Appendix B-1

Notice in Lieu of Deed Notice

Return Address:
Dorothy Laguzza, Esq.,
K&L Gates LLP
One Newark Center, Tenth Floor
Newark, NJ 07102-5285

NOTICE IN LIEU OF DEED NOTICE

THIS DOCUMENT SHALL BE DISTRIBUTED TO THE ENTITIES IDENTIFIED IN ACCORDANCE WITH N.J.A.C. 7:26C-7.2(b)2.

Prepared by: _____
[Signature]

_____
[Print name below signature]

This Notice in Lieu of Deed Notice is made as of the _____ day of _____, ____, by the City of Jersey City, New Jersey, 280 Grove Street, Jersey City, New Jersey 07302 ("Owner").

1. THE PROPERTY. The City of Jersey City is the owner in fee simple of certain real property designated as Garfield Avenue. This Notice in Lieu of Deed Notice is for the portion of Garfield Avenue between Carteret Avenue and Hudson-Bergen Light Rail on the tax map of the City of Jersey City, Hudson County (the "Property"). The New Jersey Department of Environmental Protection ("NJDEP") Program Interest Number ("Preferred ID") for the contaminated site, part of which includes the Property, is G000005480. The Property is more particularly described in Exhibit A, which is attached hereto and made a part hereof.

2. REMEDIATION.

i. NJDEP has approved this Notice in Lieu of Deed Notice as an institutional control for the Property, which is part of the remediation of the Property. The Property is subject to a Partial Consent Judgment Concerning PPG Sites entered into by NJDEP, the Owner and PPG and approved by the Superior Court of New Jersey on June 26, 2009 (Superior Court of New Jersey, Chancery Division-Hudson County, Docket No. C-77-05 ("Consent Judgment")). Pursuant to the Consent Judgment, PPG has responsibility for remediation of all hazardous substances having emanated from Hudson County Chromate (HCC) Site 114 in accordance with the Consent Judgment.

ii. N.J.A.C. 7:26C-7 requires the Owner, among other persons, to obtain a soil remedial action permit for the soil remedial action at the Property. That permit will contain the monitoring, maintenance and biennial certification requirements that apply to the Property.

3. SOIL CONTAMINATION. PPG is responsible for remediation of the Property to address Chromate Chemical Production Waste ("CCPW"). PPG has remediated contaminated soil at the Property such that soil contamination remains at certain areas of the Property that contain contaminants in concentrations that do not allow for the unrestricted use of the Property. Such soil contamination is described, including the type, concentration, and specific location of such

contamination, and the existing engineering controls on the site are described, in Exhibit B, which is attached hereto and made a part hereof. As a result, there is a statutory requirement for this Notice in Lieu of Deed Notice and engineering controls in accordance with N.J.S.A. 58:10B-13.

4. CONSIDERATION. In accordance with the remedial action for the site that includes the Property, and in consideration of the terms and conditions of that remedial action, and other good and valuable consideration, the Owner has agreed to subject the Property to certain statutory and regulatory requirements that impose restrictions upon the use of the Property, to restrict certain uses of the Property, and to provide notice to subsequent owners, lessors, lessees and operators of the Property of the restrictions and the monitoring, maintenance, and biennial certification requirements outlined in this Notice in Lieu of Deed Notice and required by law, as set forth herein.

5A. RESTRICTED AREAS. Due to the presence of contamination remaining at concentrations that do not allow for unrestricted use, the Owner has agreed, as part of the remedial action for the Property, to restrict the use of certain parts of the Property (the "Restricted Areas"); a narrative description of these restrictions is provided in Exhibit C, which is attached hereto and made a part hereof. The Owner has also agreed to maintain a list of these restrictions for referral by government officials and other interested parties. This list of restrictions is available for review at the Jersey City Division of Engineering, Traffic, and Transportation office or the Jersey City Municipal Utilities Authority ("JCMUA") office.

5B. RESTRICTED LAND USES. The following statutory land use restrictions apply to the Restricted Areas:

i. The Brownfield and Contaminated Site Remediation Act, N.J.S.A. 58:10B-12.g(10), prohibits the conversion of a contaminated site, remediated to non-residential soil remediation standards that require the maintenance of engineering or institutional controls, to a child care facility, or public, private, or charter school without the Department's prior written approval, unless a presumptive remedy is implemented; and

ii. The Brownfield and Contaminated Site Remediation Act, N.J.S.A. 58:10B-12.g(12), prohibits the conversion of a landfill, with gas venting systems and or leachate collection systems, to a single-family residence or a child care facility.

5C. ENGINEERING CONTROLS. Due to the presence of soil contamination that does not allow for unrestricted use, the Owner has also agreed, as part of the remedial action for the Property, to the placement of certain engineering controls on the Property; a narrative description of these engineering controls is provided in Exhibit C.

5D. UTILITY COORDINATION MANUAL. A Utility Coordination Manual has been prepared for use by the owner, lessee, and/or operators for the protection of workers who may be potentially exposed to chromium-impacted soils or groundwater in conjunction with utility or other ground intrusive work on the Property; the Utility Coordination Manual identifies health and safety requirements for the protection of personnel and contractors who may perform ground

intrusive activities (e.g., digging, drilling, excavation) that may disturb existing engineering controls and informs workers of potential hazards associated with chromium-impacted media. Owner shall make the Utility Coordination Manual available to operators, tenants, contractors, and/or utility workers intending to conduct invasive work within the Restricted Areas to prevent unauthorized disturbance of engineering controls and potential exposure to contaminants. The Jersey City Division of Engineering, Traffic, and Transportation, JCMUA, and/or PPG will make the Utility Coordination Manual available to owners/operators, tenants, contractors, and/or utility workers in the event that the JCMUA and/or PPG are notified of invasive work by owners/operators, tenants, contractors, and/or utility workers. The PPG Utility Coordination Manual that addresses the identification, notification, and coordination of work between PPG and the JCMUA related to the utilities located within the restricted area is attached to this Notice in Lieu of Deed Notice.

6A. CHANGE IN OWNERSHIP AND REZONING.

i. The Owner and the subsequent owners, lessors, and lessees, shall cause all leases, grants, and other written transfers of an interest in the Restricted Areas to contain a provision expressly requiring all holders thereof to take the Property subject to the restrictions contained herein and to comply with all, and not to violate any of the conditions of this Notice in Lieu of Deed Notice. Nothing contained in this Paragraph shall be construed as limiting any obligation of any person to provide any notice required by any law, regulation, or order of any governmental authority.

ii. The Owner and the subsequent owners shall provide written notice to NJDEP on a form provided by NJDEP and available at https://www.nj.gov/dep/srp/srra/forms/ within 30 calendar days after the effective date of any conveyance, grant, gift, or other transfer, in whole or in part, of the Owner's or subsequent owner's interest in the Restricted Area.

iii. The Owner and the subsequent owners shall provide written notice to the Department, on a form available from the Department at https://www.nj.gov/dep/srp/srra/forms/ within thirty (30) calendar days after the owner's petition for or filing of any document initiating a rezoning of the Property to residential.

6B. SUCCESSORS AND ASSIGNS. This Notice in Lieu of Deed Notice shall be binding upon Owner and upon Owner's successors and assigns, and subsequent owners, lessors, lessees and operators while each is an owner, lessor, lessee, or operator of the Property.

7A. ALTERATIONS, IMPROVEMENTS, AND DISTURBANCES.

i. The Owner, specifically, the Jersey City Division of Engineering, Traffic, and Transportation, and all subsequent owners, lessors, and lessees shall notify any person, including, without limitation, tenants, employees of tenants, and contractors, intending to conduct invasive work or excavate within the Restricted Areas, of the nature and location of contamination in the Restricted Areas, and, of the precautions necessary to minimize potential human exposure to contaminants.

ii. Except as provided in Paragraph 7B, below, no person shall make, or allow to be made, any alteration, improvement, or disturbance in, to, or about the Property which disturbs any engineering control at the Property without first retaining a licensed site remediation professional. Nothing herein shall constitute a waiver of the obligation of any person to comply with all applicable laws and regulations including, without limitation, the applicable rules of the Occupational Safety and Health Administration.

iii. A soil remedial action permit modification is required for any permanent alteration, improvement, or disturbance and the owner, lessor, lessee or operator shall submit the following within 30 days after the occurrence of the permanent alteration, improvement, or disturbance:

(A) A Remedial Action Workplan or Linear Construction Project notification and Final Report Form, whichever is applicable;

(B) A Remedial Action Report and Termination of a Notice in Lieu of Deed Notice Form; and

(C) A revised recorded Notice in Lieu of Deed Notice with revised Exhibits, and Remedial Action Permit Modification or Remedial Action Permit Termination form and Remedial Action Report.

iv. No owner, lessor, lessee or operator shall be required to obtain a Remedial Action Permit Modification for any temporary alteration, improvement, or disturbance, provided that the site is restored to the condition described in the Exhibits to this Notice in Lieu of Deed Notice, and the owner, lessee, or operator complies with the following:

(A) Restores any disturbance of an engineering control to pre-disturbance conditions within 60 calendar days after the initiation of the alteration, improvement or disturbance;

(B) Ensures that all applicable worker health and safety laws and regulations are followed during the alteration, improvement, or disturbance, and during the restoration;

(C) Ensures that human exposure to contamination in excess of the remediation standards does not occur; and

(D) Describes, in the next biennial certification, the nature of the temporary alteration, improvement, or disturbance, the dates and duration of the temporary alteration, improvement, or disturbance, the name of key individuals and their affiliations conducting the temporary alteration, improvement, or disturbance, and the notice the Owner gave to those persons prior to the disturbance.

