State of Oregon
Department of Environmental Quality **Memorandum**

Date:	**July 2, 2020**
To:	**Ben Leake, US EPA**
Through:	**Paul Seidel, DEQ Cleanup Section Manager** PS
From:	**Alex Liverman, Portland Harbor Stormwater Coordinator**
Subject:	**Source Control Decision** **PGE Rivergate North and South Substations** **ECSI #6069**

1.0 Introduction

This memorandum presents the basis for the Oregon Department of Environmental Quality source control decision for the Portland General Electric Rivergate North and South Substations site, located at 8920 North Time Oil Road in Portland, Oregon.

A Source Control Evaluation for the stormwater pathway at the site was conducted in accordance with the 2005 *EPA/DEQ Portland Harbor Joint Source Control Strategy,* also known as the JSCS, under a Voluntary Cleanup Agreement between PGE and DEQ, which was executed in December 2015. The evaluations addressed potential contaminant migration pathways of stormwater from the sites to the Portland Harbor reach of the Willamette River and to the Columbia Slough.

DEQ concludes from review of the 2018 Revised Stormwater Assessment Report – Rivergate Substations, 2019 Revised Stormwater Management Design Report and Operations and Maintenance Plan – PGE Rivergate Substations, 2020 Stormwater Source Control Evaluation Report and other documents noted in the references section of this memorandum, that upland sources of contamination from current and past operations have been controlled, such that stormwater and overland flow potential contaminant transport pathways from the site do not pose a significant current or future threat to the Willamette River or the Columbia Slough. Because all site stormwater now infiltrates on site and former adjacent catch basins in Time Oil Road have been sealed, the stormwater pathway to the Willamette River and Columbia Slough is incomplete and, therefore, excluded.

2.0 Site Description and History

As shown on Figure 1, the PGE Rivergate North Substation is located along the east side of Time Oil Road, borders the Rivergate Pond, which drains to the Columbia Slough, and consists of approximately 6.3 acres of sandy fill material topped with gravel, which is elevated approximately three to five feet above the surrounding grassy vegetation. The South Substation is adjacent and to the south along Time Oil Road at the lower elevation and consists of approximately 0.9 acres of graveled surface over sandy fill. PGE also owns approximately half of Time Oil Road adjacent to the substations, and all of Time Oil Road at the southern end of the south property. Total project property acreage is 14.5 acres.

PGE purchased the north property in 1967 and the undeveloped south property in 1971 and began construction of the substations shortly thereafter. Historical use of the north property was operation, between 1943 and 1950 by the Oregon Shipbuilding Corporation, of a theatre, gym, mess hall, clinic, recreation area and fire station. Current use of the properties is operation by PGE of the two electrical power substation yards and overhead and underground electrical transmission lines in the area between the Rivergate North yard and Time Oil Road. Facilities on the unstaffed sites include oil circuit breakers, transformers, fencing and a control house at the north substation. The perimeter of the north substation transformer area is underlain by a spill containment system of perforated pipes in pea gravel trenches, which discharge to an oil water separator and infiltration trench. The majority of stormwater falling on the sites infiltrates into the fill placed for development of the substation yards. Maintenance of Time Oil Road is managed under a mutual use and maintenance easement with the other owners and neighbors in the area.

3.0 Regulatory History

3.1 Hazardous Substance Releases

Spills of dielectric fluid and subsequent cleanup actions in response, occurred at both substation yards. Within the north substation fenced area, four spills ranging in volume from one half gallon to two gallons, occurred between 1975 and 2005. An in the south substation yard, three spills ranging in volume from two to 75 gallons, occurred between 1987 and 1994. PCB-contaminated soil and gravel were disposed following spill cleanup or site construction work in accordance with Toxic Substances Control Act regulations.

3.2 Previous Investigations

In 2010 and 2011, on behalf of PGE, URS conducted evaluations of on-site PCB conditions and of stormwater, erosion and overland flow processes occurring at the sites and along Time Oil Road. URS collected and analyzed samples of erodible soil and PGE also collected and analyzed concrete and capacitor bank wipe samples for waste characterization purposes during substation construction projects. At the north substation, singular PCB aroclors (1242, 1248 and 1254) were detected in four soil samples and two concrete samples. At the south substation, PCB aroclor 1254 was detected in three concrete samples (determined by PGE to have been mischaracterized in the URS report as soil samples) at concentrations that exceeded Portland Harbor soil screening level values then available for total PCBs (see Table 1). This concrete debris was removed from the site as part of the construction project waste disposal.

URS confirmed that the majority of stormwater falling on the sites infiltrates there. During intense rainfall, URS observed discharge of infiltrated stormwater through seeps at the fill/gravel interface at various locations around the edges of both substations. Seep discharges mostly infiltrated in the surrounding grassy areas, but in some cases collected in ponded areas along Time Oil Road. DEQ visited the site in 2015 and photographed rills observed along the three gravel and fill driveways (two at the north parcel and one at the south parcel) indicating stormwater flows toward Time Oil Road. URS also determined that a sump in the basement of the control house on the north substation could discharge to the fill slope and contribute to ponding along Time Oil Road. URS investigated the stormwater collection and conveyance infrastructure along Time Oil Road, which are shown in URS 2011 as two catch basins on each side of the road, with potentially interconnected piping, and a ditch along the opposite side of the road from the north substation. Subsequent PGE investigations discussed in Section 4.3 below, concluded the catch basins were not connected by piping. Large volumes of turbid stormwater were observed flowing down the sloped roadside from areas south of the south substation parcel, entering southernmost east side catch basin (CB-1), or ponding along the roadside adjacent to the north substation and at the inundated northeast catch basin (CB-2) (see Figure 1).

Because PCBs were detected in site soils, URS collected and analyzed solids samples along the flow paths of stormwater leaving the site toward the Time Oil Road active catch basin and from within the catch basin (see Figure 1). PCB aroclors 1254 and 1260 were detected in all samples, with 1248 in one sample, at concentrations that exceeded Portland Harbor soil screening level values then available for total PCBs (see Table 1).

4.0 Source Control Evaluation

Because the site is located within the uplands draining to the Portland Harbor Superfund study area, as well as to the Columbia Slough, upland source control investigations were guided by the 2005 EPA/DEQ Joint Source Control Strategy. The objective of a source control evaluation is to determine whether existing and potential sources of contamination at the site have been identified and if additional characterization or source control measures are needed. Due to the lack of any banks or frontage on the Willamette River and no known groundwater issues under the site, DEQ determined that erosion of contaminants from riverbanks, overwater discharges and groundwater are not complete pathways. These pathways were, therefore, excluded and are not discussed further in this report.

DEQ determined that stormwater in conveyance infrastructure discharging to Portland Harbor or via overland flow to the Columbia Slough were potentially complete contaminant transport pathways and the remainder of this decision document discusses these pathways.

4.1 Contaminants of Potential Concern

Based on historical and current site development and operations, site sampling results and offshore sediment sampling results, the following are contaminants of potential concern for Portland Harbor at the site:

- Polychlorinated biphenyls (PCBs) – also of concern for Columbia Slough
- Polycyclic aromatic hydrocarbons (PAHs)
- Arsenic
- Cadmium
- Copper
- Mercury
- Silver
- Zinc

Characterization of site soils and stormwater solids did not test for the following Portland Harbor ROD Table 17 stormwater contaminants: Tributyl tin; 2,3,7,8-TCDD (TEQ); Aldrin; Chlordanes; DDx; Mono-(3-carboxypropyl) phthalate (MCPP); Ethyl benzene; Hexachlorobenzene and Pentachlorophenol. However, based on the limited site development and operational history, none of the contaminants on this list were expected to have been used or released at the site.

4.3 Stormwater Source Control Investigation

When stormwater presents as a potential pathway to mobilize contamination from the site to the river, these determinations generally rest upon demonstrating that site-related information provides sufficient support to make the following findings:

1. Existing and potential facility-related contaminant sources have been identified and characterized.

2. Contaminant sources were removed or are being controlled to the extent feasible.

3. Performance monitoring conducted after source control measures were implemented supports the conclusion that the measures are effective.

4. Adequate measures are in place to ensure source control and good stormwater management measures occur in the future.

4.3.1 Stormwater Configuration
Both substations are constructed on sandy fill topped by gravel, which is intended to infiltrate stormwater, as well as to prevent offsite transport of any accidental spills. Both sites are crowned to encourage any accumulating storm flows toward the perimeters. Except for the two driveway entrances, the north substation is surrounded by a gravel and lumber berm/curb intended to contain any overland flows. Minor amounts of stormwater exit the site as seeps from the interface of the fill layers and along rills in driveways. Most seep water infiltrates in vegetated areas and no overland flows discharge to the North Rivergate Pond, which is connected to the Columbia Slough. But during saturation conditions, some minor amounts of overland flow from both substations could pond along Time Oil Road or formerly enter the southeast catch basin (labeled CB-1 on figures), which was sealed in 2019. This catch basin was determined to have no constructed bottom, such that stormwater collected in the sump could infiltrate over time. However, upon testing the sump by filling it with water, some minimal portion of collected stormwater could have previously been conveyed west in underground piping to discharge to the Willamette River at the International Slip through Outfall WR-123 (Schnitzer Burgard Industrial Park Outfall 18). DEQ agrees with PGE’s estimate of a potential overland flow discharge from PGE-owned land comprising less than one percent of the 109.7-acre basin contributions to the Willamette River through Outfall WR-123 (Schnitzer Burgard Industrial Park Outfall 18) (PGE 2020). As detailed below in Section 4.3.3, PGE implemented source control measures, including abandoning catch basin CB-1, such that discharge of stormwater from the substations and Time Oil Road to the Willamette River can no longer occur.

