cyanide (CN) may be produced during high temperature CS gas dispersion (Kluchinsky, et al., 2002). Cyanide is present in malononitrile in CS gas.
Semi-Volatile Organic Compounds (SVOCs)	EPA 8270	WPCL	Added for possible combustion products. RCA ingredient hexachloroethane is reportable by EPA 8270. Diphenylamine is reportable by EPA 8270 as a combined result with 1,4,5 N-Nitrosodiphenylamine. RCA ingredient 1,3-diethyldiphenylure may be detectable by this method.

Reporting

As a storm occurred during SAP development, was successfully sampled, and peak rain intensity (0.07"/hour) was sufficient to mobilize potential pollutants, no additional monitoring is planned at this time. Analytical results will be evaluated by comparing stormwater data to existing datasets for stormwater collected in the Portland area. Results will be used to determine if RCA residuals are present in stormwater and whether or not additional measures are necessary to minimize the potential for RCA residuals to enter the City's MS4 and be conveyed to the Willamette River. Analytical results will be provided in a report to DEQ within two weeks of receipt by BES. If you have any comments or questions, please call me at 503-823-5737.

Sincerely,

Barb Adkins
Water Resources Program Manager MS4/TMDL Program

References: Brumbaugh-Smith, Claire. 2020. Tear Gas Deployment in Portland 2020, May 29th to July 18th. http://web.pdx.edu/~cb22/Teargas/Teargasmap.html, webpage visited August 6, 2020.

City of Portland Bureau of Environmental Services (BES). 2016. *Monitoring Plan*

(MP) *For Stormwater and Surface Water Sampling by the City of Portland in Compliance with MS4 Permit Requirements*. Prepared for Oregon Department of Environmental Quality (ODEQ). July 1, 2016.

Kluchinshy, T.A., Savage, P.B., Fitz, R., & Smith, P.A. 2002. Liberation of hydrogen cyanide and hydrogen chloride during high-temperature dispersion of CS riot control agent. *AIHA Journal, 63*(4), pp. 493-496.

Power, Karin, and Blumenauer, Earl. 2020. Letter to Andrew Whitman (USEPA) and Richard Whitman (Oregon DEQ), dated July 30, 2020.

Svetokovitch, Christine, 2020. Letter from Christine Svetokovitch (Oregon DEQ) to Barb Adkins (City of Portland BES), dated July 30, 2020.

Figures: Riot Control Agent (RCA) Stormwater Monitoring Map 1
Riot Control Agent (RCA) Stormwater Monitoring Map 2

Attachments: Attachment 1 – August 6, 2020 Storm Sampling Event Field Notes
Attachment 2 – August 6, 2020 Storm Sampling Event Photographs

cc: Nina Diconcini/DEQ
Linda Scheffler/BES
Kaitlin Lovell/BES
Aaron Wieting/BES
Brian Laurent/BES

Riot Control Agent (RCA) Stormwater Monitoring Map 1

- Storm Manholes
- Sampled Locations
- Federal Agency RCA Locations
- Portland City Police RCA Locations
- MS4 Outfall
- 100J Non-Contact Cooling Water Pacific Building
- Sanitary Gravity Mains
- Storm Gravity Mains
- Combined Gravity Mains
- MS4 Outfall Boundary
- RCA Use Study Area

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ABQ669
ABQ484
ABQ608
Outfall to River
OF08A
OF

1 inch = 400 feet

1 inch = 4,000 feet

Riot Control Agent (RCA) Stormwater Monitoring Map 2

- Storm Manholes
- Sampled Locations
- Federal Agency RCA Locations
- Portland City Police RCA Locations
- MS4 Outfall
- 100J Non-Contact Cooling Water Pacific Building
- Sanitary Gravity Mains
- Storm Gravity Mains
- Combined Gravity Mains
- MS4 Outfall Boundary
- ABQ484 Catchment
- RCA Use Study Area

Environmental Services, City of Portland

N W E S

ABQ484

Lownsdale Square

Chapman Square

Mark O. Hatfield US Courthouse

Multnomah County Justice Center

1 inch = 100 feet

ABQ669

ABQ484

ABQ608

OF08A

1 inch = 800 feet

ATTACHMENT 1

August 6, 2020 Storm Sampling Event Field Notes

City of Portland
Environmental Services

DAILY FIELD REPORT

Project Riot Control Agent Stormwater

Location SW Portland ABQ484 & ABQ669 Date 8/6/2020

Subject Stormwater Sampling Personnel JXL, RCB, MTS, JXB, ECP

0635	Arrive at SW 3rd & Salmon. Lite mist, streets mostly dry. Will split up to recon OF 08A and reference site ABQ669
0646	Arrive at SW Salmon & Park to investigate ABQ669, assess traffic control. Some baseflow in main line and lateral entering from the south. ABQ669 determined to be a suitable site to collect control sample.
0700	Return to SW 3rd & Salmon. MTS reports that OF 08A partially submerged, not suitable for sampling. Alternate ABQ608 will suffice.
0742	Rain/showers increasing, yet no runoff to catch basins at SW 3rd & Salmon.
0745	Contractors at Mark O. Hatfield building began pressure washing graffiti from building exterior.
0756	Runoff observed into catch basins. Mobilizing to sample.
0813	Entered node. Entrant notes that flow in line is turbid, storm flow. (ABQ484) MJS
0815	Rain increasing.
0819	Collected samples.
	Departed.
0840	Arrive at SW Salmon & Park. Rain has shifted to showers, yet ample runoff continues. Flow elevated in node ABQ669
0849	Entered node. Elevated flow, more than 5 times previously observed baseflow
0853	Collected samples from lateral entering from south.
0911	Departed site.

Attachments:

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DAILY FIELD REPORT

Project Riot Control Agent Stormwater
Location ABQ484 + ABQ608
Subject Stormwater sampling

Project No.
Date 8-6-20
By ECP/MJS

0845: ECP/MJS arrive at ABQ608 (1st & Jefferson) to continued light rainfall. Flow in node is slightly turbid with foam.
0852: Successful sample at ABQ608

0900: Depart 1st & Jefferson for Outfall 8A.
0913: Outfall 8A is partially submerged by river water (~3 feet deep). Evidence of positive flow out of pipe compared to earlier inspection of the outfall (prior to rainfall). However, river water only being partially displaced by stormwater discharge, would not be representative of stormwater.
0930: Depart for WPCL.

Attachments

ATTACHMENT 2

August 6, 2020 Storm Sampling Event Photographs

ABQ484, SW 3rd & Salmon ST

ABQ484, Storm flow, SW 3rd & Salmon St

ABQ608, Storm flow, Outfall alternate, SW 1st & Jefferson

ABQ663 (Outfall 8A), Partially submerged just after sample collection at alternate location (ABQ608)

ABQ669, SW Salmon & Park Avenue

ABQ669, Storm flow, SW Salmon & Park Avenue