7B. EMERGENCIES. In the event of an emergency which presents, or may present, an unacceptable risk to the public health and safety, or to the environment, or an immediate environmental concern, see N.J.S.A. 58:10C-2, any person may temporarily breach an engineering control provided that that person complies with each of the following:

i. Immediately notifies NJDEP of the emergency, by calling the DEP Hotline at 1-877-WARNDEP or 1-877-927-6337;

ii. Hires a Licensed Site Remediation Professional (unless the Restricted Areas includes an unregulated heating oil tank) to respond to the emergency;

iii. Limits both the actual disturbance and the time needed for the disturbance to the minimum reasonably necessary to adequately respond to the emergency;

iv. Implements all measures necessary to limit actual or potential, present or future risk of exposure to humans or the environment to the contamination;

v. Notifies NJDEP when the emergency or immediate environmental concern has ended by calling the DEP Hotline at 1-877-WARNDEP or 1-877-927-6337; and

vi. Restores the engineering control to the pre-emergency conditions as soon as possible; and

vii. Submits to NJDEP within 60 calendar days after completion of the restoration of the engineering control, a report including: (a) the nature and likely cause of the emergency; (b) the measures that have been taken to mitigate the effects of the emergency on human health and the environment; (c) the measures completed or implemented to restore the engineering control; and (d) any changes to the engineering control or site operation and maintenance plan to prevent reoccurrence of such conditions in the future.

8. TERMINATION OF NOTICE IN LIEU OF DEED NOTICE.

i. This Notice in Lieu of Deed Notice may be terminated only upon recording a NJDEP-approved Termination of a Notice in Lieu of Deed Notice, available at N.J.A.C. 7:26C Appendix C, with the Affected Parties as identified in N.J.A.C. 7:26C-7.2(b)2, expressly terminating this Notice in Lieu of Deed Notice.

ii. Within 30 calendar days after recording a NJDEP-approved Termination of a Notice in Lieu of Deed Notice, the owner of the property should apply to NJDEP for termination of the soil remedial action permit pursuant to N.J.A.C. 7:26C-7.

9. ACCESS. The Owner, and the subsequent owners, lessors, lessees, and operators agree to allow NJDEP, its agents and representatives access to the Property to inspect and evaluate the continued protectiveness of the remedial action that includes this Notice in Lieu of Deed Notice and to conduct additional remediation to ensure the protection of the public health and safety and of the environment if the subsequent owners, lessors, lessees, and operators, during their ownership, tenancy, or operation, and the Owner fail to conduct such remediation pursuant to this Notice in Lieu of Deed Notice as required by law. The Owner, and the subsequent owners, lessors, and lessees, shall also cause all leases, subleases, grants, and other written transfers of an

interest in the Restricted Areas to contain a provision expressly requiring that all holders thereof provide such access to NJDEP.

10. ENFORCEMENT OF VIOLATIONS.

i. This Notice in Lieu of Deed Notice itself is not intended to create any interest in real estate in favor of NJDEP, nor to create a lien against the Property, but merely is intended to provide notice of certain conditions and restrictions on the Property and to reflect the regulatory and statutory obligations imposed as a conditional remedial action for this site.

ii. The restrictions provided herein may be enforceable solely by NJDEP against any person who violates this Notice in Lieu of Deed Notice. To enforce violations of this Notice in Lieu of Deed Notice, NJDEP may initiate one or more enforcement actions pursuant to N.J.S.A. 58:10-23.11, and N.J.S.A. 58:10C, and require additional remediation and assess damages pursuant to N.J.S.A. 58:10-23.11, and N.J.S.A. 58:10C.

11. SEVERABILITY. If any court of competent jurisdiction determines that any provision of this Notice in Lieu of Deed Notice requires modification, such provision shall be deemed to have been modified automatically to conform to such requirements. If a court of competent jurisdiction determines that any provision of this Notice in Lieu of Deed Notice is invalid or unenforceable and the provision is of such a nature that it cannot be modified, the provision shall be deemed deleted from this instrument as though the provision had never been included herein. In either case, the remaining provisions of this Notice in Lieu of Deed Notice shall remain in full force and effect.

12A. EXHIBIT A. Exhibit A includes the following maps of the Property and the vicinity:

i. Exhibit A-1: Vicinity Map - A map that identifies by name the roads, and other important geographical features in the vicinity of the Property (for example, USGS Quad map, Hagstrom County Maps);

ii. Exhibit A-2: Metes and Bounds Description - A tax map of lots and blocks as wells as metes and bounds description of the restricted area within the Property, including references to tax lot and block numbers for the properties adjacent to the Property and distances from nearby intersections;

iii. Exhibit A-3: Property Map - A scaled map of the Property, scaled at one inch to 200 feet or less, and if more than one map is submitted, the maps shall be presented as overlays, keyed to a base map; and the Property Map shall include diagrams of major surface topographical features such as buildings, roads, and parking lots.

12B. EXHIBIT B. Exhibit B includes the following descriptions of the Restricted Areas:

i. Exhibit B-1: Restricted Area Map - A separate map for each restricted area that includes:

(A) As-built diagrams of each engineering control, including caps, fences, slurry walls, (and, if any) ground water monitoring wells, extent of the ground water classification exception area, pumping and treatment systems that may be required as part of a ground water engineering control in addition to the Notice in Lieu of Deed Notice;

(B) As-built diagrams of any buildings, roads, parking lots and other structures that function as engineering controls; and

(C) Designation of all soil and all upland sediment sample locations within the restricted areas that exceed any soil standard that are keyed into one of the tables described in the following paragraph.

ii. Exhibit B-2: Restricted Area Data Table – A separate table for each restricted area that includes either (A) or (B) through (F):

(A) Only for historic fill extending over the entire site or a portion of the site and for which analytical data are limited or do not exist, a narrative that states that historic fill is present at the site, a description of the fill material (e.g., ash, cinders, brick, dredge material), and a statement that such material may include, but is not limited to, contaminants such as PAHs and metals;

(B) Sample location designation from the Restricted Area map (Exhibit B-1);

(C) Sample elevation based upon mean sea level;

(D) Name and chemical abstract service registry number of each contaminant with a concentration that exceeds the unrestricted use standard;

(E) The restricted and unrestricted use standards for each contaminant in the table; and

(F) The remaining concentration of each contaminant at each sample location at each elevation.

12C. EXHIBIT C. Exhibit C includes narrative descriptions of the institutional controls and engineering controls as follows:

i. Exhibit C-1: Notice in Lieu of Deed Notice as Institutional Control: Exhibit C-1 includes a narrative description of the restriction and obligations of this Notice in Lieu of Deed Notice that are in addition to those described above, as follows:

(A) Description and estimated size in square feet of the Restricted Areas as described above;

(B) Description of the restrictions on the Property by operation of this Notice in Lieu of Deed Notice; and

(C) The objective of the restrictions.

ii. Exhibit C-2: Restricted Area A Engineering Control –Asphalt/ Concrete Cap: Exhibit C-2 includes a narrative description of the Asphalt/ Concrete Cap Engineering Control as follows:

(A) Description of the engineering control;

(B) The objective of the engineering control; and

(C) How the engineering control is intended to function.

iii. Exhibit C-3: Restricted Area B Engineering Control - Clean Fill Soil Cap: Exhibit C-3 includes a narrative description of the Dense-Graded Aggregate (DGA) Clean Fill Soil Cap as follows:

(A) Description of the engineering control;

(B) The objective of the engineering control; and

(C) How the engineering control is intended to function.

13. SIGNATURES. IN WITNESS WHEREOF, Owner has executed this Notice in Lieu of Deed Notice as of the date first written above.

ATTEST: City of Jersey City

_____ By_____

_____ _____
[Print name and title] [Signature]

STATE OF NEW JERSEY SS.:
COUNTY OF HUDSON

I certify that on _____, 20__, _____, Business Administrator personally came before me, and this person acknowledged under oath, to my satisfaction, that:

(a) this person is the business administrator of the City of Jersey City, the City named in this document;

(b) this document was signed and delivered by the City of Jersey City as its voluntary act and was duly authorized;

(c) this person signed this proof to attest to the truth of these facts.