4.3.2 Stormwater Pathway Investigation
Because the site was intended to infiltrate and lacks a stormwater collection and conveyance system, investigation of the stormwater pathway focused mainly on soil samples at erosive areas that could flow overland to roadside ponding areas and potentially contributing to discharge from CB-1 to the Willamette River. As noted above, CB-2 has no outlet for discharge of stormwater and minimal amounts of roadway ponded stormwater can no longer discharge through CB-1. Stormwater and stormwater solids samples were collected from CB-1 and stormwater samples were collected from significant rills when flows could be observed, but most sampling was of soils with the potential for mobilization in overland flows.

Despite the fact that stormwater and any entrained solids no longer discharge from the site, sampling was screened against the relevant Portland Harbor Record of Decision Table 17 cleanup values and, for contaminants without CULs, the JSCS Table 3-1 screening level values. Tables 1 and 2 present the results of the sampling and screening for the recent data collected by PGE in 2016-17, as well as the earlier data collected by URS in 2011 and discussed in Section 3.2 of this report. For soil samples, the summary of CUL/SLV exceedances includes four individual PAHs exceeded individual SLVs in one of four samples, the PCBs CUL was exceeded in nine of 14 samples, three of four samples exceeded the arsenic CUL and one each of four samples exceeded the cadmium and zinc CULs. For stormwater samples, the summary of CUL/SLV exceedances included six to seven individual PAHs exceeded CULs in two of nine locations, total PCBs and cadmium exceeded the CULs in two of nine locations, arsenic exceeded the CUL in all nine locations, copper exceeded the CUL in eight of nine locations and zinc exceeded the CUL in five of nine locations. Although soil samples are not comparable to stormwater solids measurements that make up the DEQ rank-order curves, PGE also plotted the data on the available rank-order curves for both stormwater and stormwater solids (see Figures 2-13). With the exceptions of arsenic, one sample each of cadmium and copper, two samples of zinc in stormwater and two samples of PCBs in soil, the data fall below the flat portion of the curves. Thus, despite some contaminant CUL/SLV exceedances, contaminants in these media are not atypically elevated at the site and are not of concern for the Willamette River or Columbia Slough since neither soils nor stormwater discharge from the site.

4.3.3 Stormwater Source Control Measures

In 2018, PGE installed temporary measures to reduce ponding and observe conditions to support abandonment of catch basin CB-1 in Time Oil Road. In 2019, PGE abandoned CB-1, along with another catch basin discovered to be buried nearby, preventing any possibility of stormwater discharges from the substations or Time Oil Road to Portland Harbor. In addition, partial pavement was removed in the area between the north substation and the road to allow infiltration of large volumes of runoff that formerly ponded there, driveways were regraded to direct runoff to infiltration areas, and a new infiltration facility was installed between the south substation and Time Oil Road to capture and infiltrate runoff from the south sloping down from North Lombard Street. Locations of all source control measures installed are shown on Figure 14. Although PGE property does not contribute runoff to the Columbia Slough, via the Rivergate Pond, the new infiltration feature is expected to reduce roadway discharges to the pond via the ditch along the west side of Time Oil Road. The infiltration features will be monitored for effectiveness and corrected, as warranted, in conformance with the City of Portland's Standard Operation and Maintenance Plan for Basins.

4.3.4 Stormwater Pathway Lines of Evidence Evaluation

In alignment with Section 5.3 of the JSCS, which describes appropriate approaches for screening of direct discharges, a weight-of-evidence evaluation was undertaken in consideration of the following site-specific factors:

1. Identification and characterization of potential sources of contaminants – Existing and potential facility-related stormwater contaminant sources were identified and characterized.

2. Magnitude of stormwater, and stormwater solids exceedances at each sampling point and proximity of sampling point to the river – Stormwater sampling results that exceeded the applicable Portland Harbor Cleanup Levels or JSCS initial upland source control screening level values were compared to DEQ charts from *Appendix E: Tools for Evaluating Stormwater Data*, which was updated 2015. This tool was created by using contaminant concentration data from many of the stormwater and stormwater solids samples collected at Portland Harbor-area heavy industrial sites. This data was used to create a series of charts that plot rank-order samples against contaminant concentrations and are used to identify contaminant concentrations in samples that are atypically elevated. Concentrations falling within the upper/steeper portion of the curve are an indication that uncontrolled contaminant sources may be present at the site and that additional evaluation or source control measures may be needed. Concentrations that fall on the lower/flatter portion of the curve suggest that stormwater is not being unusually impacted by contaminants at the site, and while concentrations may exceed the PH CULs or JSCS SLVs, they are within the range found in stormwater or solids from active industrial sites in Portland Harbor.

3. Regional background soil concentrations of naturally occurring chemicals for evaluating stormwater solids – Although in three of four soil samples at the site arsenic was measured at concentrations above the CUL, arsenic concentrations were not measured above the regional background concentration of 8,800 ug/kg.

4. Presence of bioaccumulative chemicals – Arsenic, some individual PAHs and PCBs were measured at the site at levels above CULs, but not atypically elevated in the steep portion of the rank order curves.

Due to these low levels and because stormwater and soils are not discharged from the site, the presence of these bioaccumulative chemicals is not a concern for Portland Harbor or the Columbia Slough.

5. Site hydrology including site conditions, size of drainage and location and estimated size of discharge All precipitation falling on the site infiltrates into the graveled surfaces or infiltration facilities, such that that there is no discharge of stormwater from the site.

6. Stormwater system design and management – Infiltration features are installed on the site and are maintained per City of Portland Stormwater Management Manual recommendations, such that there is no discharge of stormwater from the site.

7. Estimate of potential contaminant loading to the river – Because all stormwater falling on the site infiltrates, there is no discharge to Portland Harbor or the Columbia Slough and, therefore, no potential for contaminant loading.

In summary, these lines of evidence indicate that the stormwater pathway from the site to Portland Harbor is controlled and does not pose a threat to sediment recontamination or risk to in-water receptors, so no additional controls are warranted.

4.4 Source Control Decision

Based on review of the file, DEQ concludes that this upland site is adequately characterized and stormwater is excluded as a potential pathway to the Portland Harbor reach of the Willamette River and to the Columbia Slough. The property does not appear to be a current or reasonably likely future source of contamination to the Willamette River, provided that effective stormwater control measures remain in place and are routinely maintained.

5.0 References

DEQ. 2007. Guidance for Assessing Bioaccumulative Chemicals of Concern in Sediment. http://www.deq.state.or.us/lq/pubs/docs/cu/GuidanceAssessingBioaccumulative.pdf. January 2007 (updated April 2007).

DEQ. 2009 (updated 2010 and 2015). Guidance for Evaluating the Stormwater Pathway at Upland Sites. http://www.deq.state.or.us/lq/cu/stmwtrguidance.htm.

DEQ. 2018. Fact Sheet – Background Levels of Metals in Soils for Cleanups. https://www.oregon.gov/deq/FilterDocs/cu-bkgrmetals.pdf. January 25, 2018.

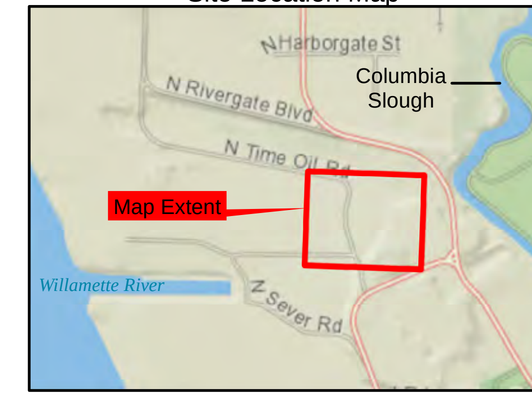
AECOM. 2019. Revised Stormwater Management Design Report and Operations and Maintenance Plan – PGE Rivergate Substations. Prepared for Portland General Electric by AECOM. February 2019.

PGE. 2018. Revised Stormwater Assessment Report – Rivergate Substations. Prepared by Portland General Electric. March 2018.

PGE. 2020. Stormwater Source Control Evaluation Report Rivergate Substations. January 2020.

URS, 2011. Technical Memorandum: Rivergate North and South Substations Stormwater Drainage Assessment. Prepared for Portland General Electric by URS. November 2011.

