Appendix J-1

Site 133 East Antimony

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Memorandum

To	Tom Cozzi, NJDEP	Page 1
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Subject	PPG Site 133 East	
	Compliance Averaging for Antimony in Soil (Revision 1)	
From	Claire Hunt	
Date	April 25, 2018	

This memorandum provides documentation of attainment of compliance for antimony in soil with the 31 milligram per kilogram (mg/kg) Residential Direct Contact Site Remediation Standard (RDCSRS) for a site-specific soil sample set from Site 133 East in accordance with the New Jersey Department of Environmental Protection's (NJDEP) Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria (September 24, 2012, Version 1.0).

Introduction

This memorandum provides documentation of attainment of compliance for antimony with the 31 mg/kg RDCSRS for a site-specific soil sample set that includes an antimony exceedance in one sample collected at Site 133 East:

Grid ID	Location ID	Sample ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD 88)	Antimony (mg/kg)
W38A	133-V38A-SW-E1	133-V38A-SW-E-6.9-7.4	3.6 - 4.1	5.8 - 5.3	91.1 J

bgs below ground surface
ft foot or feet
J The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
mg/kg milligram per kilogram
NAVD88 North American Vertical Datum of 1988

Figure 1 shows borings with remaining antimony data, the Site boundary, and the location of the sample exceeding the antimony RDCSRS. The remaining-in-place sample antimony results are provided in Table 5-2 of the Site 133 East Remedial Action Report (RAR) Tables and Figures (Revision 1), April 2018.

Delineation

The sample is delineated by the following samples shown on **Figure 1**. Laboratory reports and data validation reports for these samples are included with the Site 133 East RAR Tables and Figures (Revision 1) submittal, April 2018.

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Lab SDG	Date Collected	Sample Status	Antimony Result (mg/kg)	Direction
W37A	133-P3C-W37AR	7.0 - 7.5	5.9 - 5.4	JB65296A	4/22/2014	removed	3.6	North
U37A	133-P3C-U37A	7.0 - 7.5	5.6 - 5.1	JB81300T	11/7/2014	removed	6.2	West
W38A	133-V38A-SW-E2	5.6 - 6.1	3.8 - 3.3	JC36658A	2/2/2017	remaining	< 0.43 U	Vertical
W39A	135-W39A-SW-N1	3.0 - 3.5	6.4 - 5.9	JC36564A	2/1/2017	removed	1.6 J	East
V40A	135-P3C-V41A	7.0 - 7.5	6.7 - 6.2	JB42618A	7/19/2013	remaining	< 0.32 UJ	South

bgs below ground surface
ft foot or feet
J The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
mg/kg milligram per kilogram
NAVD88 North American Vertical Datum of 1988
SDG sample delivery group
U The analyte was not detected above the sample reporting limit shown.
UJ The analyte was not detected above the sample reporting limit shown and the reporting limit was approximate.

Functional Area

The antimony RDCSRS is based on the ingestion-dermal pathway (**Attachment 1**). The functional area for the ingestion-dermal pathway is limited to 0.25 acre for residential use. The extent of the functional area within the Site boundary is shown in **Figure 1**. The shape is square and conforms to the Site boundary. Remaining samples within the functional area extents were collected from deeper than 2 feet below ground surface and are considered a part of the functional area for the calculation.

Compliance Averaging

Compliance with the antimony RDCSRS is demonstrated through spatial averaging. Theissen polygons were created within the functional area as shown in **Figure 1**. The selected samples and associated Theissen polygon areas are listed below. The sample selection process is as follows:

1. All of the samples for antimony with a sample status of remaining that fall within the functional area horizontally and vertically are identified (backfill samples are excluded).
2. The maximum concentration is selected at each sample location for use in the weighted average. The maximum of the concentration for detections or the Method Detection Limit/Reporting Limit (MDL/RL) for non-detects is selected.

Laboratory reports and data validation reports for the samples are included with the Site 133 East RAR Tables and Figures (Revision 1) submittal, April 2018.

Grid ID	Location ID	Sample Depth (ft bgs)	Sample Elevation (ft NAVD 88)	Lab SDG	Date Collected	Maximum Antimony Result (mg/kg)	Area (sf)	Area x Maximum Antimony Result (sf*mg/kg)
T38A	133-P3C-T38A	12.0 - 12.5	0.8 - 0.3	JB82214A	11/19/2014	9.0 J	1,865	16,785
U36A	133-P3C-U36A	18.0 - 18.5	-5.4 - -5.9	JB81503R	11/11/2014	14.9 RA	1,856	27,654
W37A	133-P3C-W37AR	15.6 - 16.1	-2.7 - -3.2	JB65296A	4/22/2014	0.47 J	893	420
U39A	133-U39A-PB-N	10.3 - 10.8	2.1 - 1.6	JC1883	7/1/2015	< 0.41 UB	2,108	864
V37A	133-V37A-PB	16.1 - 16.6	-3.5 - -4.0	JC35627A	1/17/2017	< 0.64 UJ	1,597	1,022
W37A	133-V37A-SW-E	14.1 - 14.6	-1.5 - -2.0	JC35627A	1/17/2017	< 4.9 U	617	3,023
W38A	133-V38A-SW-E1	6.9 - 7.4	5.8 - 5.3	JC36658A	2/2/2017	91.1 J	411	37,442
W38A	133-V38A-SW-E2	8.9 - 9.4	3.8 - 3.3	JC36658A	2/2/2017	< 0.43 U	776	334
W38A	135-W39A-SW-N2	5.0 - 5.5	4.4 - 3.9	JC36564A	2/1/2017	1.2 J	580	696
						Total	10,703	88,241

bgs	below ground surface
ft	foot or feet
J	The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
mg/kg	milligram per kilogram
NAVD88	North American Vertical Datum of 1988
RA	The result was rejected due to deficiencies but is considered usable for decision-making purposes.
SDG	sample delivery group
sf	square feet
U	The analyte was not detected above the sample reporting limit shown.
UB	The analyte concentration is less than or equal to three times the concentration in the associated method/prep blank. The presence of the analyte in the sample is negated (UB) due to laboratory contamination.
UJ	The analyte was not detected above the sample reporting limit shown and the reporting limit was approximate.