_____
[Signature]

_____
[Print name and title of attesting witness]

Signed and sworn before me on _____, 20__

_____, Notary Public

_____
[Print name and title]

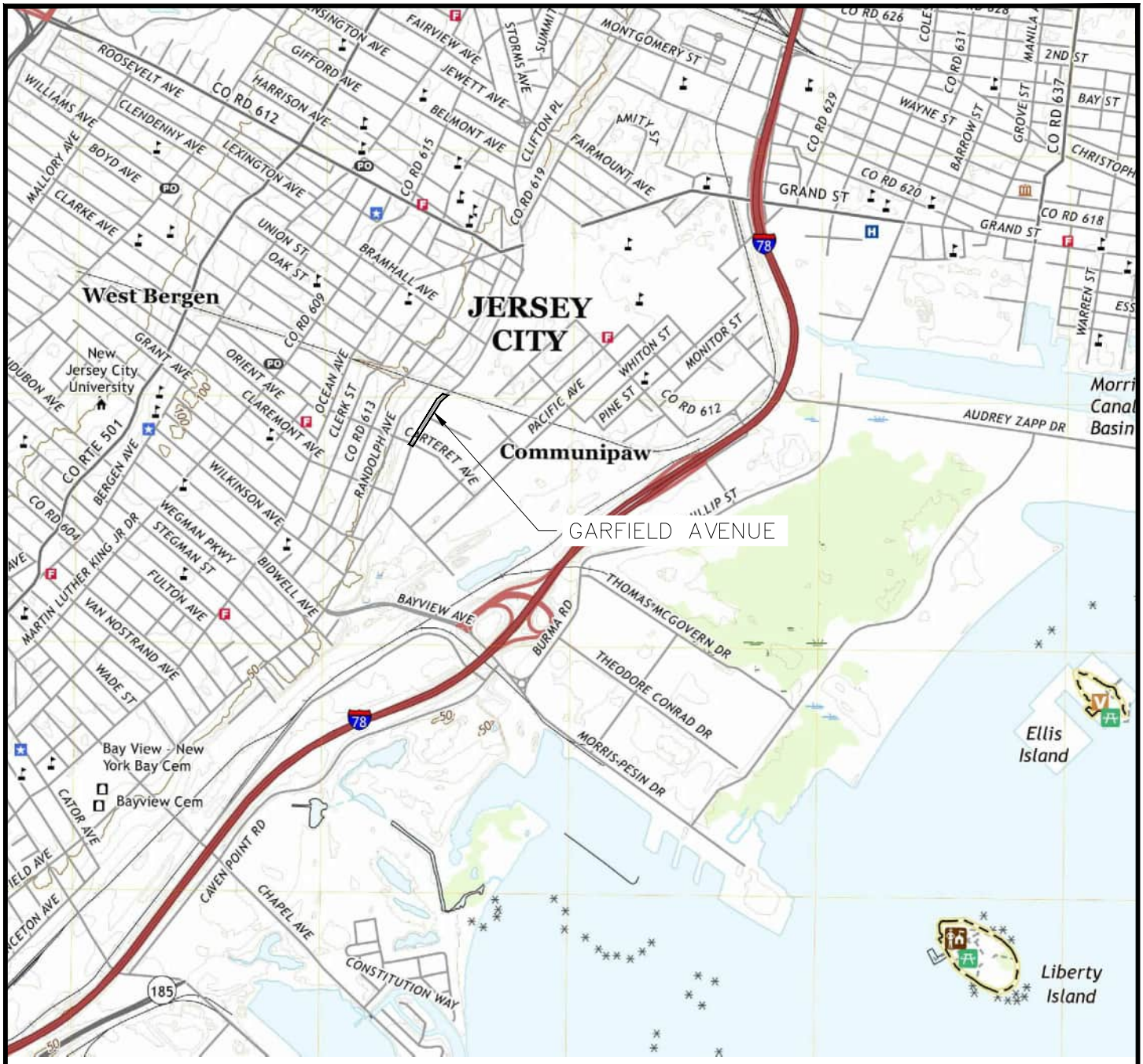
EXHIBIT A

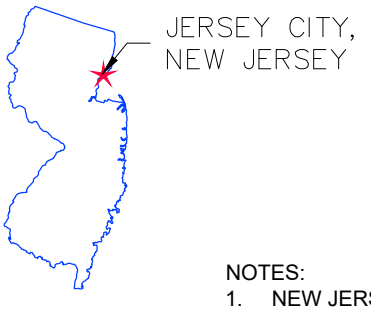
Maps of the Property and Vicinity

Exhibit A-1: Vicinity Map

Exhibit A-2: Metes and Bounds Description

Exhibit A-3: Property Map





JERSEY CITY,
NEW JERSEY

1000 0 2000

GRAPHIC SCALE IN FEET

NOTES:
1. NEW JERSEY STATE PLANE NORTH AMERICAN DATUM 1983 COORDINATES, US SURVEY FEET.
2. IMAGE SOURCE: USGS TOPOGRAPHIC QUADRANGLE: JERSEY CITY, NJ, 2019.

PI - PROGRAM INTEREST
USGS - UNITED STATES GEOLOGICAL SURVEY

AECOM

GARFIELD AVENUE PI # G000005480 JERSEY CITY, NEW JERSEY	**VICINITY MAP**
DATE: 08/29/22 DRWN: MDN	**EXHIBIT A-1**

BORBAS
SURVEYING & MAPPING LLC

Facilities Mapping Specialists
Environmental Site Mapping
Transportation and
Right-of-Way Surveys

Expert Witness Services
Aerial Base Mapping
Certified Drone Pilots
Hydrographic-Bathymetric Surveys

**DESCRIPTION OF A DEED NOTICE AREA LOCATED
OVER A PORTION OF GARFIELD AVENUE
IN JERSEY CITY, HUDSON COUNTY, NEW JERSEY**

BEGINNING at a point being the intersection of the southerly line of Carteret Avenue (60 feet wide) with the westerly line of Garfield Avenue (60 feet wide), said point having a NAD83 New Jersey State Plane Coordinate of North: 683280.1 East: 610618.4 (US Survey Feet, measured in 2005); and runs thence

1. By a line across Carteret Avenue, North 18 degrees 43 minutes 52 seconds East 31.21 feet to an angle point; thence

2. Still by a line across Carteret Avenue and continuing along the westerly line of Garfield Avenue, North 31 degrees 16 minutes 57 seconds East 686.09 feet to an angle point; thence

3. Still along the westerly line of Garfield Avenue, North 52 degrees 22 minutes 59 seconds East 115.20 feet to a point; thence

4. Still along the westerly line of Garfield Avenue, South 37 degrees 37 minutes 01 seconds East 10.00 feet to a point; thence

5. Still along the westerly line of Garfield Avenue, North 52 degrees 22 minutes 59 seconds East 17.14 feet to a point; thence

6. By a line across Garfield Avenue, South 72 degrees 21 minutes 19 seconds East 60.84 feet to a point in the easterly line of Garfield Avenue; thence

7. Along the easterly line of Garfield Avenue, South 52 degrees 22 minutes 59 seconds West 155.84 feet to a point; thence

8. Still along the easterly line of Garfield Avenue and continuing across Carteret Avenue (60 feet wide), South 31 degrees 16 minutes 57 seconds West 668.32 feet to an angle point; thence

9. Still by a line across Carteret Avenue, South 18 degrees 43 minutes 52 seconds West 29.97 feet to a point on the aforesaid southerly right of way line of Carteret Avenue (60 feet wide); thence