Site Location Map



Map Features

- URS 2011 Soil Sample Location
- Stormwater Sample Point
- Catch Basin Solids Sample Area
- Erodible Soil Subsample Point
- Erodible Soil Sample Area
- Proposed Stormwater Sample Area (Not Sampled Due to Lack of Flow)
- Historical Spill Locations

0 50 100
Feet

Portland General Electric
Portland, Oregon

Figure 1
Sampling Locations
Rivergate Substations
Source Control Evaluation

Date: 1/15/2020	Drawn By: Brad Wymore	Rev.:

Drawing File: V:\Sample Spill GDB\MXD\Rivergate_stormwater_assessment_location.mxd

Table 1
Rivergate North and South Substation
Catch Basin Solids and Erodible and Surface Soils Sample Analytical Results

	PH Cleanup Level * or JSCS Screening Level Value (SLV)	CB-1 Solids 8/11/2016	CB-2 Solids 8/11/2016	Area 8 Soil 8/11/2016	Area 9 Soil 8/11/2016	Area A Soil 10/19/2017	Area B Soil 10/19/2017	Area C Soil 10/19/2017	Area D Soil 10/19/2017	Area E Soil 10/19/2017	URS SS-01 5/19/2011	URS SS-02 5/19/2011	URS SS-03 5/19/2011	URS SS-04 (CB-1 Outlet) 5/19/2011	URS SS-05 5/19/2011
		Rivergate North Substation									Rivergate South Substation				
Units	µg/kg														
Polycyclic Aromatic Hydrocarbons															
Acenaphthene	300	ND	ND	ND	ND										
Acenaphthylene	200	ND	ND	ND	ND										
Anthracene	845	ND	ND	9.15	ND										
Benz(a)anthracene	1,050	128[a]	239[a]	82.4	61.5										
Benzo(a)pyrene	1,450	ND	282	121	98.3										
Benzo(b)fluoranthene		123[a]	616[a]	170[a]	138[a]										
Benzo(k)fluoranthene	13,000	ND	170[a]	64.5[a]	43.2[a]										
Benzo(g,h,i)perylene	300	118	**458**	84.8	81.2										
Chrysene	1,290	ND	513[a]	108	83.4										
Dibenz(a,h)anthracene	1,300	ND	ND	21.3	16.8										
Dibenzofuran		ND	ND	ND	ND										
Fluoranthene	2,230	165	483	128	93.1										
Fluorene	536	ND	ND	ND	ND										
Indeno(1,2,3-cd)pyrene	100	ND	**312**	91.1	82.8										
1-Methylnaphthalene		1,440	ND	ND	ND										
2-Methylnaphthalene	200	**1,240**	ND	ND	ND										
Naphthalene	561	**804**	ND	ND	ND										
Phenanthrene	1,170	263	224	50.9	32.8										
Pyrene	1,520	255	631	122	98.7										
Sum PAHs		**4,536**	**3,928**	**1,053**	**830**										
Polychlorinated biphenyls															
Aroclor 1016	530	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242		ND	40.5[b]	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	1,500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	196
Aroclor 1254	300	20.4[b]	58.1[b]	ND	ND	ND	13.6[b]	ND	ND	20.1[b]	32.1	20.1	266	19.2	**446**
Aroclor 1260	200	18.2[b]	43.1[b]	ND	ND	ND	ND	ND	ND	16.6[b]	9.64	11.0	111	11.8	106
Aroclor 1262		ND	ND	ND	ND	ND	ND	ND	ND	ND					
Aroclor 1268		ND	ND	ND	ND	ND	ND	ND	ND	ND					
Sum PCBs	*9	**38.6**	**141.7**	ND	ND	ND	**13.6**	ND	ND	**36.7**	**41.74**	**31.1**	**377**	**31**	**748**
Metals															
Arsenic	*3000	ND	3,100	4,320	2,460										
Cadmium	*510	371	**1,340**	231	250										
Copper	*359,000	33,600	94,400	18,600	15,900										
Mercury	*85	ND	ND	ND	ND										
Silver	5,000	ND	ND	ND	ND										
Zinc	*459,000	111,000	**494,000**	109,000	227,000										

Notes

(highlighted) = reported concentration exceeds *CULs or SLVs.
ND = analyte not detected at or above the MRL
ND = analyte not detected at or above an elevated MRL
[a] Reported result was accompanied by the following qualifier: "Due to matrix interference, this analyte cannot be accurately quantified. The reported result is estimated."
[b] Reported result was accompanied by the following qualifier: "Result estimated due to the presence ofmultiple PCB Aroclors and/or matrix

Table 2
Rivergate North Substation
Stormwater Sample Analytical Results

	JSCS Screening Level Value (SLV)	Portland Harbor ROD Cleanup Levels	Catchbasin 1 10/13/2016	Catchbasin 1 10/26/2016	Location 5A 10/13/2016	Location 5A 10/17/2016	Location 5A 10/26/2016	Location 5B 10/17/2016	Location 5B 10/26/2016	Location 4 10/17/2016	Location 4 10/26/2016
Units	µg/L										
Polycyclic Aromatic Hydrocarbons											
Acenaphthene	0.2		ND	ND[b]	ND	ND	ND	ND	ND	ND	ND
Acenaphthylene	0.2		ND	ND[b]	ND	ND	ND	ND	ND	ND	ND
Anthracene	0.2		ND	ND[b]	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	0.018	0.0012	**0.0277[a]**	ND[b]	ND	ND	ND	ND	ND	ND	**0.0731[a]**
Benzo(a)pyrene	0.018	0.00012	**0.0517**	ND[b]	ND	ND	ND	ND	ND	ND	**0.107**
Benzo(b)fluoranthene	0.018	0.0012	**0.0943[a]**	ND[b]	ND	ND	ND	ND	ND	ND	**0.134[a]**
Benzo(k)fluoranthene	0.018	0.0013	**0.0261[a]**	ND[b]	ND	ND	ND	ND	ND	ND	**0.0488[a]**
Benzo(g,h,i)perylene	0.2		0.0671	ND[b]	ND	ND	ND	ND	ND	ND	0.0885
Chrysene	0.018	0.0013	**0.0730[a]**	ND[b]	ND	ND	ND	ND	ND	ND	**0.0857[a]**
Dibenz(a,h)anthracene	0.018	0.00012	ND	ND[b]	ND	ND	ND	ND	ND	ND	ND
Dibenzofuran			ND	ND[b]	ND	ND	ND	ND	ND	ND	
Fluoranthene	0.2		0.0762	ND[b]	ND	ND	ND	ND	ND	ND	0.123
Fluorene	0.2		ND	ND[b]	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.018	0.0012	**0.0584**	ND[b]	ND	ND	ND	ND	ND	ND	**0.0876**
1-Methylnaphthalene			ND	ND[b]	ND	ND	ND	ND	ND	ND	
2-Methylnaphthalene	0.2		ND	ND[b]	ND	ND	ND	ND	ND	ND	ND
Naphthalene	0.2	12	**0.247**	ND[b]	0.166	ND	ND	ND	ND	ND	ND
Phenanthrene	0.2		0.0353	ND[b]	ND	ND	ND	ND	ND	ND	0.0346
Pyrene	0.2		0.0996	**0.587[b]**	ND	ND	ND	ND	ND	ND	0.143
Sum PAHs			**0.635**	**0.587**	**0.166**	ND	ND	ND	ND	ND	**0.925**
Polychlorinated biphenyls											
Aroclor 1016	0.96		ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	0.034		ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	0.034		ND[c]	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	0.034		ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	0.034		ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.033		**0.0740[d]**	**0.107[d]**	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	0.034		**0.0565[d]**	**0.0868[d]**	ND	ND	ND	ND	ND	ND	ND
Aroclor 1262			ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1268			ND	ND	ND	ND	ND	ND	ND	ND	ND
Sum PCBs	6.4E-05	0.0000064	**0.1305**	**0.1938**	ND	ND	ND	ND	ND	ND	ND
Metals											
Arsenic	0.045	0.018	**1.54**	**1.04**	**4.81**	**2.60**	**4.58**	**5.49**	**4.27**	**29.8**	**6.17**
Cadmium	0.094		**0.511**	ND	ND	ND	ND	ND	ND	**0.978**	ND
Copper	2.7	2.74	**36.1**	**29.6**	**3.36**	2.31	**2.84**	**3.71**	**8.42**	**137**	**40.9**
Mercury	0.77		ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	0.12		ND	ND	ND	ND	ND	ND	ND	ND	ND
Zinc	36	36.5	**195**	**171**	16.6	13.9	16.4	25.2	**52.5**	**7,930**	**1,990**

Notes

= reported concentration exceeds the CULs or SLVs.

ND = analyte not detected at or above the MRL

ND = analyte not detected at or above an elevated MRL

= data may not be reliable due to data quality concern (see text Section 5.1 for discussion)

[a] Reported result was accompanied by the following qualifier: "Due to matrix interference, this analyte cannot be accurately quantified. The reported result is estimated."

[b] Reported result was accompanied by the following qualifier: "Reporting levels elevated due to dilution necessary for analysis."

[c] Reported result was accompanied by the following qualifier: "The Reporting Limit for this analyte has been raised to account for interference from coeluting organic compounds present in the sample."

[d] Reported result was accompanied by the following qualifier: "Result estimated due to the presence ofmultiple PCB Aroclors and/or matrix interference."