Weighted Average Concentration = 88,241 square feet x mg/kg / 10,703 square feet = 8 mg/kg

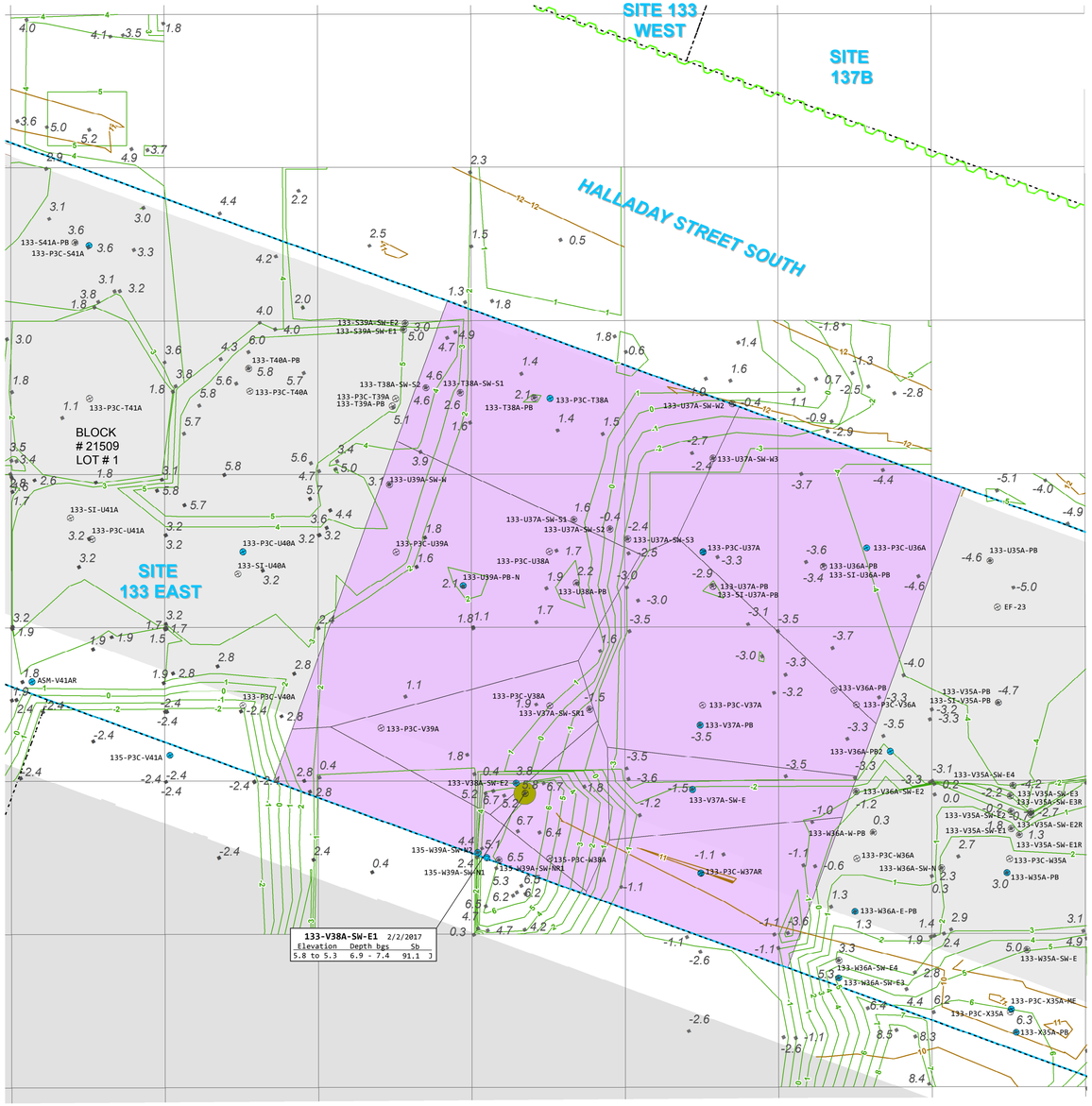
Conclusion

The spatially weighted average antimony concentration within the study area at Site 133 East is 8 mg/kg, which is compliant with the 31 mg/kg RDCSRS.

Attachments:

Figure 1 Sample Map for Antimony Compared to Soil Remediation Standards and Functional Area

Attachment 1 NJDEP Environmental Criteria for Antimony



ABBREVIATIONS:

CCPW - Chromate Chemical Production Waste

Cr^{+3} - trivalent chromium

Cr^{+6} - hexavalent chromium

Cr - chromium

ft - feet

mg/kg - milligrams per kilogram

N/A - not applicable

NAVD88 - North American Vertical Datum of 1988

NJDEP - New Jersey Department of Environmental Protection

NRDCSRS - New Jersey Department of Environmental Protection Non-Residential Direct Contact Soil Remediation Standard

RDCSRS - New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard

Sb - antimony

QUALIFIERS:

J - The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.

GENERAL NOTES:

G1. The antimony data associated with the sample locations shown on this figure are provided in the Technical Memorandum P*PG Site 133 East, Compliance Averaging for Antimony in Soil (Revision 1)*, AECOM, March 2018.

G2. "Elevation" refers to the sample elevation based on the pre-remediation surface elevation for samples collected from the pit bottom, and the surface elevation of the sample location when the sample was collected via boring or test pit.

G3. Elevation vertical datum is NAVD88, in U.S. survey ft.

G4. Results are reported in mg/kg.

G5. Source of block/lot information is Jersey City Parcel Data from New Jersey Geographic Information Network (NJGIN), last updated 10/6/2015 (available at: http://data.jerseycitynj.gov/dataset/jersey-city-parcel-polygon).

G6. This figure presents data for locations within the Site boundary that have samples remaining in place. In addition, locations from outside the Site boundary and/or removed samples may be shown to demonstrate compliance with the remediation objectives.

SPECIFIC NOTES:

S1. Pre-construction topographical contours are sourced from the "Catch Basin-Receptor Evaluation Survey, PPG Site 114, City of Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated April 19, 2011. Property lines are sourced from the "Boundary and Line Delineation Map, PPG Site, Lot 1 & 2, Block 21509, Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated July 21, 2014.

S2. Post-excavation elevation survey points were taken from the "Post Excavation Elevations Plan for ENTACT, LLC; PPG Phase 3C," produced by Maser Consulting P.A., dated 04/19/2017 with revisions.

S3. Conceptual post-excavation elevation contours were generated using professional judgement based on post-excavation elevation survey points and knowledge of excavation practices utilized during remedial excavation (i.e., excavation conducted on a 30 ft by 30 ft basis).

S4. The extent of excavation shown here represents the as-built terminal excavation elevation for remediation of Cr^{+6}, CCPW, non-Cr constituents, and concrete foundation removal.