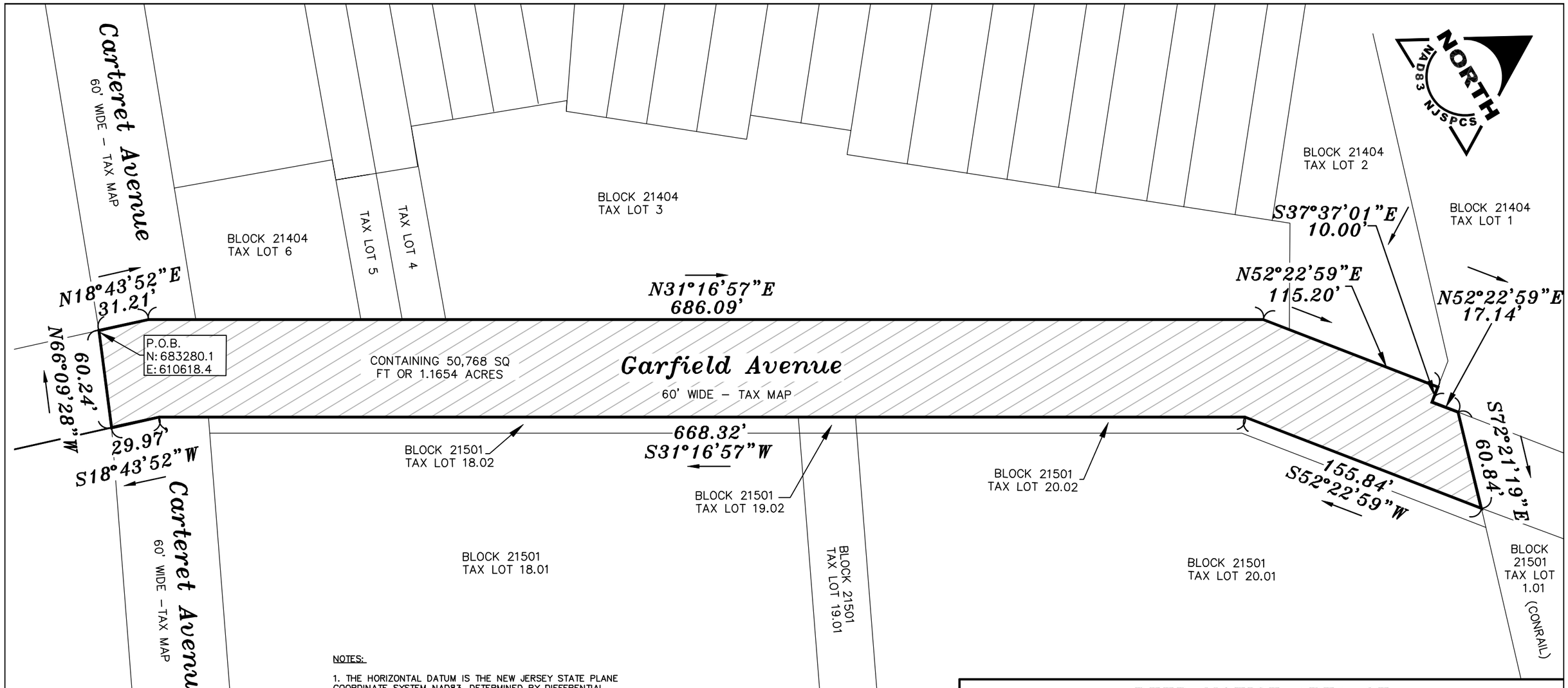
10. By a line across Garfield Avenue (60 feet wide), North 66 degrees 09 minutes 28 seconds West 60.24 feet to the point and place of BEGINNING.

Containing 50,768 square feet or 1.1654 Acres of land more or less.

The basis of bearings for this description is the New Jersey State Plane Coordinate System NAD83.

This description was prepared in accordance with a plan entitled, “DEED NOTICE AREA OF A PORTION OF GARFIELD AVENUE, CITY OF JERSEY CITY, HUDSON COUNTY NEW JERSEY”, prepared by Borbas Surveying and Mapping, dated December 22, 2022.

J. Peter Borbas, PLS
NJ 24GS03165300
December 22, 2022



NOTES:

1. THE HORIZONTAL DATUM IS THE NEW JERSEY STATE PLANE COORDINATE SYSTEM NAD83, DETERMINED BY DIFFERENTIAL GPS ON DECEMBER 22, 2005, REFERENCE STATIONS: NJI2, NJNT, SHK1, AND LAMT.

2. ALL COORDINATES AND ELEVATIONS SHOWN HEREON ARE IN U.S. SURVEY FEET.

REFERENCES:

1. MAP ENTITLED "R.O.W. DEDICATION PLAT – CANAL CROSSING REDEVELOPMENT 900 GARFIELD AVENUE LOTS 16–20, BLOCK 21501 CITY OF JERSEY CITY HUDSON COUNTY, NEW JERSEY, 07305" PREPARED BY DRESDNER ROBIN ENVIRONMENTAL MANAGEMENT, INC. 1 EVERTRUST PLAZA, SUITE 901, JERSEY CITY, NJ 07302. DATED FEBRUARY 18, 2020.

2. MAP ENTITLED "BOUNDARY AND TOPOGRAPHIC SURVEY TAX MAP LOTS 1, 2A, 3A & 4A IN BLOCK 2026.1, PPG INDUSTRIES SITE 114, THE CITY OF JERSEY CITY, HUDSON CO., NEW JERSEY", PREPARED BY BORBAS SURVEYING AND MAPPING, LLC, DATED NOVEMBER 14, 2007.

3. TAX MAPS, CITY OF JERSEY

0 30 60 120

SCALE: 1"=60'

12-21-2022	ORIGINAL ISSUE

ADDITIONS AND UPDATES

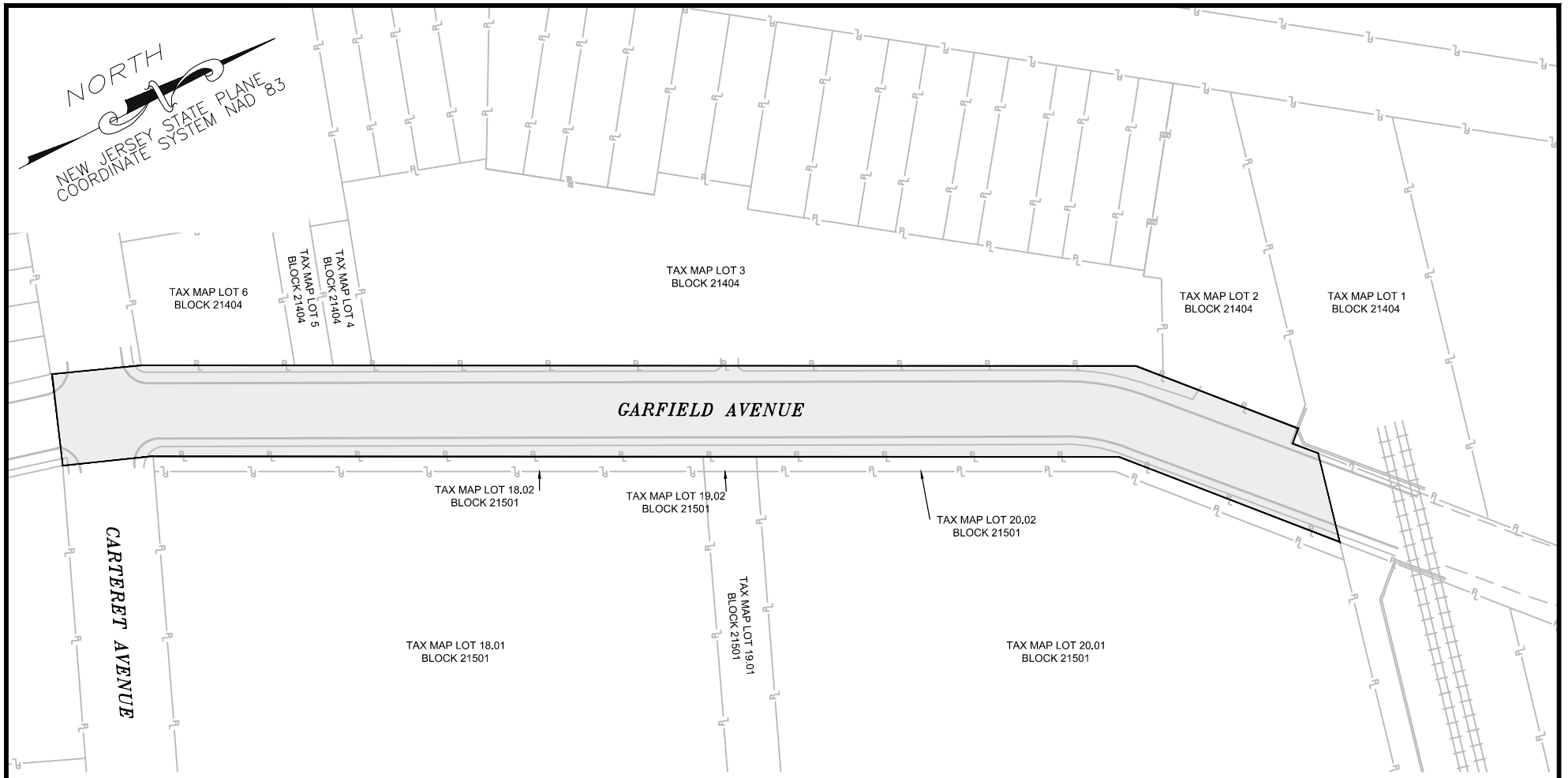
DEED NOTICE AREA OF A PORTION OF GARFIELD AVENUE CITY OF JERSEY CITY HUDSON COUNTY, NEW JERSEY