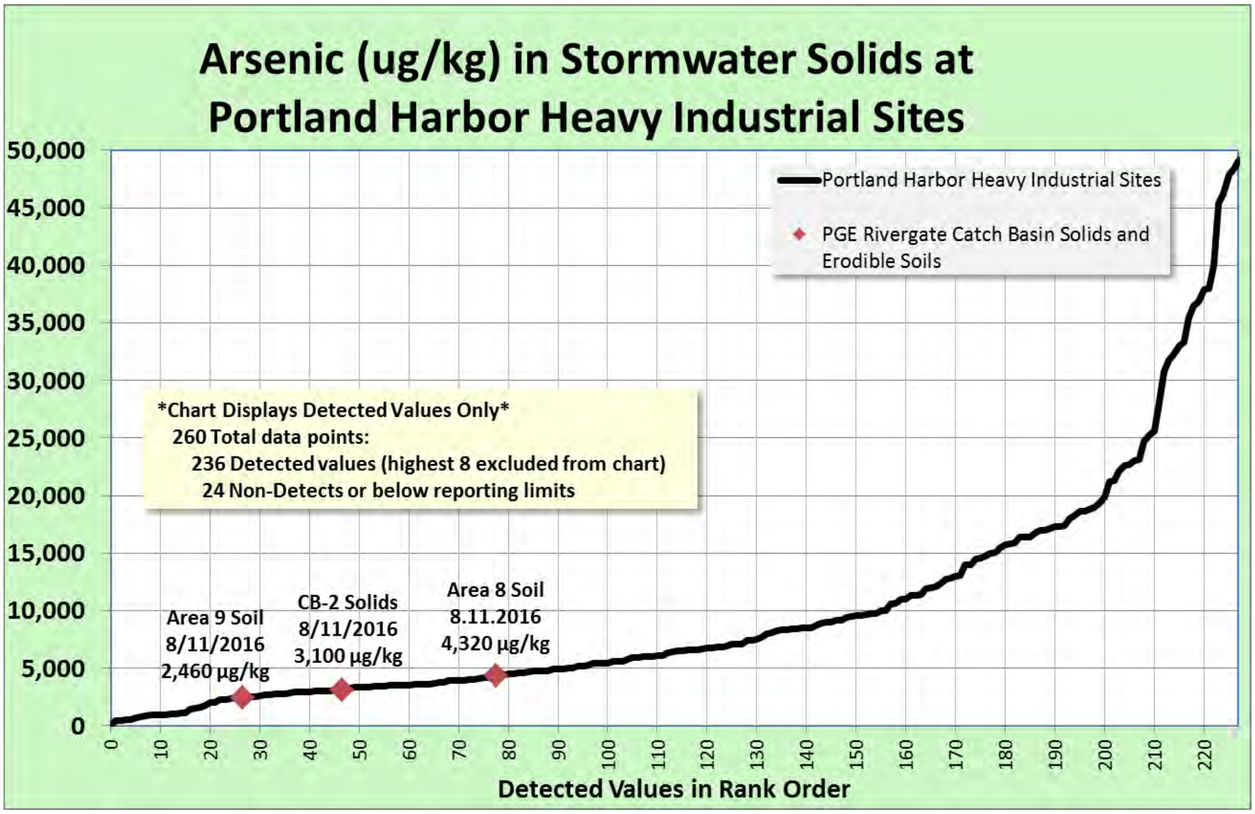


Figure 2: Arsenic in Stormwater Solids at Portland Harbor Heavy Industrial Sites with PGE Catch Basin Solids and Erodible Soils Data.

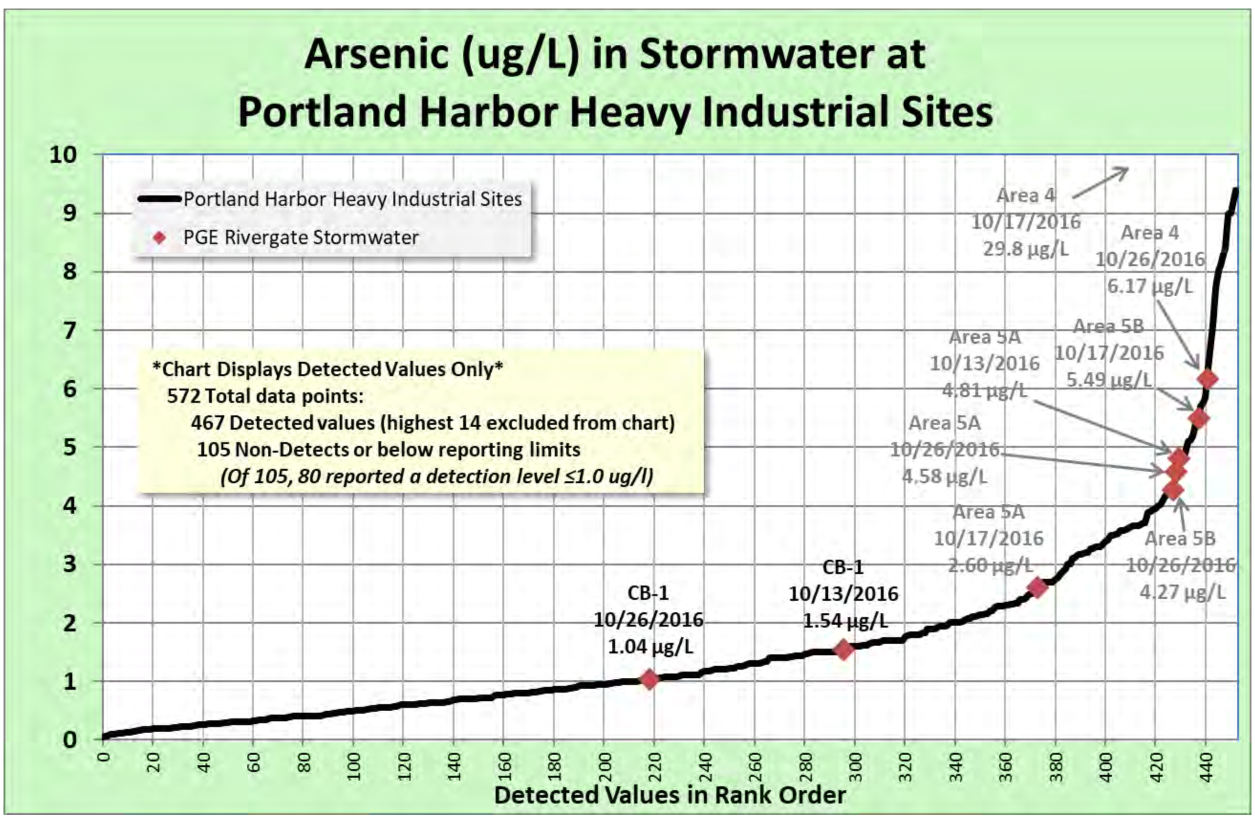


Figure 3: Arsenic in Stormwater at Portland Harbor Heavy Industrial Sites with PGE Stormwater Data. Data labeled in grey may not be reliable due to data quality concerns (see Section 5.1 of PGE 2020).

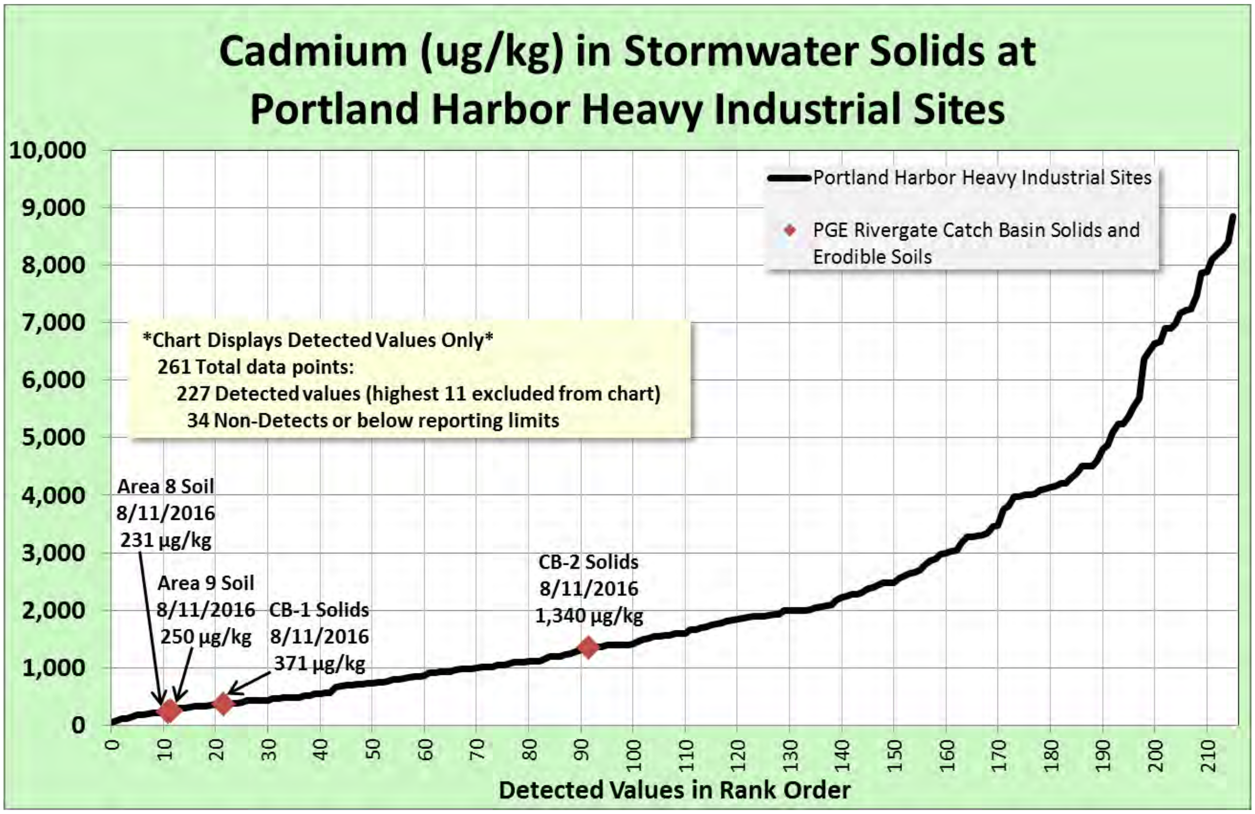


Figure 4: Cadmium in Stormwater Solids at Portland Harbor Heavy Industrial Sites with PGE Catch Basin Solids and Erodible Soils Data.