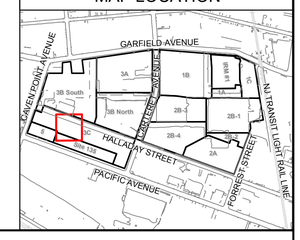
S5. In Grids U36A, U37A, V35A, W35A, and X35A, two sample locations are located adjacent; therefore, the sampling location symbols overlap on the figure.

LEGEND

- SAMPLING LOCATION (REMAINING SAMPLES)
- SAMPLING LOCATION (REMOVED CONFIRMATION SAMPLES)
- REMAINING SAMPLES NOT ANALYZED FOR CCPW METALS
- RESULT IS BELOW THE MOST STRINGENT STANDARD
- RESULTS EXCEED THE MOST STRINGENT STANDARD, BUT ARE IN COMPLIANCE WITH REMEDIATION OBJECTIVES
- ANTIMONY (Sb)
- POST-EXCAVATION ELEVATION SURVEY POINT REPRESENTING AS-BUILT TERMINAL EXCAVATION ELEVATION (FT NAVD88)
- CONCEPTUAL POST-EXCAVATION ELEVATION CONTOUR (1-FOOT INTERVAL IN FT NAVD88)
- IN PLACE SHEET PILE (AS OF OCTOBER 2017)
- PRE-REMEDIATION ELEVATION CONTOUR (1-FOOT INTERVAL IN FT NAVD88)
- PROPERTY LINE
- FORMER BUILDING SLAB (AVERAGE ELEVATION 12.8 FT NAVD88)
- GRID LAYOUT
- SITE BOUNDARY
- THEISSEN POLYGON

Soil Remediation Standards (mg/kg)		
Analyte	RDCSRS	NRDCSRS
ANTIMONY	31	450

MAP LOCATION



AECOM

0 10 20 30 Feet

PPG SITE 133 EAST GARFIELD AVENUE GROUP JERSEY CITY, NEW JERSEY	SAMPLE MAP FOR ANTIMONY COMPARED TO SOIL REMEDIATION STANDARDS AND FUNCTIONAL AREA
DATE: 04/20/2018	FIGURE 1

ATTACHMENT 1

NJDEP Environmental Criteria for Antimony

New Jersey Department of Environmental Protection

Standards for Drinking Water, Ground Water, Soil and Surface Water

Antimony (Total)

CAS #: 7440-36-0

Drinking Water Standards (µ g/l or ppb)

Standard: 6 **Type:** Primary FEDERAL MCL

Ground Water Quality Standards (µ g/l or ppb)

Standard: 6 **Type:** Specific

GW-Quality Criterion: 6

PQL: 3

Surface Water Quality Standards (µ g/l or ppb)

Fresh Water-

Human Health: 5.6(h)(T) **Aquatic-Acute:** **Aquatic-Chronic:**

Saline Water-

Human Health: 640(h)(T) **Aquatic-Acute:** **Aquatic-Chronic:**

Soil Standards (mg/kg)

Residential Direct Contact Health Based Criteria and Soil Remediation Standard

Soil Remediation Standard: 31 **Effective:** 6/2/2008 **Interim:** ☐

Ingestion Dermal: 31

Inhalation: 360,000

Soil PQL: 6

Non-Residential Direct Contact Health Based Criteria and Soil Remediation Standard

Soil Remediation Standard: 450 **Effective:** 6/2/2008 **Interim:** ☐

Ingestion Dermal: 450

Inhalation: 23,000

Soil PQL: 6

Appendix J-2

Site 133 East Thallium

To	Wayne Howitz, NJDEP	Page 1
	David Doyle, NJDEP	
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	Bhavini Doshi, City of Jersey City	
	Peter Baker, City of Jersey City	
	Nick Strasser, City of Jersey City	
	James D. Ray, MDMC-Law	
	Nancy Colson, MDMC-Law	
CC	Jody Overmyer, PPG	
	Mark Terril, PPG	
	Rich Feinberg, PPG	
	Joseph Lagrotteria, LeClairRyan	
	Dorothy Laguzza, LeClairRyan	
	Carolyn Scott, AECOM	
	Aimee Ruiter, AECOM	
	Abigail Small, AECOM	
Subject	PPG Site 133 East	
	Compliance Averaging for Thallium in Soil (Revision 2)	
From	Claire Hunt	
Date	July 26, 2018	

This memorandum provides documentation of attainment of compliance for thallium in soil with the 3 milligram per kilogram (mg/kg) default Impact to Groundwater Soil Screening Level (DIGWSSL) for a site-specific soil sample set from Site 133 East in accordance with the New Jersey Department of Environmental Protection's (NJDEP) *Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria* (September 24, 2012, Version 1.0).

Introduction

This memorandum provides documentation of attainment of compliance for thallium with the 3 mg/kg DIGWSSL for a site-specific soil sample set that includes a thallium exceedance in one sample collected at Site 133 East:

Grid ID	Location ID	Sample ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD 88)	Thallium (mg/kg)
Z28A	133-P3C-Z28A	133-P3C-Z28A-3.0-3.5	3.0 - 3.5	7.7 1 7.2	3.4 J

bgs	below ground surface
ft	foot or feet
J	The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
mg/kg	milligram per kilogram
NAVD88	North American Vertical Datum of 1988

The DIGWSSL applies to samples above the 50th percentile groundwater elevation for the Site, which is El. 6.2 feet (ft) in the North American Vertical Datum of 1988 (ft NAVD88). The calculation for the 50th percentile groundwater elevation is provided in Attachment 1 of the 133 East Remedial Action Report (RAR) Tables and Figures (Revision 2) submittal, July 2018.

Figure 1 shows borings with remaining thallium data, the Site boundary, and the location of the sample exceeding the thallium DIGWSSL. The remaining-in-place thallium sample results are provided in Table 5-2 of the *Site 133 East Remedial Action Report (RAR) Tables and Figures (Revision 2)* submittal, July 2018.

Delineation

The sample is delineated by the following samples shown on **Figure 1**.