BORBAS SURVEYING & MAPPING, LLC
402 MAIN STREET, BOONTON, NEW JERSEY 07005
Phone (973) 316-8743 www.borbas.com
NJ CERTIFICATE OF AUTHORIZATION NO. 24GA28056200
Environmental Site Mapping o Hazardous Materials and Waste Surveys
Aerial Control and GPS Surveys o Topographic and Existing Condition Surveys
Remote Sensing and GIS o Hydrographic/Bathymetric Surveys o ALTA/NSPS Certified Surveys
Transportation and Right of Way Surveys o Deformation and Structure Monitoring Surveys

SCALE: 1"=60'	
SHEET NO.: 1 OF 1	
FIELD BOOK: N/A	
JOB NO.: 051201	
PROJECT NAME: 051201	
DRAWING NO.: 051201_2022-12-21_GARFIELD AVE_DN	

J. PETER BORBAS
NJ PROFESSIONAL LAND SURVEYOR 24GS03165300 PROFESSIONAL PLANNER 3884

Date: DECEMBER 22, 2022



LEGEND

- PROPERTY LINE
- LIGHT RAIL TRACKS
- PROPERTY LIMITS FOR NOTICE IN LIEU OF DEED NOTICE

NOTES:

NAD 83 – NORTH AMERICAN DATUM OF 1983
PI – PROGRAM INTEREST
TBD – TO BE DETERMINED

1. PROPERTY BOUNDARIES ARE SOURCED FROM TBD.
2. THE PROPERTY REFERENCED IN THIS NOTICE IN LIEU OF DEED NOTICE IS GARFIELD AVENUE.

AECOM

50 0 100
GRAPHIC SCALE IN FEET

GARFIELD AVENUE
PI # G000005480
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

DATE: 08/29/2022 | DRWN: MDN

PROPERTY MAP

EXHIBIT A-3

EXHIBIT B

Description of Restricted Area

Exhibit B-1A: Restricted Area Map - Restricted Area A

Exhibit B-1B: Restricted Area Map - Restricted Area B

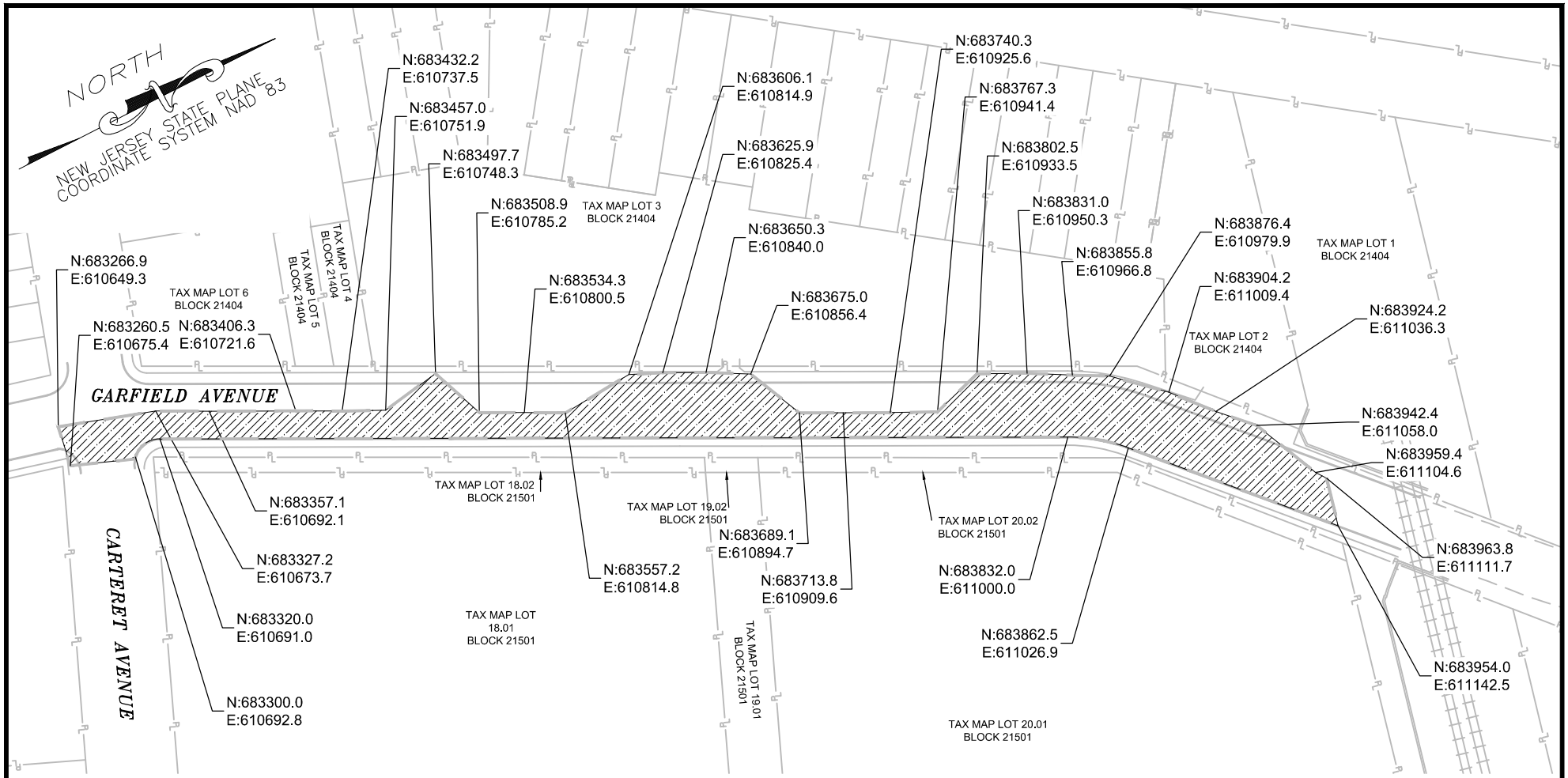
Exhibit B-1C: Restricted Area Map - Restricted Area A - Sample Locations

Exhibit B-1D: Restricted Area Map - Restricted Area B - Sample Locations

Exhibit B-1E: Engineering Controls - As-Built Typical Section - Existing Asphalt/Concrete Cap, Clean Fill Soil Cap

Exhibit B-2A: Restricted Area Data Table - Restricted Area A - Existing Asphalt/Concrete Cap

Exhibit B-2B: Restricted Area Data Table - Restricted Area B - Clean Fill Soil Cap



LEGEND

- EXISTING CONCRETE CURB
- EXISTING EDGE OF SIDEWALK
- PROPERTY LINE
- SOIL RESTRICTED AREA A
- LIGHT RAIL TRACKS
- EXISTING ASPHALT/CONCRETE CAP

NOTES:

NAD 83 – NORTH AMERICAN DATUM OF 1983
PI – PROGRAM INTEREST
TBD – TO BE DETERMINED

1. PROPERTY BOUNDARIES ARE SOURCED FROM TBD.
2. THE PROPERTY REFERENCED IN THIS NOTICE IN LIEU OF DEED NOTICE IS GARFIELD AVENUE.