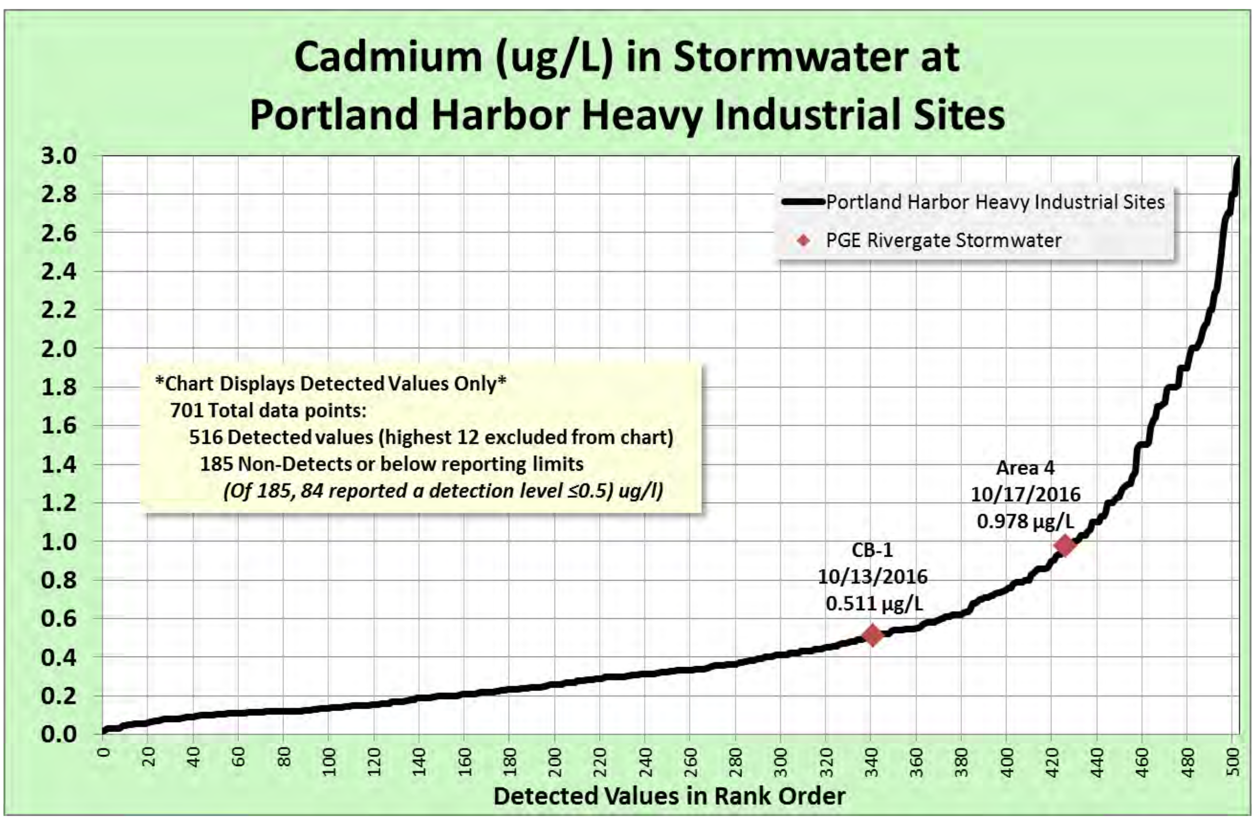


Figure 5: Cadmium in Stormwater at Portland Harbor Heavy Industrial Sites with PGE Stormwater Data.

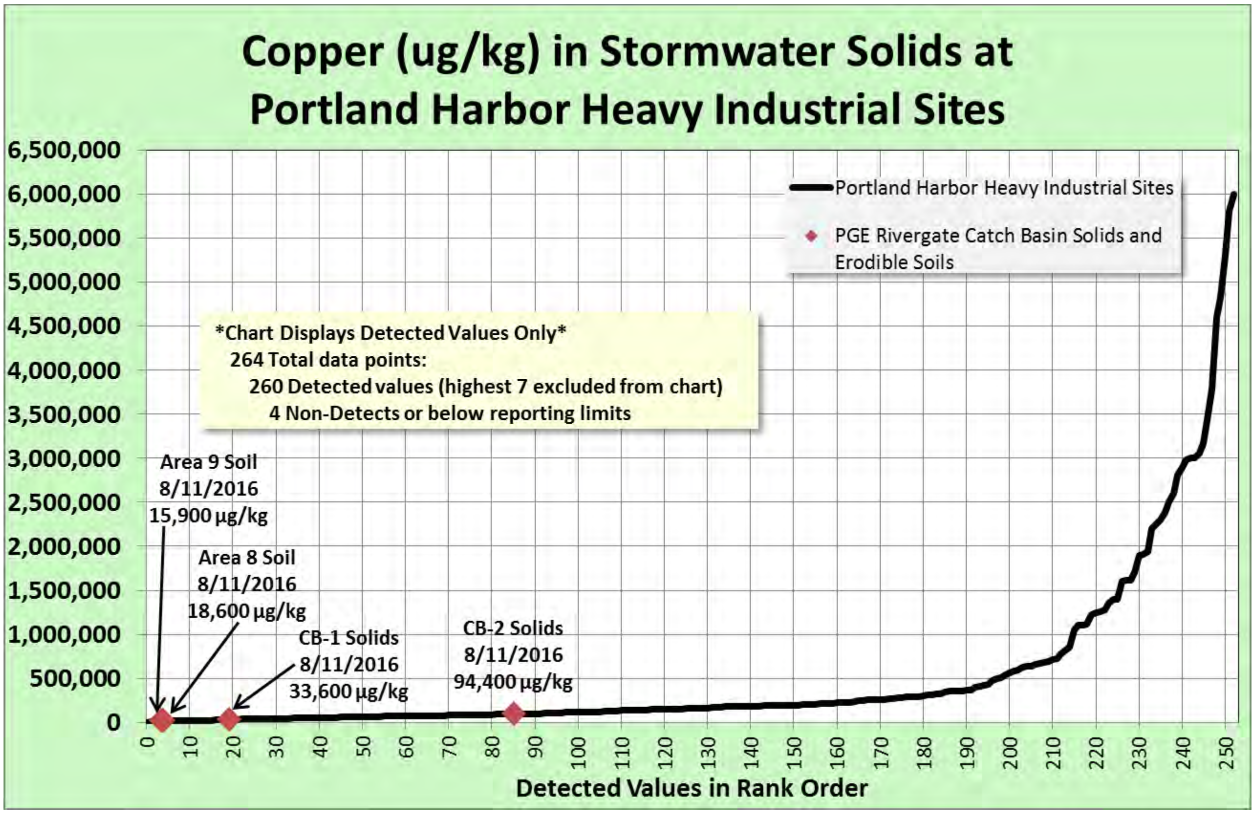


Figure 6: Copper in Stormwater Solids at Portland Harbor Heavy Industrial Sites with PGE Catch Basin Solids and Erodible Soils Data.