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Lab SDG	Date Collected	Sample Status	Thallium Result (mg/kg)	Direction
CC28A	135-CC28A	6.0 - 6.5	7.5 - 7.0	JC14689A	2/23/2016	removed	0.2 U	East
Y28A	133-P3C-Y28A-ME	5.0 - 5.5	7.8 - 7.3	JB96260A	6/3/2015	remaining	0.3 J	West
Z23A	133-P3C-Z23AR	4.5 - 5.0	8.5 - 8.0	JB82738T	11/25/2014	removed	0.2 UJ	North
Z30A	133-P3C-Z30A-ME	3.0 - 3.5	8.5 - 8.0	JB96803A	6/11/2015	removed	0.2 UJ	South
The sample is delineated vertically by the groundwater interface.								Vertical

bgs	below ground surface
ft	foot or feet
J	The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample
mg/kg	milligram per kilogram
NAVD88	North American Vertical Datum of 1988
SDG	sample delivery group
U	The analyte was not detected above the sample reporting limit shown.
UJ	The analyte was not detected above the sample reporting limit shown and the reporting limit was approximate.

Laboratory reports and data validation reports for most of the above samples were included with the *Site 133 East RAR Tables and Figures (Revision 1)* submittal, April 2018. The laboratory report and data validation report for the delineation sample in Grid CC28A were included with the *Site 135 South RAR Tables and Figures (Revision 0)* submittal, February 2018.

Functional Area

The functional area for the impact-to-groundwater pathway is limited in the direction of groundwater flow to 100 feet. Groundwater flow in the vicinity of the sample exceedance is to the southeast according to groundwater contours shown on Figure 3-9 (May 2011 Groundwater Contour Map, Shallow Monitoring Wells), included in the *Remedial Investigation Report – Soil Garfield Avenue Group Non-Residential Chromate Chemical Production Waste Sites 114, 132, 133, 135, 137, 143 and 186 Jersey City, New Jersey*, dated February 2012. The groundwater flow direction is displayed on **Figure 1**.

Perpendicular to groundwater flow, the functional area is limited to the delineated extent of contamination. The long end of the functional area was drawn between delineation locations 133-P3C-Z23AR and 133-P3C-Z30A-ME.

Per the attainment guidance, the shape of the functional area must also be defined by "the delineated extent of contamination in all other directions." Because the distance between the exceedance and the delineation samples is greater than 100 feet in the direction of groundwater flow, it is not possible to have a single functional area which is 100 feet in the direction of groundwater flow and includes all delineation samples. Therefore, two overlapping functional areas are defined to demonstrate compliance. Functional Area 1 includes delineation samples to the north and west. Function Area 2 includes delineation samples to the south and east. Both functional areas include the location of the exceedance. The extents of both functional areas are shown in **Figure 1**.

The sample exceeding the DIGWSSL (depth 3.0 - 3.5 ft bgs) is located within two feet above the groundwater interface (El. 6.2 ft NAVD88). The remaining samples within the functional area extents that were collected between the groundwater interface (El. 6.2 ft NAVD88) and the 2 feet above the groundwater interface (to El. 8.2 ft NAVD88) are a part of the functional areas for the calculation.

Compliance Averaging

Compliance with the thallium DIGWSSL can be attained through the arithmetic average because there are less than ten samples remaining in place in the functional areas. The sample size is small within the functional areas because excavation was conducted to below the water table in the majority of the grids. The arithmetic mean method is more representative of the post-remedial conditions than the spatial averaging method due to the limited number of samples that remain in place above the water table following excavation. The selected samples are listed below. The sample selection process is as follows:

1. All of the samples for thallium with a sample status of remaining that fall within the functional areas horizontally and vertically are identified (backfill samples are excluded).
2. All remaining samples are used in the arithmetic average. Zero is substituted for the method detection limit/reporting limit (MDL/RL) for non-detects.

The data listed below were selected:

Functional Area 1: Includes the North and West Delineation Samples

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Date Collected	Thallium Result (mg/kg)	Thallium Result Used in Calculation (mg/kg)
Y28A	133-P3C-Y28A-ME	5.0 - 5.5	7.8 - 7.3	06/03/2015	0.38 J	0.38
Y28A	133-P3C-Y28A-ME	6.0 - 6.5	6.8 - 6.3	06/03/2015	0.47 J	0.47
Y29A	133-P3C-Y29A-ME	5.0 - 5.5	7.7 - 7.2	06/03/2015	0.46 U	0
Y29A	133-P3C-Y29A-ME	6.0 - 6.5	6.7 - 6.2	06/03/2015	0.88 J	0.88
Z28A	133-P3C-Z28A	3.0 - 3.5	7.7 - 7.2	06/21/2013	3.4 J	3.4
					Sum	5.13

bgs below ground surface
ft foot or feet
J The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
mg/kg milligrams per kilogram
NAVD88 North American Vertical Datum of 1988
U The analyte was not detected above the sample reporting limit shown.

Arithmetic Average Concentration = 5.13 mg/kg / 5 samples = 1 mg/kg

Functional Area 2: Includes the South and East Delineation Samples

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Date Collected	Thallium Result (mg/kg)	Thallium Result Used in Calculation (mg/kg)
Y29A	133-P3C-Y29A-ME	5.0 - 5.5	7.7 - 7.2	06/03/2015	0.46 U	0
Y29A	133-P3C-Y29A-ME	6.0 - 6.5	6.7 - 6.2	06/03/2015	0.88 J	0.88
Z28A	133-P3C-Z28A	3.0 - 3.5	7.7 - 7.2	06/21/2013	3.4 J	3.4
					Sum	4.28

bgs below ground surface
ft foot or feet
J The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
mg/kg milligrams per kilogram
NAVD88 North American Vertical Datum of 1988
U The analyte was not detected above the sample reporting limit shown.