AECOM

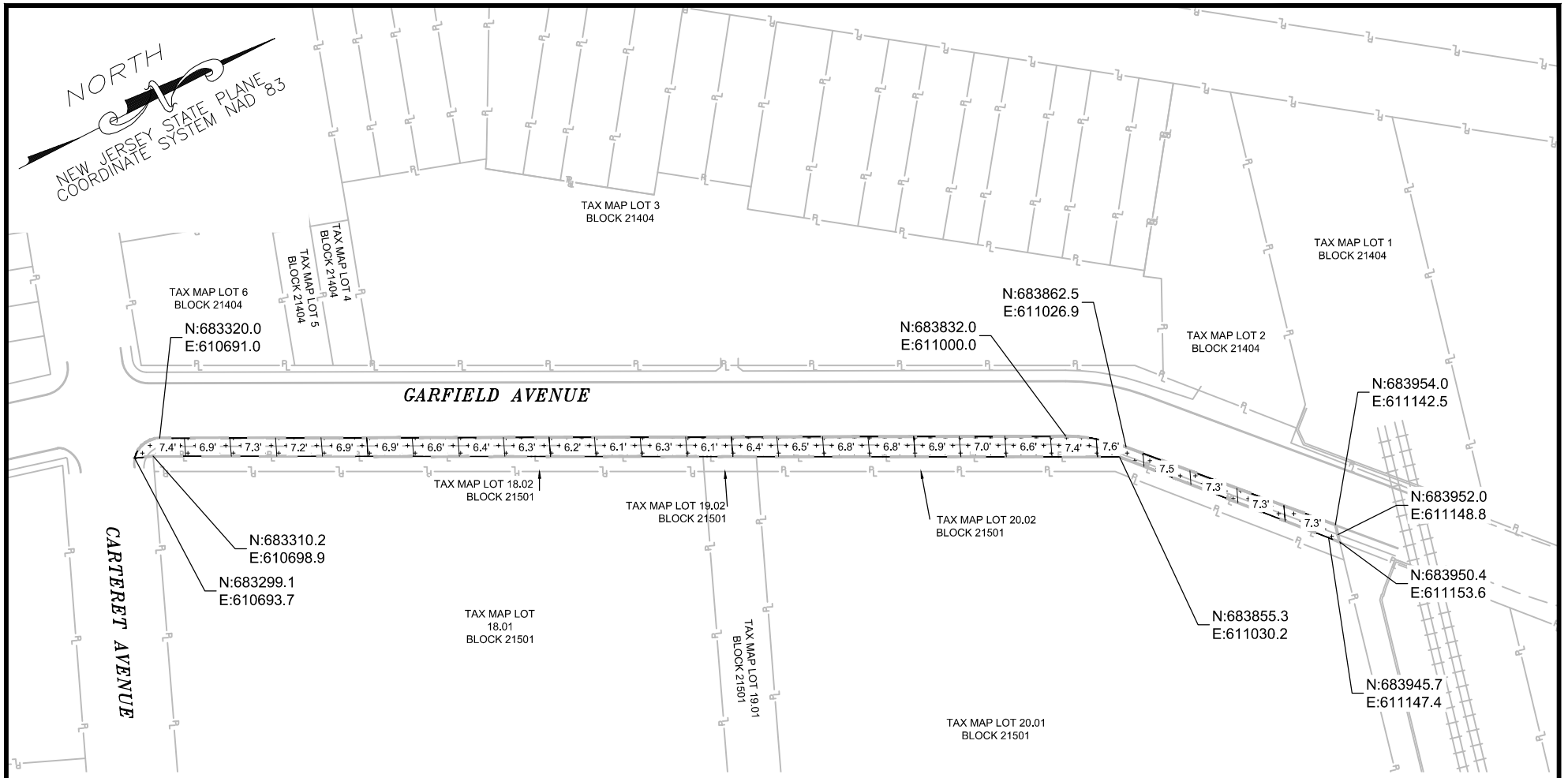
50 0 100
GRAPHIC SCALE IN FEET

GARFIELD AVENUE
PI # G000005480
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

DATE: 08/30/2022 | DRWN: MDN

NOTICE IN LIEU OF DEED NOTICE
RESTRICTED AREA MAP
RESTRICTED AREA A

EXHIBIT B-1A



LEGEND

- EXISTING CONCRETE CURB
- EXISTING EDGE OF SIDEWALK
- PROPERTY LINE
- SOIL RESTRICTED AREA B
- LIGHT RAIL TRACKS
- CLEAN FILL SOIL CAP

7.4' CLEAN FILL SOIL CAP ELEVATION GRID AND BOUNDARY

NOTES:

NAD 83 – NORTH AMERICAN DATUM OF 1983
PI – PROGRAM INTEREST
TBD – TO BE DETERMINED

1. PROPERTY BOUNDARIES ARE SOURCED FROM TBD.
2. THE PROPERTY REFERENCED IN THIS NOTICE IN LIEU OF DEED NOTICE IS GARFIELD AVENUE.

AECOM

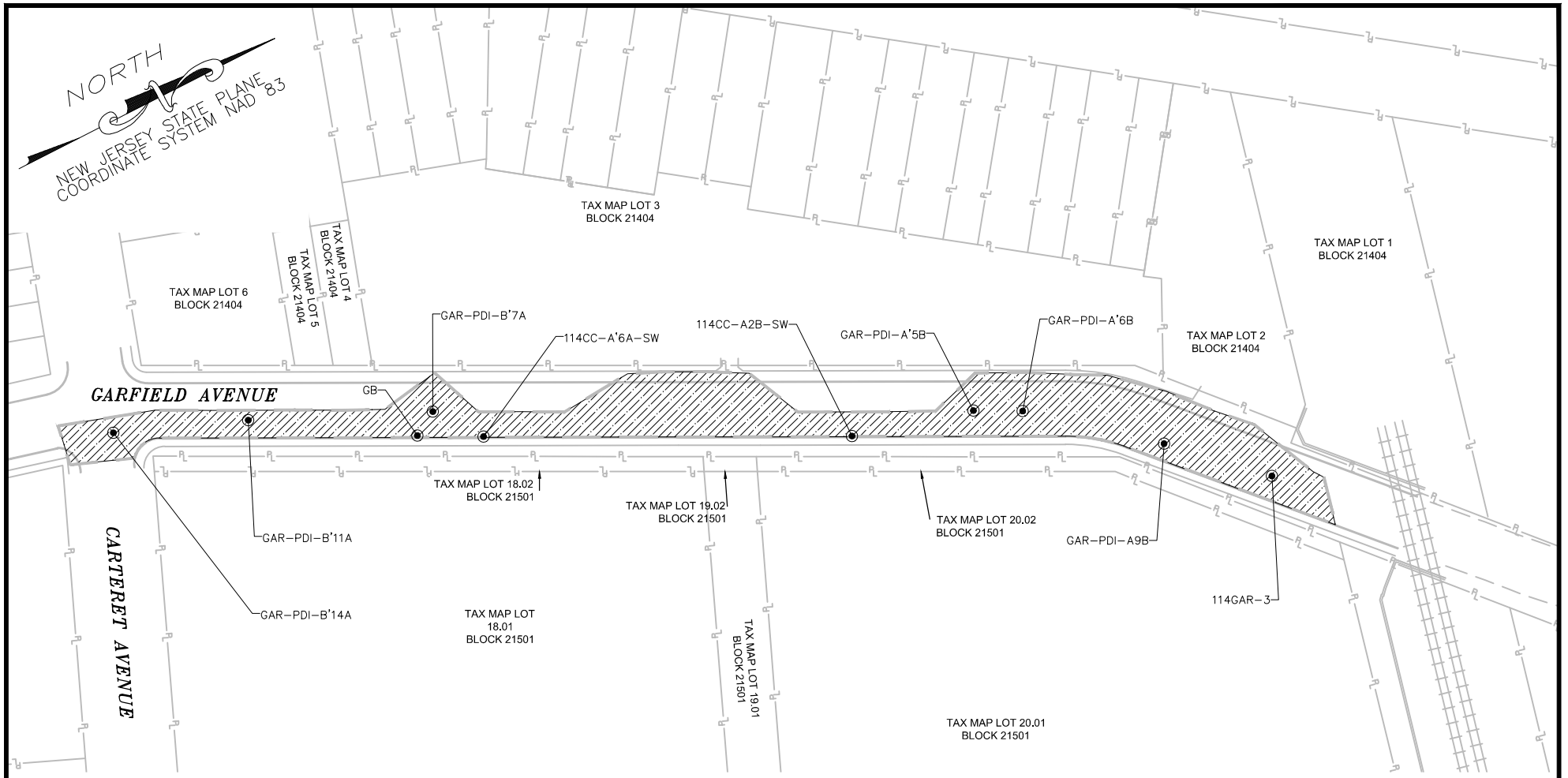
50 0 100
GRAPHIC SCALE IN FEET

GARFIELD AVENUE
PI # G000005480
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

DATE: 08/30/2022 | DRWN: MDN

NOTICE IN LIEU OF DEED NOTICE
RESTRICTED AREA MAP
RESTRICTED AREA B

EXHIBIT B-1B



LEGEND

- EXISTING CONCRETE CURB
- EXISTING EDGE OF SIDEWALK
- PROPERTY LINE
- SOIL RESTRICTED AREA A
- LIGHT RAIL TRACKS
- EXISTING ASPHALT/CONCRETE CAP
- SAMPLE LOCATION

NOTES:

NAD 83 – NORTH AMERICAN DATUM OF 1983
PI – PROGRAM INTEREST
TBD – TO BE DETERMINED

1. PROPERTY BOUNDARIES ARE SOURCED FROM TBD.
2. THE PROPERTY REFERENCED IN THIS NOTICE IN LIEU OF DEED NOTICE IS GARFIELD AVENUE.