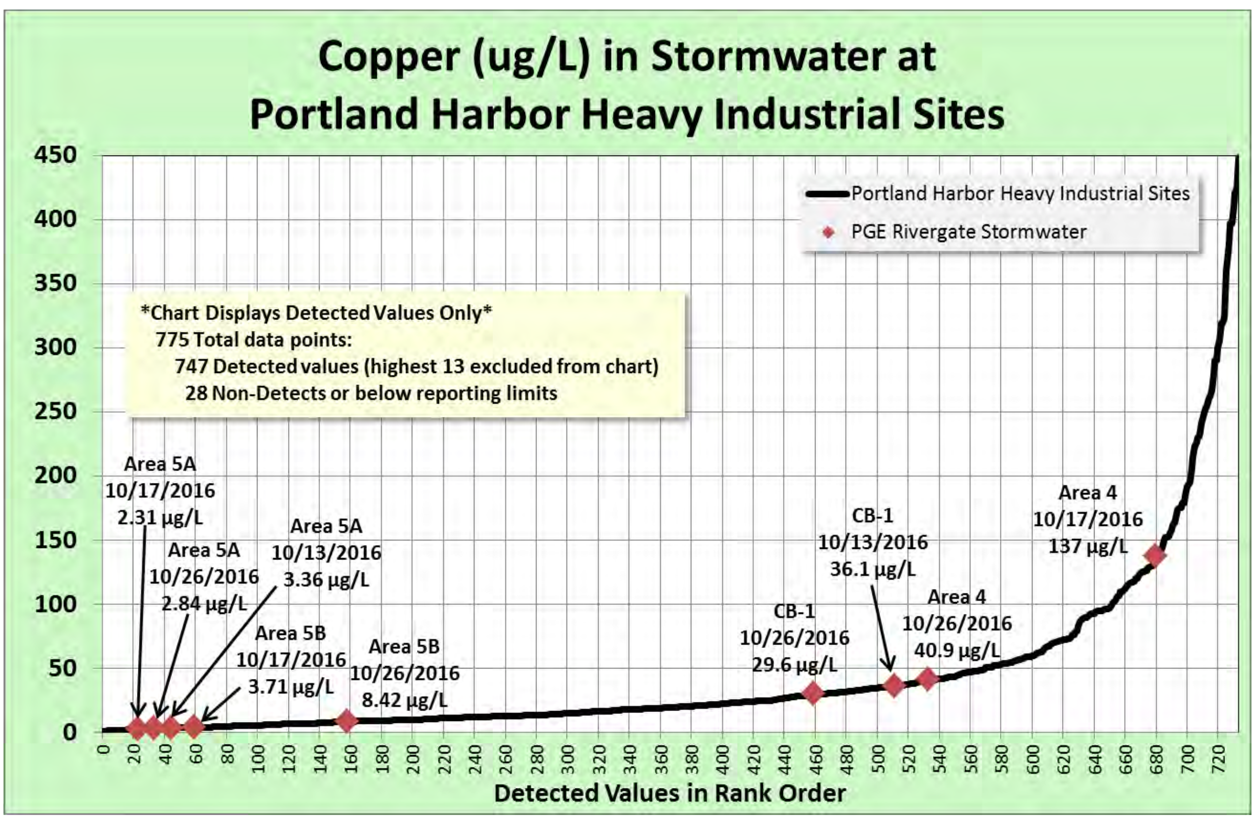


Figure 7: Copper in Stormwater at Portland Harbor Heavy Industrial Sites with PGE Stormwater Data.

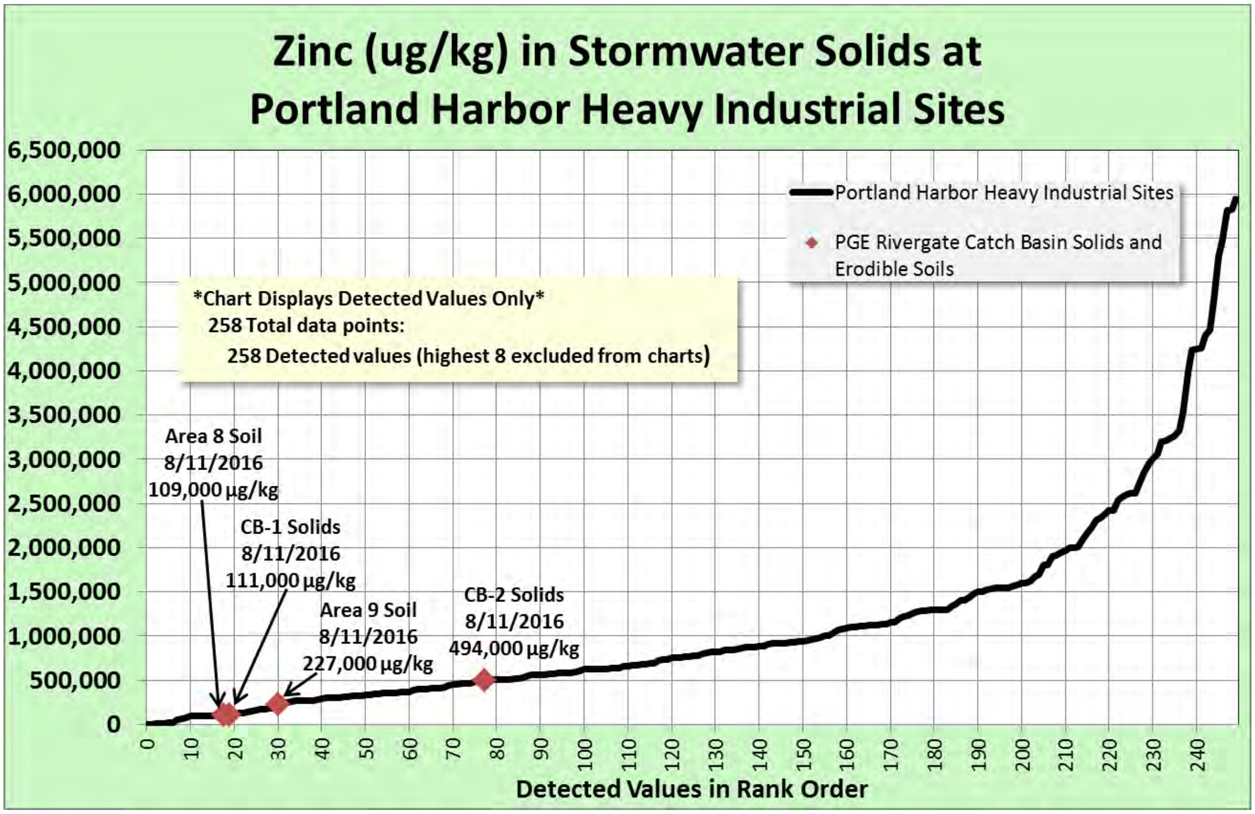


Figure 8: Zinc in Stormwater Solids at Portland Harbor Heavy Industrial Sites with PGE Catch Basin Solids and Erodible Soils Data.

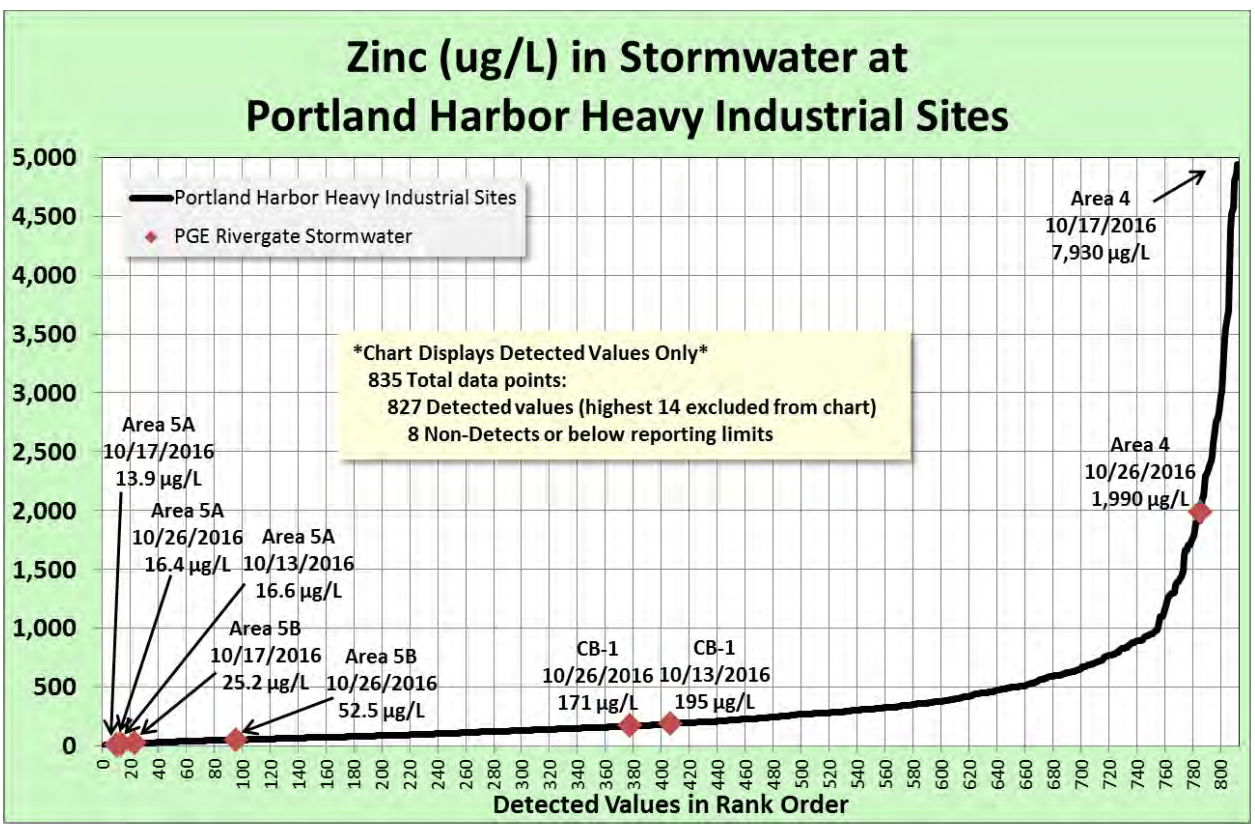


Figure 9: Zinc in Stormwater at Portland Harbor Heavy Industrial Sites with PGE Stormwater Data.