Arithmetic Average Concentration = 4.28 mg/kg / 3 samples = 1 mg/kg

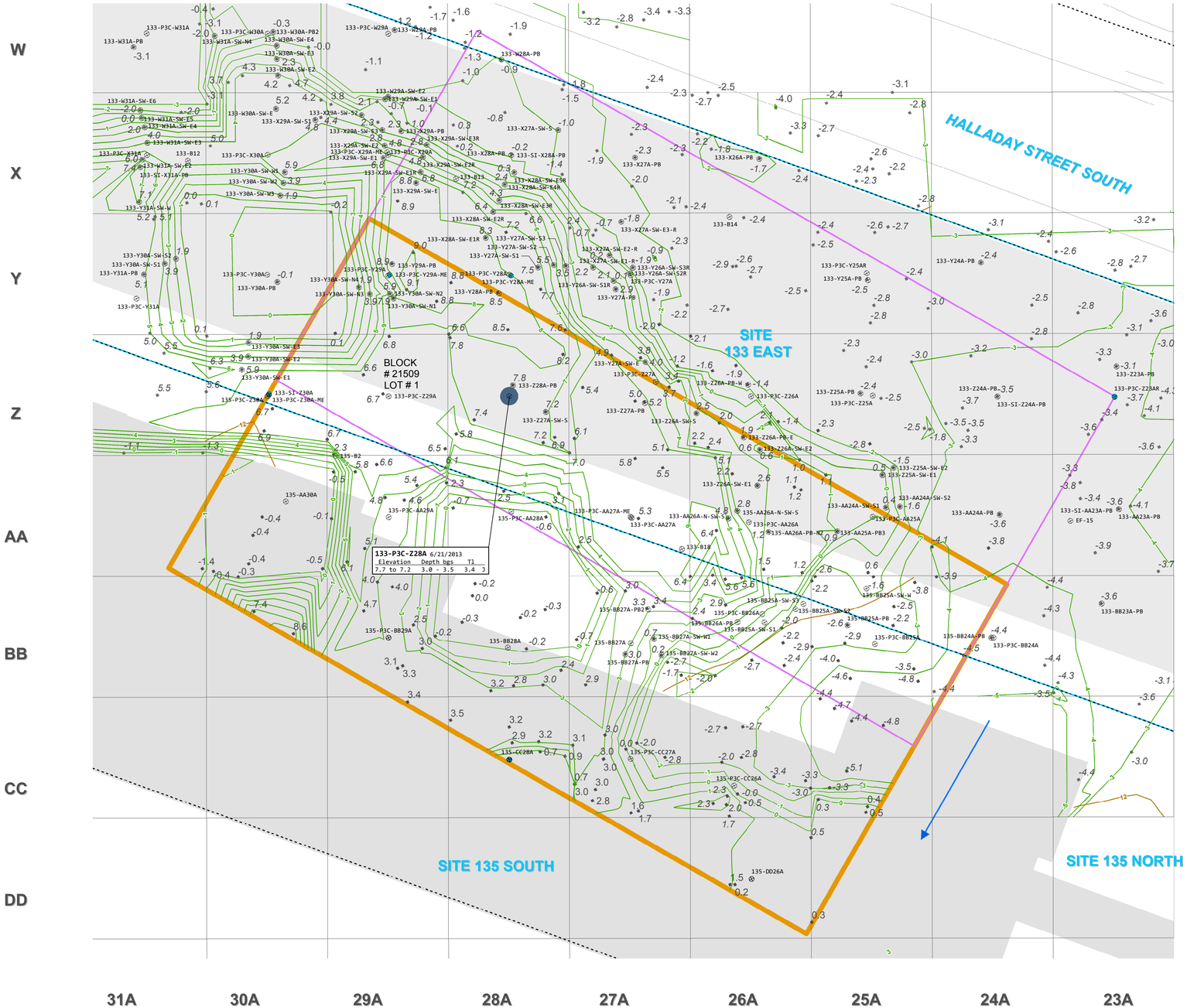
Laboratory reports and data validation reports for the above samples were included with the *Site 133 East Remedial Action Report Tables and Figures (Revision 1)* submittal, April 2018.

Conclusion

Based on the impact-to-groundwater scenario, the arithmetic mean thallium concentration within the study area at sample 133-P3C-Z28A-3.0-3.5 is 1 mg/kg for both functional areas, which is compliant with the 3 mg/kg DIGWSSL.

Attachments:

Figure 1 Sample Map for Thallium in the Unsaturated Soil Zone Compared to IGW Soil Screening Levels and Functional Areas



ABBREVIATIONS:

CCPW - Chromate Chemical Production Waste
Cr^{+6} - hexavalent chromium
Cr - chromium
DIGWSSL - Default Impact to Groundwater Soil Screening Level
ft - feet
IGW - Impact to Groundwater
mg/kg - milligram per kilogram
N/A - not applicable
NAVD88 - North American Vertical Datum of 1988
TI - thallium

QUALIFIERS:

J - The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.

GENERAL NOTES:

G1. The thallium data associated with the sample locations shown on this figure are provided in the Technical Memorandum *PPG Site 133 East, Compliance Averaging for Thallium in Soil (Revision 2)*, AECOM, July 2018.

G2. "Elevation" refers to the sample elevation based on the pre-remediation surface elevation for samples collected from the pit bottom, and the surface elevation of the sample location when the sample was collected via boring or test pit.

G3. Elevation vertical datum is NAVD88, in U.S. survey ft.

G4. Results are reported in mg/kg.

G5. Source of block/lot information is Jersey City Parcel Data from New Jersey Geographic Information Network (NJGIN), last updated 10/6/2015 (available at: http://data.jerseycitynj.gov/dataset/jersey-city-parcel-polygon).

G6. This figure presents data for locations within the Site boundary and functional areas that have samples remaining in place. In addition, locations from outside the Site boundary and/or removed samples may be shown to demonstrate compliance with the remediation objectives.

SPECIFIC NOTES:

S1. Pre-construction topographical contours are sourced from the "Catch Basin-Receptor Evaluation Survey, PPG Site 114, City of Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated April 19, 2011. Property lines are sourced from the "Boundary and Line Delineation Map, PPG Site, Lot 1 & 2, Block 21509, Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated July 21, 2014.

S2. Post-excavation elevation survey points were taken from the "Post Excavation Elevations Plan for ENTACT, LLC; PPG Phase 3C," produced by Maser Consulting P.A., dated 04/19/2017 with revisions.

S3. Conceptual post-excavation elevation contours were generated using professional judgement based on post-excavation elevation survey points and knowledge of excavation practices utilized during remedial excavation (i.e., excavation conducted on a 30 ft by 30 ft basis).

S4. The extent of excavation shown here represents the as-built terminal excavation elevation for remediation of Cr^{+6}, CCPW, non-Cr constituents, and concrete foundation removal.

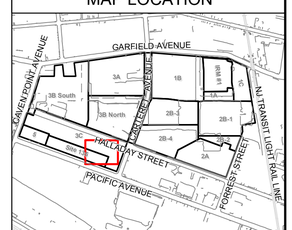
S5. In Grids AA27A, BB24A, X28A, X29A, Y26A, Y27A, Y28A, Y29A, Z24A, and Z30A, two sample locations are located adjacent; therefore, the sampling location symbols overlap on the figure.