AECOM

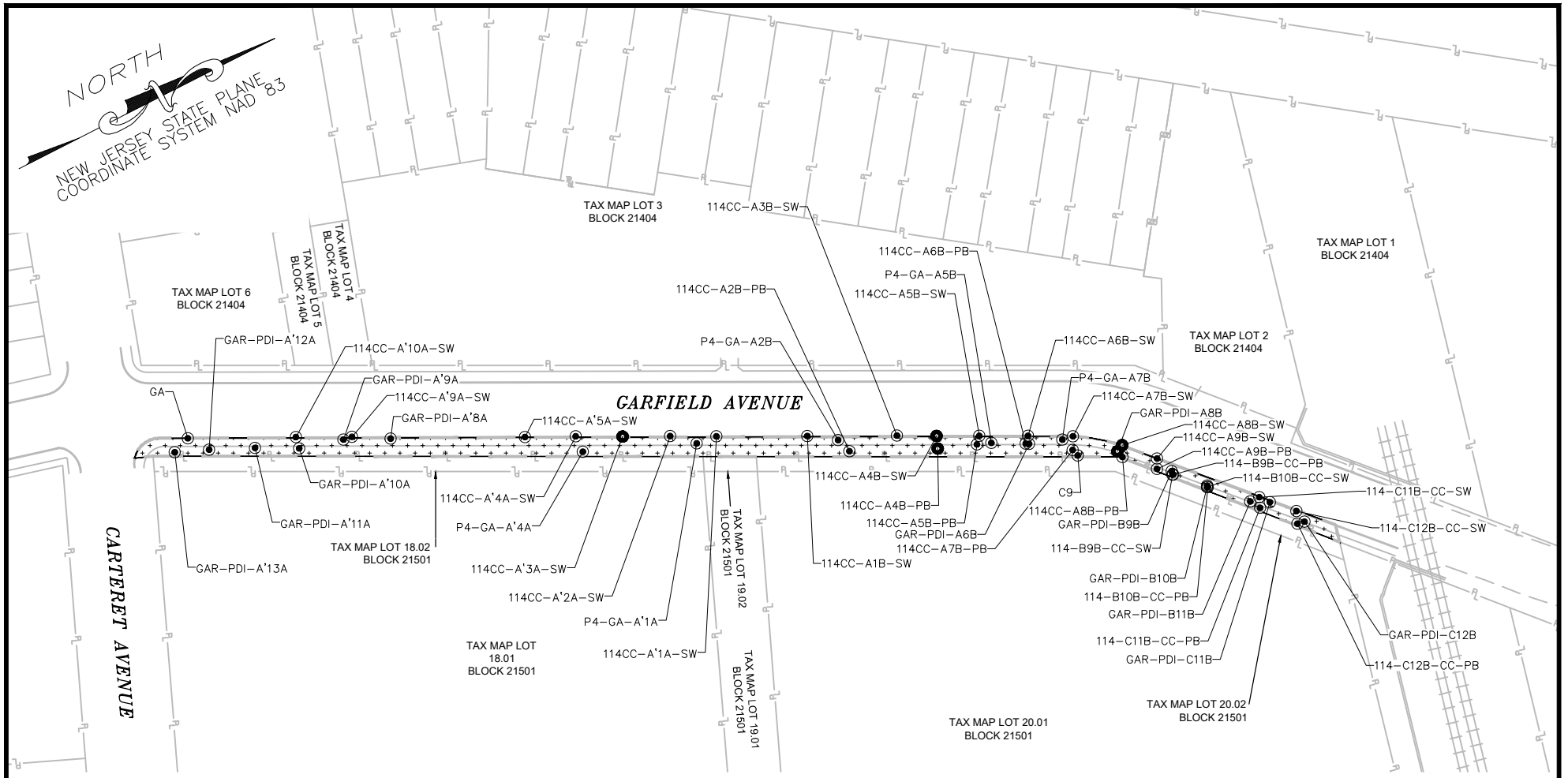
50 0 100
GRAPHIC SCALE IN FEET

GARFIELD AVENUE
PI # G000005480
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

DATE: 08/30/2022 | DRWN: MDN

NOTICE IN LIEU OF DEED NOTICE
RESTRICTED AREA MAP
RESTRICTED AREA A
SAMPLE LOCATIONS

EXHIBIT B-1C



LEGEND

- EXISTING CONCRETE CURB
- EXISTING EDGE OF SIDEWALK
- PROPERTY LINE
- SOIL RESTRICTED AREA B
- LIGHT RAIL TRACKS
- CLEAN FILL SOIL CAP
- SAMPLE LOCATION
- SAMPLE LOCATION WHERE VISIBLE CCPW WAS OBSERVED

NOTES:

CCPW – CHROMATE CHEMICAL PRODUCTION WASTE
NAD 83 – NORTH AMERICAN DATUM OF 1983
PI – PROGRAM INTEREST
TBD – TO BE DETERMINED

1. PROPERTY BOUNDARIES ARE SOURCED FROM TBD.
2. THE PROPERTY REFERENCED IN THIS NOTICE IN LIEU OF DEED NOTICE IS GARFIELD AVENUE.

AECOM

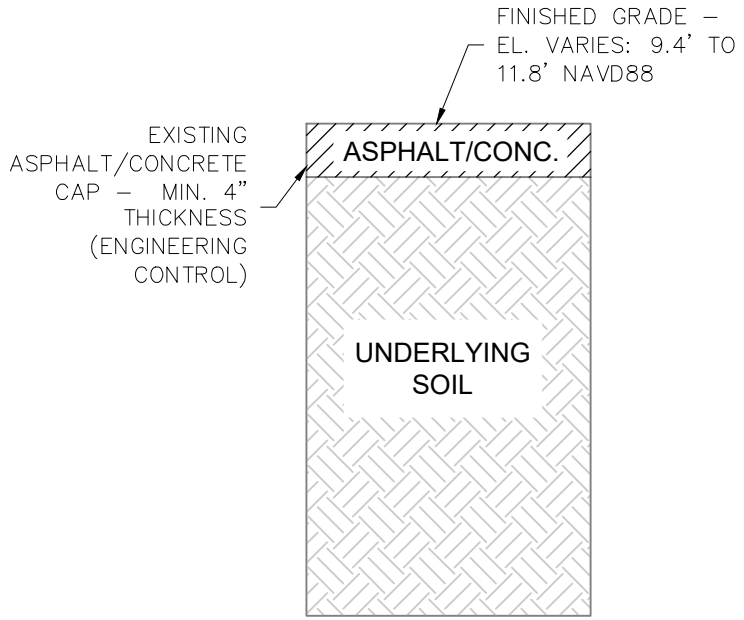
50 0 100
GRAPHIC SCALE IN FEET

GARFIELD AVENUE
PI # G000005480
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

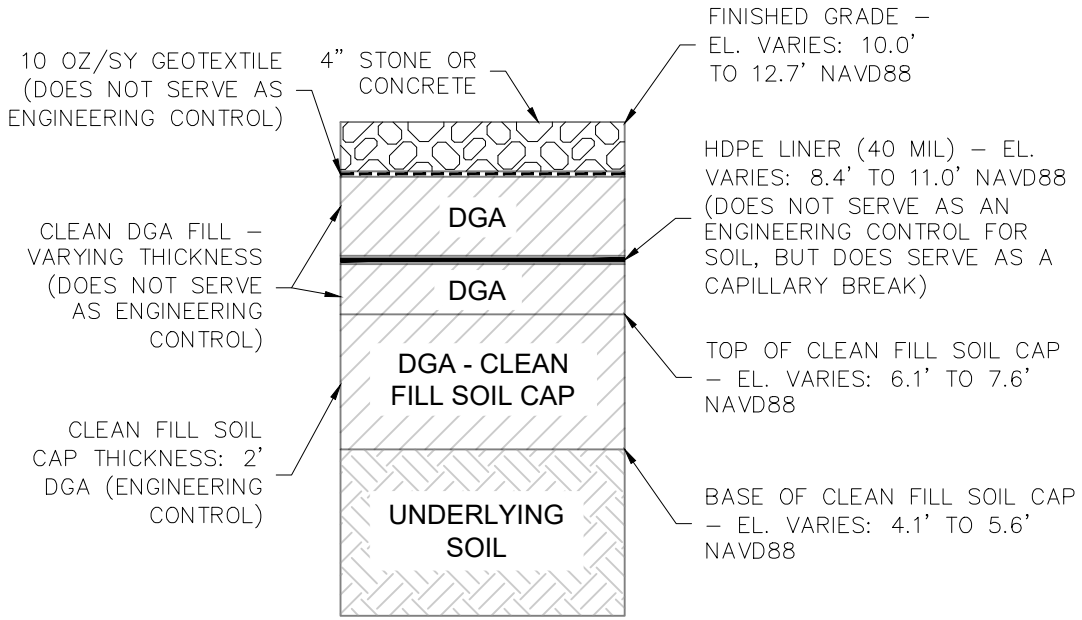
DATE: 12/09/2022 | DRWN: MDN

NOTICE IN LIEU OF DEED NOTICE
RESTRICTED AREA MAP
RESTRICTED AREA B
SAMPLE LOCATIONS

EXHIBIT B-1D



1 EX. ASPHALT/CONCRETE CAP
NTS



2 CLEAN FILL SOIL CAP
NTS

NOTES:

1. THE ENGINEERING CONTROL FOR EACH CAP IS SPECIFIED IN THE DETAILS ON THIS SHEET. THE ADDITIONAL COMPONENTS DEPICTED BY THESE DETAILS ARE PROVIDED FOR RESTORATION PURPOSES.