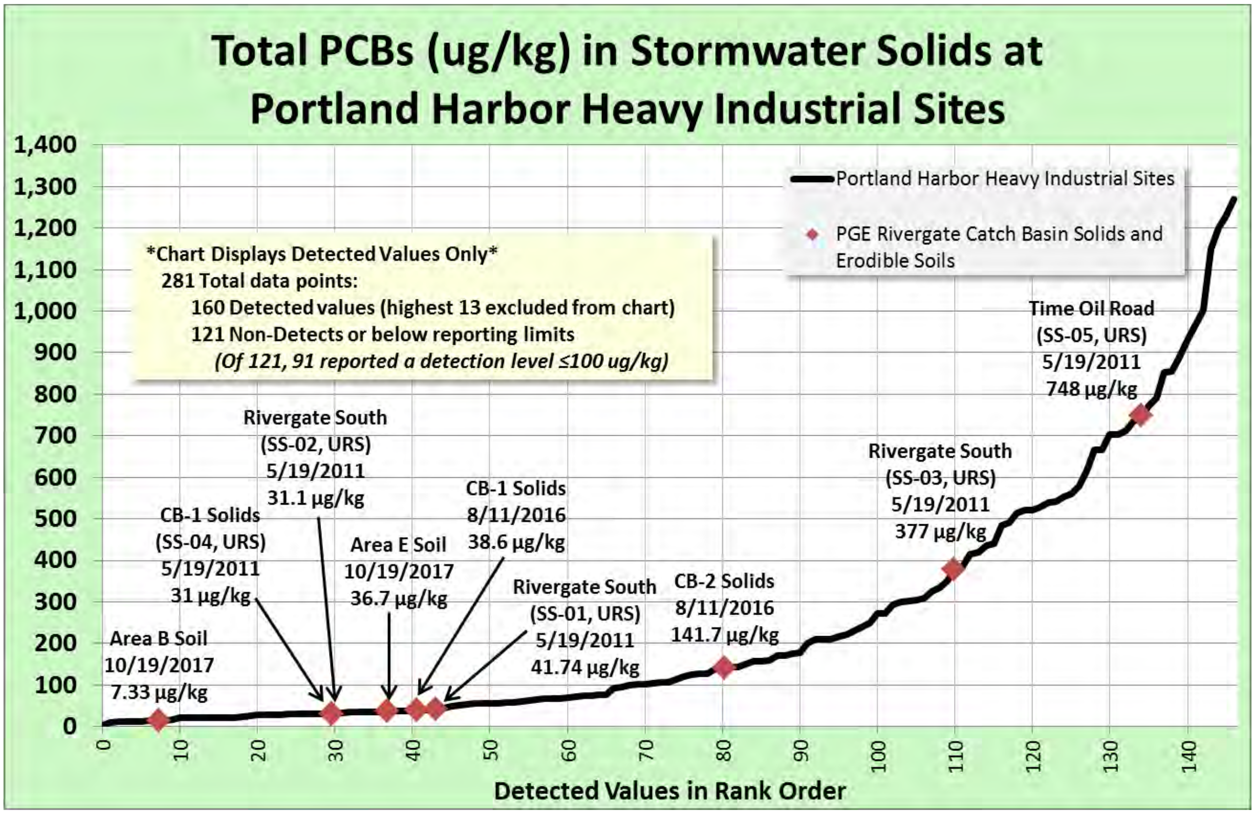


Figure 10: Total PCBs in Stormwater Solids at Portland Harbor Heavy Industrial Sites with the sum of detected PCB Aroclors in PGE Catch Basin Solids and Erodible and Surface Soils Data.

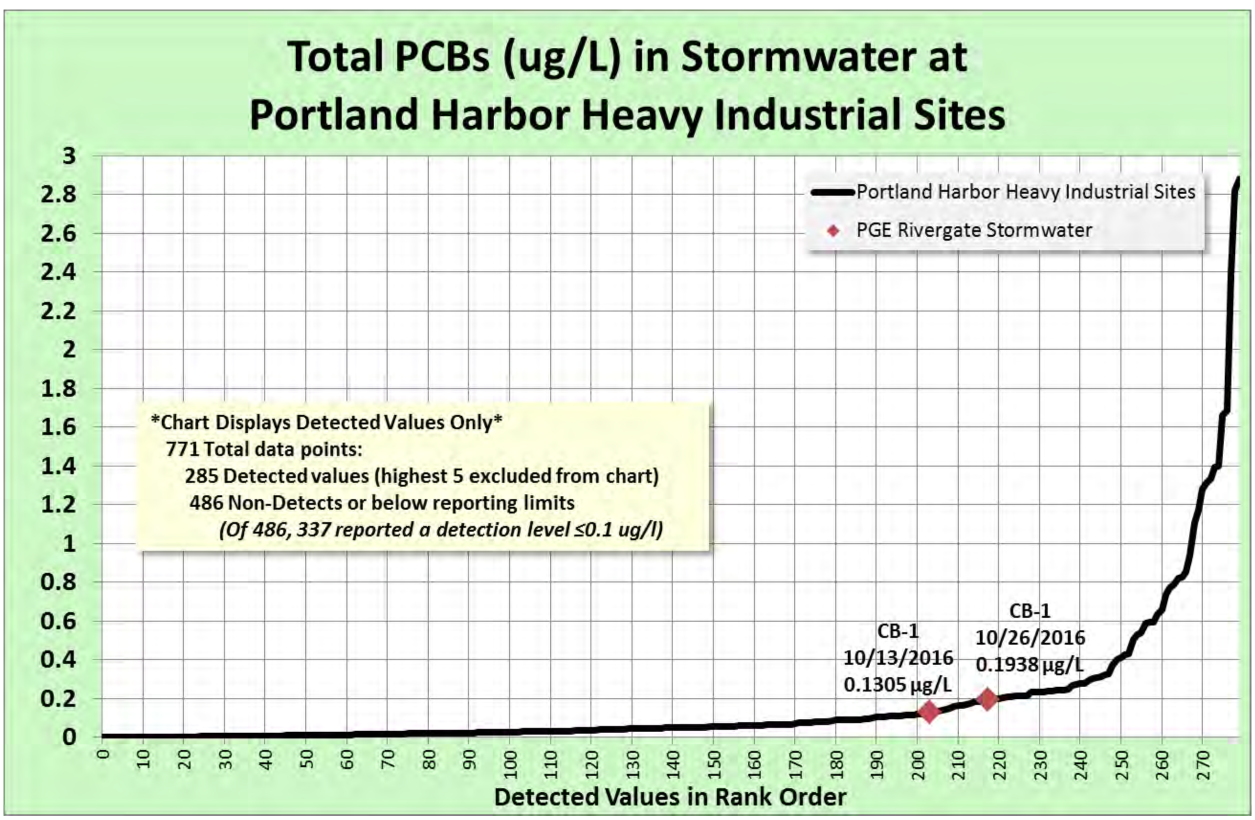


Figure 11: Total PCBs in Stormwater at Portland Harbor Heavy Industrial Sites with the sum of detected PCB Aroclors in PGE Stormwater Data.