LEGEND

- SAMPLING LOCATION (REMAINING SAMPLES)
- SAMPLING LOCATION (REMOVED CONFIRMATION SAMPLES)
- REMAINING SAMPLES NOT ANALYZED FOR CCPW METALS
- RESULT IS BELOW THE MOST STRINGENT STANDARD
- RESULTS EXCEED THE MOST STRINGENT STANDARD, BUT ARE IN COMPLIANCE WITH REMEDIATION OBJECTIVES
- THALLIUM (TI)
- -3.8 POST-EXCAVATION ELEVATION SURVEY POINT REPRESENTING AS-BUILT TERMINAL EXCAVATION ELEVATION (FT NAVD88)
- CONCEPTUAL POST-EXCAVATION ELEVATION CONTOUR (1-FOOT INTERVAL IN FT NAVD88)
- PRE-REMEDIATION ELEVATION CONTOUR (1-FOOT INTERVAL IN FT NAVD88)
- PROPERTY LINE
- FORMER BUILDING SLAB (AVERAGE ELEVATION 12.8 FT NAVD88)
- FUNCTIONAL AREA 1
- FUNCTIONAL AREA 2
- GRID LAYOUT
- SITE BOUNDARY
- GROUNDWATER FLOW DIRECTION

Soil Screening Levels (mg/kg)	
Analyte	**DIGWSSL**
THALLIUM	3

MAP LOCATION



AECOM

PPG
SITE 133 EAST
GARFIELD AVENUE GROUP
JERSEY CITY, NEW JERSEY

DATE: 07/25/2018

SAMPLE MAP FOR THALLIUM
IN THE UNSATURATED SOIL ZONE
COMPARED TO IGW SOIL SCREENING LEVELS
AND FUNCTIONAL AREAS

FIGURE 1

Appendix J-3

Site 135 South Antimony

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Memorandum

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Subject	PPG Site 135 South	
	Compliance Averaging for Antimony in Soil (Revision 0)	

From	Claire Hunt
Date	May 16, 2018

This memorandum provides documentation of attainment of compliance for antimony in soil with the 31 milligram per kilogram (mg/kg) residential direct contact site remediation standard (RDCSRS) for a site-specific soil sample set from Site 135 South in accordance with the New Jersey Department of Environmental Protection's (NJDEP) Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria (September 24, 2012, Version 1.0).

Introduction

Based on investigation and remediation, the following antimony concentrations remain in place in excess of the RDCSRS at Site 135 South when using single point compliance and for which we have applied compliance averaging for the attainment of compliance:

Grid ID	Location ID	Sample ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Antimony (mg/kg)
Y37A	135-Y38A-SW-N4	135-Y38A-SW-N-12.0-12.5	12.0 - 12.5	1.9 - 1.4	37.6
Z38A	135-Y38A-SW-E3	135-Y38A-SW-E-12.0-12.5	12.0 - 12.5	1.9 - 1.4	138

bgs below ground surface
ft foot or feet
mg/kg milligram per kilogram
NAVD88 North American Vertical Datum of 1988

Figure 1 shows borings with antimony remaining in place, the Site boundary, and the location of the samples exceeding the antimony RDCSRS. The remaining in-place results for antimony are provided in Table 5-2 of the *Site 135 South Remedial Action Report (RAR) Tables and Figures (Revision 1)*, May 2018.

Delineation

The antimony concentrations in excess of the RDCSRS at two locations at Site 135 South are delineated as indicated in the table below and shown on **Figure 1**.

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Date Collected	Antimony Result (mg/kg)	Direction
AA36A	135-SI-AA36A	9.5 - 10.0	2.2 - 1.7	8/28/2015	1.2 J	East
X38A	135-X38A-SW-W3	11.4 - 11.9	2.2 - 1.7	1/31/2017	1.6 J	West
Y36A	135-Y36A	11.5 - 12.0	2.4 - 1.9	8/28/2015	7.8	North
Y37A	135-Y38A-SW-N5	14.0 - 14.5	-0.1 - -0.6	12/21/2016	28.1	Vertical
Y40A	135-Z40A-SW-W3	12.0 - 12.5	2.0 - 1.5	1/6/2017	2.7	South
Z38A	135-Y38A-SW-E4	14.0 - 14.5 ft	-0.1 - -0.6	12/21/2016	2.2 J	Vertical

bgs below ground surface
ft foot or feet
J The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
mg/kg milligrams per kilogram
NAVD88 North American Vertical Datum of 1988

Laboratory reports and data validation reports for the delineation samples were included in the *Site 135 South Remedial Action Report (RAR) Tables and Figures (Revision 0)* submittal, February 23, 2018.

Functional Area

The antimony RDCSRS is based on the ingestion-dermal pathway (**Attachment 1**). The functional area for the ingestion-dermal pathway is limited to 0.25 acres for residential exposure scenario. The shape of the functional area is generally rectangular and within the Site boundary. Remaining samples within the functional area extents were collected from deeper than 2 feet below ground surface and are considered a part of the functional area for the calculations.

Compliance Averaging

Compliance with the antimony RDCSRS is demonstrated through spatial averaging. Thiessen polygons were created within the functional area as shown in **Figure 1**. The selected samples and associated Thiessen polygon areas are listed below. The sample selection process is as follows:

1. All of the samples for antimony with a sample status of remaining that fall within the functional area horizontally and vertically are identified (backfill samples are excluded).
2. The maximum concentration is selected at each sample location for use in the weighted average. The maximum of the concentration for detections or the method detection limit (MDL)/reporting limit (RL) for non-detects is selected.

Laboratory reports and data validation reports for the samples were included with the *Site 135 South RAR Tables and Figures (Revision 0)* submittal, February 23, 2018.

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Date Collected	Maximum Antimony Result (mg/kg)	Area (sf)	Area x Maximum Antimony Result (sf*mg/kg)
Y39A	135-Y38A-SW-S2	8.0 - 8.5	5.9 - 5.4	12/21/2016	8.4	538	4,519
Z39A	135-Z39A-PB	6.1 - 6.6	7.9 - 7.4	12/21/2016	2.1 J	511	1,073
Y37A	135-Y38A-SW-N4	12.0 - 12.5	1.9 - 1.4	12/21/2016	37.6	334	12,558
X38A	135-X38A-PB	13.4 - 13.9	0.2 - -0.3	1/31/2017	1.3 J	350	455
Y36A	135-Y36A	11.5 - 12.0	2.4 - 1.9	8/28/2015	7.8	2,341	18,260
Y40A	135-Z40A-SW-W3	12.0 - 12.5	2.0 - 1.5	1/6/2017	2.7	281	759
Y39A	135-Y38A-SW-S4	12.0 - 12.5	1.9 - 1.4	12/21/2016	3.6	54	194
Y39A	135-Y38A-SW-S3	10.0 - 10.5	3.9 - 3.4	12/21/2016	3.7	92	340
X39A	135-W39A-SW-E	7.0 - 7.5	2.4 - 1.9	2/1/2017	0.29 U	459	133
Z39A	135-Z40A-SW-N3	12.0 - 12.5	2.0 - 1.5	1/6/2017	1.5 J	276	414
Z39A	135-Z40A-SW-N2	10.0 - 10.5	4.0 - 3.5	1/6/2017	7.6	57	433
Z39A	135-Z40A-SW-N1	8.0 - 8.5	6.0 - 5.5	1/6/2017	1.8 J	305	549
Y38A	135-Y38A-SW-S5	14.0 - 14.5	-0.1 - -0.6	12/21/2016	3.1	334	1,035
Y37A	135-Y38A-SW-N5	14.0 - 14.5	-0.1 - -0.6	12/21/2016	28.1	252	7,081
Y37A	135-Y38A-SW-N3	10.0 - 10.5	3.9 - 3.4	12/21/2016	20.1	62	1,246
Y37A	135-Y38A-SW-N2	8.0 - 8.5	5.9 - 5.4	12/21/2016	20.6	970	19,982
Z38A	135-Y38A-SW-E3	12.0 - 12.5	1.9 - 1.4	12/21/2016	138	468	64,584

Grid ID	Location ID	Depth Interval (ft bgs)	Sample Elevation (ft NAVD88)	Date Collected	Maximum Antimony Result (mg/kg)	Area (sf)	Area x Maximum Antimony Result (sf*mg/kg)
Z38A	135-Y38A-SW-E2	10.0 - 10.5	3.9 - 3.4	12/21/2016	12.3	123	1,513
Z38A	135-Y38A-SW-E1	8.0 - 8.5	5.9 - 5.4	12/21/2016	4.2	1,940	8,148
X38A	135-Y38A-SW-W3	14.0 - 14.5	-0.1 - -0.6	12/22/2016	5.5	594	3,267
X39A	135-X38A-SW-S	11.4 - 11.9	2.2 - 1.7	1/31/2017	2.6 J	470	1,222
					Total	10,811	147,767

bgs	below ground surface
ft	foot or feet
J	The result was an estimated value; the associated numerical value was an approximate concentration of the analyte in the sample.
mg/kg	milligram per kilogram
NAVD88	North American Vertical Datum of 1988
SDG	sample delivery group
sf	square feet
U	The analyte was not detected above the sample reporting limit shown.

Weighted Average Concentration = 147,767 sf x mg/kg / 10,811 sf = 14 mg/kg

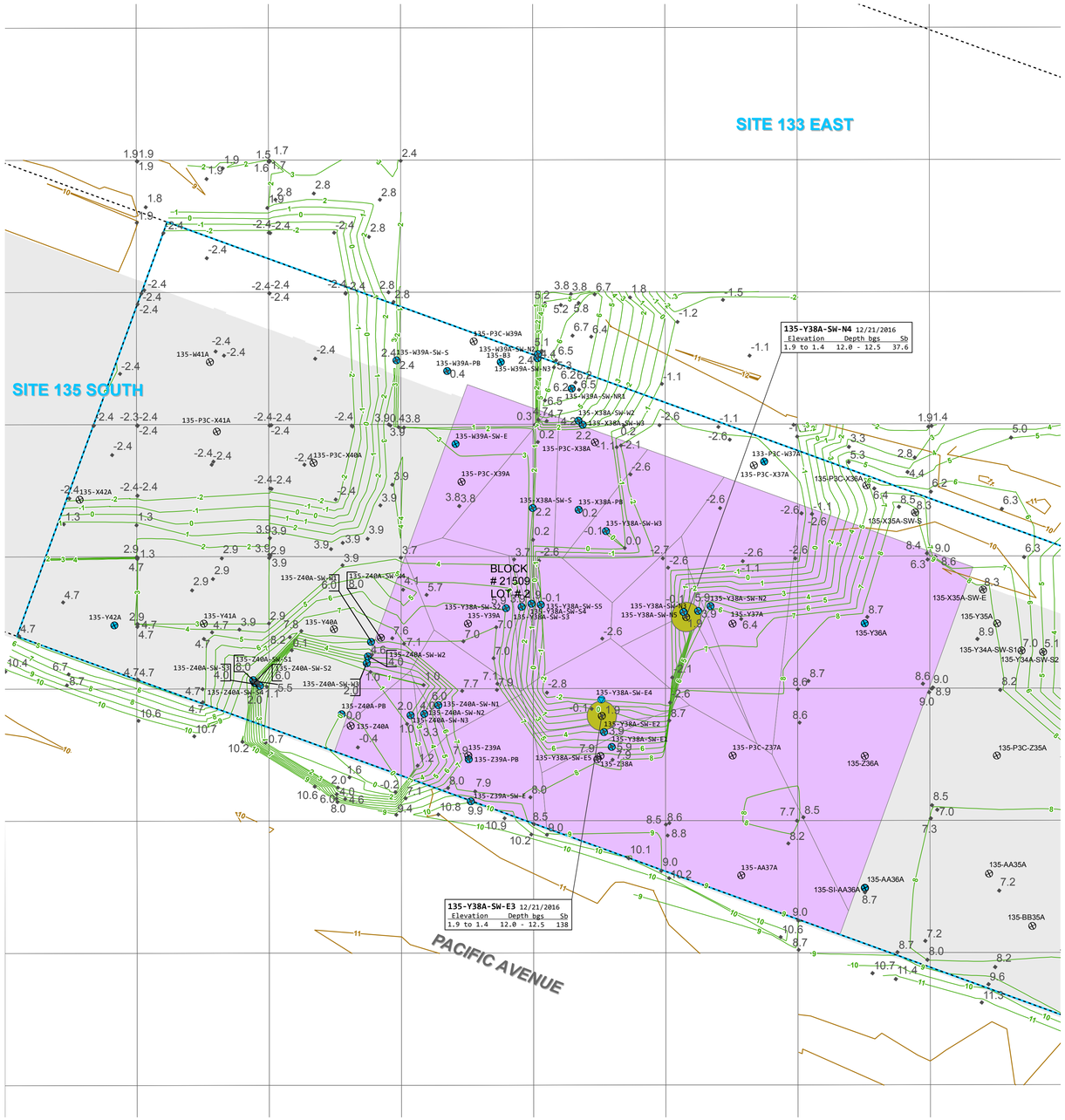
Conclusion

Based on the residential exposure scenario, the spatially weighted average antimony concentration within the study area at samples 135-Y38A-SW-N4 and 135-Y38A-SW-E3 is 14 mg/kg, which is compliant with the 31 mg/kg RDCSRS.