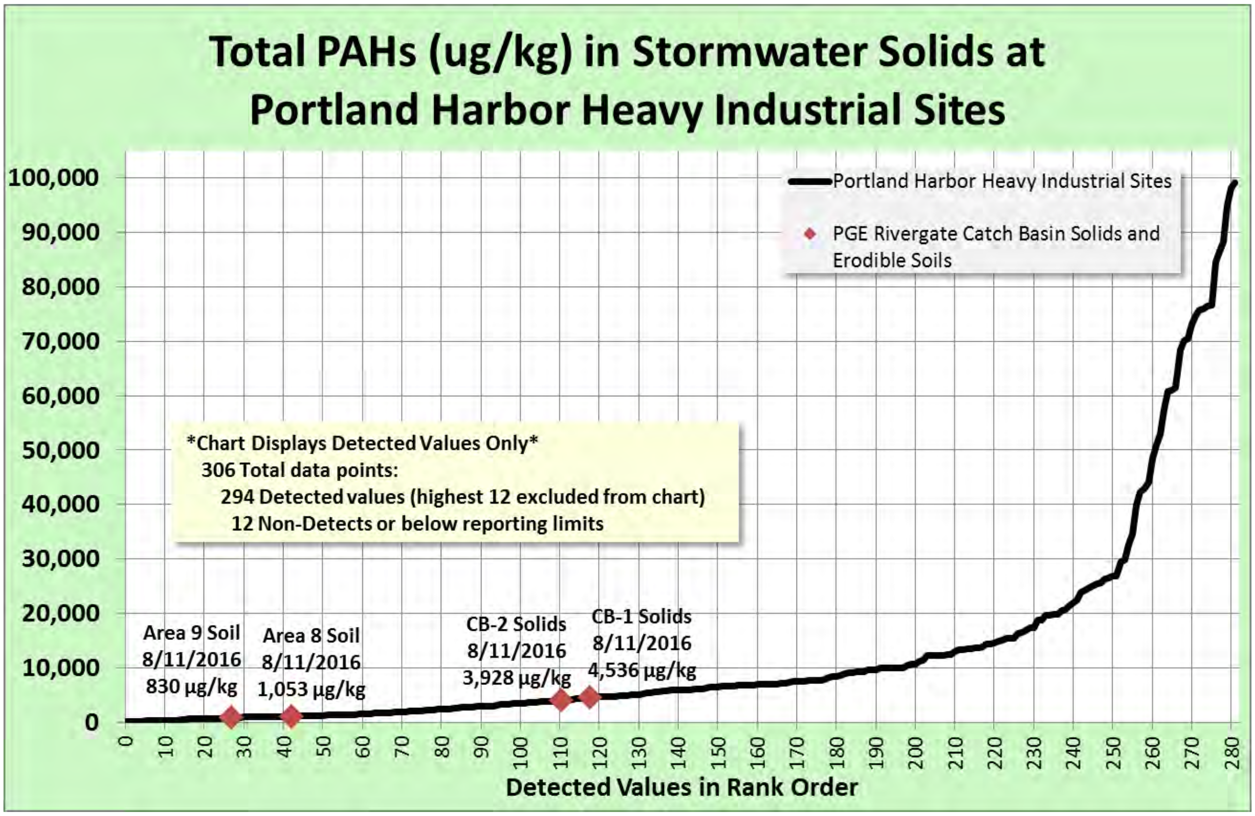


Figure 12: Total PAHs in Stormwater Solids at Portland Harbor Heavy Industrial Sites with the sum of detected PAH compounds in PGE Catch Basin Solids and Erodible Soils Data.

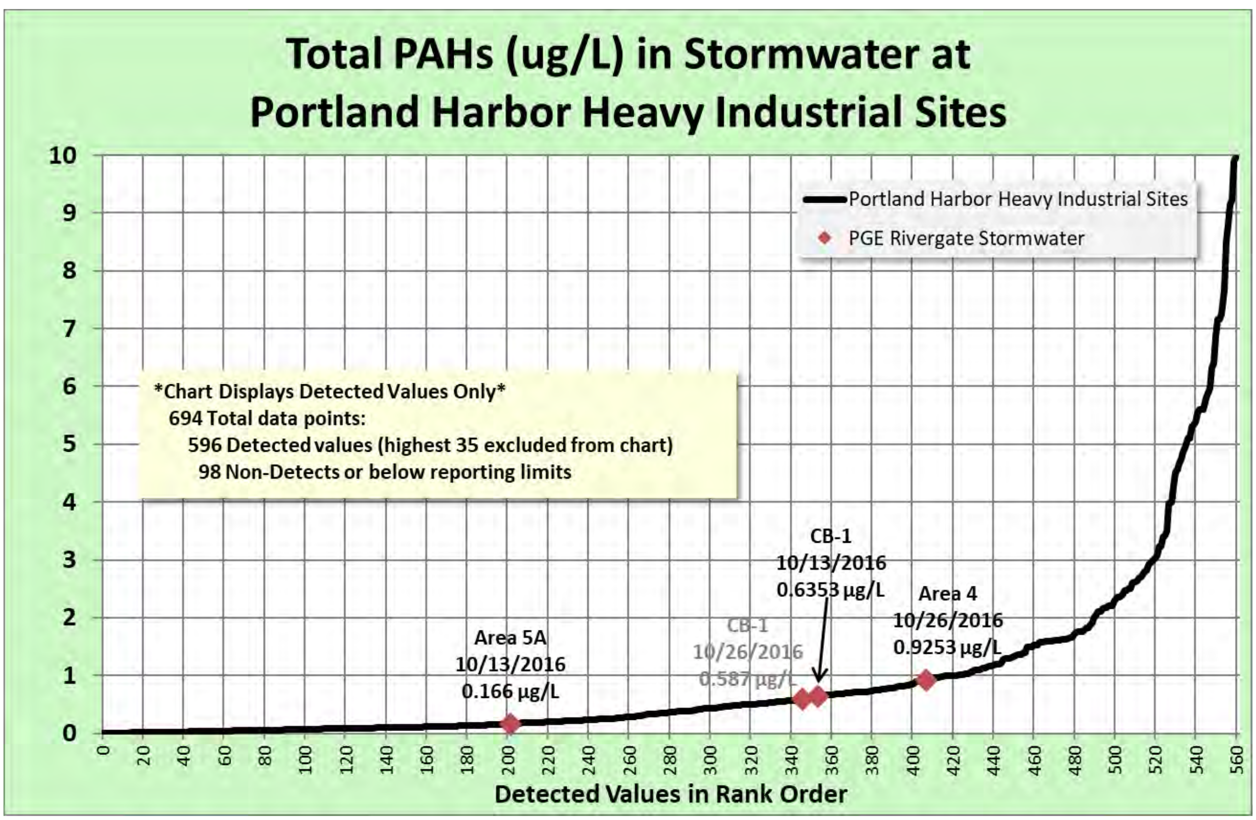
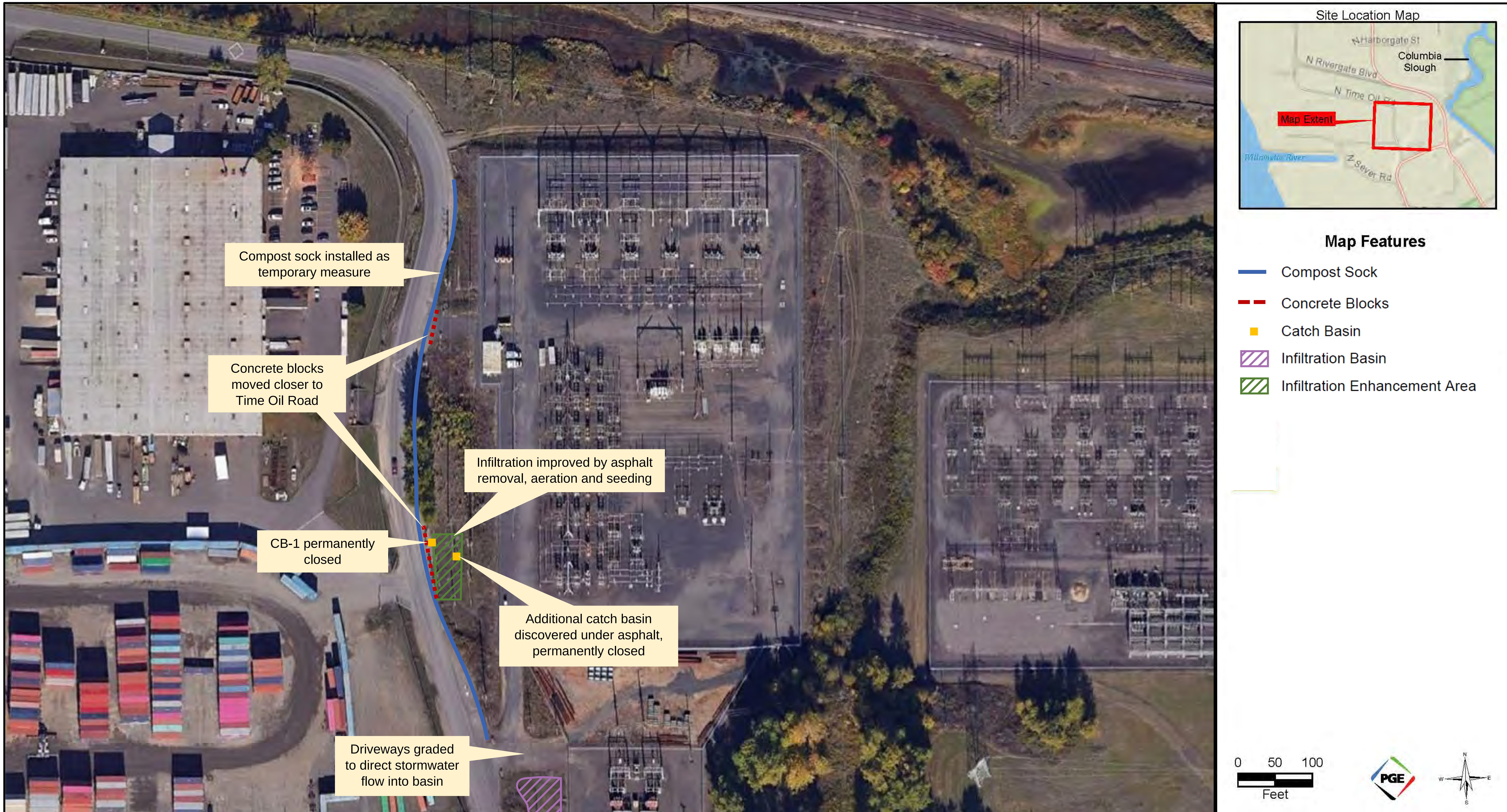


Figure 13: Total PAHs in Stormwater at Portland Harbor Heavy Industrial Sites with the sum of detected PAH compounds in PGE Stormwater Data. Data labeled in grey may not be reliable due to data quality concerns (see Section 5.1).



Portland General Electric

Portland, Oregon

Figure 14

Source Control Measures

Rivergate Substations

Source Control Evaluation

Date:	Drawn By:	Rev:
4/9/2020	Amber DiLoreto	