Attachments:

Figure 1 Site 135 South (Column 35A to 42A) Sample Map for Antimony Compared to Soil Remediation Standards and Functional Area

Attachment 1 NJDEP Environmental Criteria for Antimony



ABBREVIATIONS:

CCPW - Chromate Chemical Production Waste

Cr^{+6} - hexavalent chromium

Cr - chromium

ft - feet

mg/kg - milligrams per kilogram

N/A - not applicable

NAVD88 - North American Vertical Datum of 1988

NRDCSRS - New Jersey Department of Environmental Protection Non-Residential Direct Contact Soil Remediation Standard

RDCSRS - New Jersey Department of Environmental Protection Residential Direct Contact Soil Remediation Standard

RDCSRS-GAG - Residential Direct Contact Soil Remediation Standard - Garfield Avenue Group (alternative remediation standard approved by the New Jersey Department of Environmental Protection on December 28, 2016)

Sb - antimony

GENERAL NOTES:

G1. The antimony metals data associated with the sample locations shown on this figure are provided in Table 5-2. Data presented in call out boxes on this figure are outliers (i.e., data points that require further explanation). Specific notes for each outlier sample are provided in the Specific Notes in Table 5-2.

G2. "Elevation" refers to the sample elevation based on the pre-remediation surface elevation for samples collected from the pit bottom, and the surface elevation of the sample location when the sample was collected via boring or test pit.

G3. Elevation vertical datum is NAVD88, in U.S. survey ft.

G4. Results are reported in mg/kg.

G5. Source of block/lot information is Jersey City Parcel Data from New Jersey Geographic Information Network (NJGIN), last updated 10/6/2015 (available at: http://data.jerseycitynj.gov/dataset/jersey-city-parcel-polygon).

G6. This figure presents data only for locations within the Site boundary that have samples remaining in place.

SPECIFIC NOTES:

S1. Pre-construction topographical contours are sourced from the "Catch Basin-Receptor Evaluation Survey, PPG Site 114, City of Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated April 19, 2011. Property lines are sourced from the "Boundary and Line Delineation Map, PPG Site, Lot 1 & 2, Block 21509, Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated July 21, 2014.

S2. Post-excavation elevation survey points were taken from the "Post Excavation Elevations Plan for ENTACT, LLC; PPG Phase 3C," produced by Maser Consulting P.A., dated 04/19/2017 with revisions.

S3. Conceptual post-excavation elevation contours were generated using professional judgement based on post-excavation elevation survey points and knowledge of excavation practices utilized during remedial excavation (i.e., excavation conducted on a 30 ft by 30 ft basis).

S4. The extent of excavation shown here represents the as-built terminal excavation elevation for remediation of Cr^{+6}, CCPW, non-Cr constituents, and concrete foundation removal.

S5. In Grid AA36A, two sample locations are located adjacent; therefore, the sampling location symbols overlap on the figure.

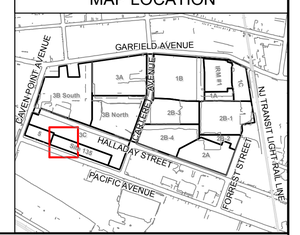
LEGEND

- REMAINING SAMPLES NOT ANALYZED FOR ANTIMONY
- SAMPLING LOCATION (REMAINING SAMPLES)
- SAMPLING LOCATION (REMOVED CONFIRMATION SAMPLES)
- RESULT IS BELOW THE MOST STRINGENT STANDARD
- RESULTS EXCEED THE MOST STRINGENT STANDARD, BUT ARE IN COMPLIANCE WITH REMEDIATION OBJECTIVES
- -3.8 POST-EXCAVATION ELEVATION SURVEY POINT REPRESENTING AS-BUILT TERMINAL EXCAVATION ELEVATION (FT NAVD88)
- PROPERTY LINE
- PRE-REMEDIATION ELEVATION CONTOUR (1-FOOT INTERVAL IN FT NAVD88)
- CONCEPTUAL POST-EXCAVATION ELEVATION CONTOUR (1-FOOT INTERVAL IN FT NAVD88)
- GRID LAYOUT
- THIESSEN POLYGON
- FORMER BUILDING SLAB (AVERAGE ELEVATION 12.7 FT NAVD88)
- SITE BOUNDARY

Soil Remediation Standards (mg/kg)

Analyte	RDCSRS	RDCSRS-GAG	NRDCSRS
ANTIMONY	31	N/A	450

MAP LOCATION



0 20 40 Feet

AECOM

PPG SITE 135 SOUTH GARFIELD AVENUE GROUP JERSEY CITY, NEW JERSEY	SITE 135 SOUTH (COLUMN 35A TO 42A) SAMPLE MAP FOR ANTIMONY COMPARED TO SOIL REMEDIATION STANDARDS AND FUNCTIONAL AREA
DATE: 05/14/2018	FIGURE 1

ATTACHMENT 1

NJDEP Environmental Criteria for Antimony

New Jersey Department of Environmental Protection

Standards for Drinking Water, Ground Water, Soil and Surface Water

Antimony (Total)

CAS #: 7440-36-0

Drinking Water Standards (µ g/l or ppb)

Standard: 6 **Type:** Primary FEDERAL MCL

Ground Water Quality Standards (µ g/l or ppb)

Standard: 6 **Type:** Specific

GW-Quality Criterion: 6

PQL: 3

Surface Water Quality Standards (µ g/l or ppb)

Fresh Water-

Human Health: 5.6(h)(T) **Aquatic-Acute:** **Aquatic-Chronic:**

Saline Water-

Human Health: 640(h)(T) **Aquatic-Acute:** **Aquatic-Chronic:**

Soil Standards (mg/kg)

Residential Direct Contact Health Based Criteria and Soil Remediation Standard

Soil Remediation Standard: 31 **Effective:** 6/2/2008 **Interim:** ☐

Ingestion Dermal: 31

Inhalation: 360,000

Soil PQL: 6

Non-Residential Direct Contact Health Based Criteria and Soil Remediation Standard

Soil Remediation Standard: 450 **Effective:** 6/2/2008 **Interim:** ☐

Ingestion Dermal: 450

Inhalation: 23,000

Soil PQL: 6