CONC.	–	CONCRETE
DGA	–	DENSE–GRADED AGGREGATE
EL.	–	ELEVATION
EX.	–	EXISTING
HDPE	–	HIGH–DENSITY POLYETHYLENE
MIN.	–	MINIMUM
NAVD88	–	NORTH AMERICAN VERTICAL DATUM OF 1988
NTS	–	NOT TO SCALE
OZ/SY	–	OUNCES PER SQUARE YARD

AECOM

GARFIELD AVENUE
PI # G000005480
JERSEY CITY, HUDSON COUNTY, NEW JERSEY

DATE: 12/13/2022 | DRWN: MDN

ENGINEERING CONTROLS
AS-BUILT TYPICAL SECTIONS
EXISTING ASPHALT/CONCRETE CAP
CLEAN FILL SOIL CAP

EXHIBIT B-1E

Exhibit B-2A
Restricted Area Data Table - Restricted Area A
Exisiting Asphalt/Concrete Cap
Garfield Avenue
Jersey City, Hudson County, New Jersey

				Analyte CAS RN CrSCC Units	CHROMIUM (HEXAVALENT) 18540-29-9 20 mg/kg	
Location ID	**Sample ID**	**Sample Depth Interval (ft bgs)**	**Sample Elevation Interval (ft NAVD88)**	**Date Collected**	**Result**	**Qualifier**
114CC-A`6A-SW	114-A'6A-0.5-1.0-SW	0.5 to 1.0	9.4 to 8.9	06/25/2012	**138**	J
114CC-A2B-SW	114-A2B-0.5-1.0-SW	0.5 to 1.0	9.5 to 9.0	07/18/2012	**55.3**	J
114CC-A2B-SW	114-A2B-4.5-5.0-SW	4.5 to 5.0	5.5 to 5.0	07/18/2012	**41.3**	J
114GAR-3	114TP-3GAR-0.5-1.0	0.5 to 1.0	10.8 to 10.3	09/05/2012	**692**	
114GAR-3	114TP-3GAR-1.5-2.0	1.5 to 2.0	9.8 to 9.3	09/06/2012	**126**	J
114GAR-3	114TP-3GAR-4.0-4.5	4.0 to 4.5	7.3 to 6.8	09/06/2012	**293**	J
114GAR-3	114TP-3GAR-5.5-6.0	5.5 to 6.0	5.8 to 5.3	09/06/2012	**405**	J
GAR-PDI-A'5B	GAR-PDI-A'5B-3.5-4.0	3.5 to 4.0	7.2 to 6.7	10/23/2016	**50.9**	J
GAR-PDI-A'6B	GAR-PDI-A'6B-9.5-10.0	9.5 to 10.0	1.5 to 1.0	10/23/2016	**25.3**	
GAR-PDI-A9B	GAR-PDI-A9B-1.5-2.0	1.5 to 2.0	9.6 to 9.1	02/12/2017	**22.4**	
GAR-PDI-A9B	GAR-PDI-A9B-3.5-4.0	3.5 to 4.0	7.6 to 7.1	02/12/2017	**22.7**	
GAR-PDI-A9B	GAR-PDI-A9B-5.5-6.0	5.5 to 6.0	5.6 to 5.1	02/12/2017	**395**	
GAR-PDI-A9B	GAR-PDI-A9B-7.5-8.0	7.5 to 8.0	3.6 to 3.1	02/12/2017	**1110**	
GAR-PDI-A9B	GAR-PDI-A9B-9.5-10.0	9.5 to 10.0	1.6 to 1.1	02/12/2017	**80.4**	
GAR-PDI-A9B	GAR-PDI-A9B-17.5-18.0	17.5 to 18.0	-6.4 to -6.9	02/12/2017	**29.9**	J
GAR-PDI-B'7A	GAR-PDI-B'7A-17.5-18.0	17.5 to 18.0	-7.0 to -7.5	11/06/2016	**48.5**	J
GAR-PDI-B'11A	GAR-PDI-B'11A-10.0-10.5	10.0 to 10.5	1.1 to 0.6	11/20/2016	**127**	J
GAR-PDI-B'11A	GAR-PDI-B'11A-10.5-11.0	10.5 to 11.0	0.6 to 0.1	11/20/2016	**116**	J
GAR-PDI-B'11A	GAR-PDI-B'11A-14.0-14.5	14.0 to 14.5	-2.9 to -3.4	11/20/2016	**21.0**	J
GAR-PDI-B'11A	GAR-PDI-B'11A-16.0-16.5X	16.0 to 16.5	-4.9 to -5.4	11/20/2016	**23.6**	J
GAR-PDI-B'14A	GAR-PDI-B'14A-8.0-8.5	8.0 to 8.5	3.4 to 2.9	11/13/2016	**82.7**	J
GAR-PDI-B'14A	GAR-PDI-B'14A-9.5-10.0	9.5 to 10.0	1.9 to 1.4	11/13/2016	**92.0**	J
GAR-PDI-B'14A	GAR-PDI-B'14A-10.0-10.5	10.0 to 10.5	1.4 to 0.9	11/13/2016	**25.9**	J
GB	GB0.4-0.9	0.4 to 0.9	9.8 to 9.3	03/15/2004	**20.6**	
GB	GB1.5-2	1.5 to 2.0	8.7 to 8.2	03/15/2004	**48.4**	

Notes:
bgs - below ground surface
CAS RN - Chemical Abstracts Service Registry Number
CrSCC - Chromium Soil Cleanup Criteria
ft - feet
J - Indicates 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
Bold font indicates result exceeds the CrSCC.
"X" at the end of a Sample ID indicates a field duplicate sample.

Exhibit B-2B
Restricted Area Data Table - Restricted Area B
Clean Fill Soil Cap
Garfield Avenue
Jersey City, Hudson County, New Jersey

				Analyte	CHROMIUM (HEXAVALENT)		ANTIMONY	
				CAS RN	18540-29-9		7440-36-0	
				CrSCC	20		N/A	
				RDCSRS	N/A		31	
				NRDCSRS	N/A		450	
				Units	mg/kg		mg/kg	
Location ID	Sample ID	Sample Depth Interval (ft bgs)	Sample Elevation Interval (ft NAVD88)	Date Collected	Result	Qualifier	Result	Qualifier
114CC-A8B-PB	114-A8B-6.0-6.5-PB	6.0 to 6.5	5.6 to 5.1	7/30/2012	**748**	J		
114-B10B-CC-PB	114-B10B-PB-6.0-6.5	6.3 to 6.8	5.3 to 4.8	09/19/2014	**348**			
114-B10B-CC-SW	114-B10B-SW-2.0-2.5	2.3 to 2.8	9.3 to 8.8	09/19/2014	**284**			
114-B10B-CC-SW	114-B10B-SW-4.0-4.5	4.3 to 4.8	7.3 to 6.8	09/19/2014	**509**			
114-B10B-CC-SW	114-B10B-SW-5.5-6.0	5.8 to 6.3	5.8 to 5.3	09/19/2014	**487**			
114-B9B-CC-PB	114-B9B-SW-6.0-6.5	6.2 to 6.7	5.3 to 4.8	09/18/2014	**484**			
114-B9B-CC-SW	114-B9B-SW-2.0-2.5	2.2 to 2.7	9.3 to 8.8	09/18/2014	**305**			
114-B9B-CC-SW	114-B9B-SW-4.0-4.5	4.2 to 4.7	7.3 to 6.8	09/18/2014	**921**			
114-B9B-CC-SW	114-B9B-SW-4.0-4.5X	4.2 to 4.7	7.3 to 6.8	09/18/2014	**1020**			
114-B9B-CC-SW	114-B9B-SW-5.5-6.0	5.7 to 6.2	5.8 to 5.3	09/18/2014	**379**			
114-C11B-CC-PB	114-C11B-PB-6.0-6.5	6.5 to 7.0	5.3 to 3.8	09/23/2014	**194**			
114-C11B-CC-SW	114-C11B-SW-2.0-2.5	2.0 to 2.5	9.3 to 8.8	09/23/2014	**248**			
114-C11B-CC-SW	114-C11B-SW-4.0-4.5	4.0 to 4.5	7.3 to 6.8	09/23/2014	**81.1**			
114-C11B-CC-SW	114-C11B-SW-5.5-6.0	5.5 to 6.0	5.8 to 5.3	09/23/2014	**109**			
114-C12B-CC-PB	114-C12B-PB-6.0-6.5	6.9 to 7.4	5.3 to 4.8	09/24/2014	**195**	J		
114-C12B-CC-SW	114-C12B-SW-2.0-2.5	2.4 to 2.9	9.3 to 8.8	09/24/2014	**85.0**	J		
114-C12B-CC-SW	114-C12B-SW-4.0-4.5	4.4 to 4.9	7.3 to 6.8	09/24/2014	**110**	J		
114-C12B-CC-SW	114-C12B-SW-5.5-6.0	5.9 to 6.4	5.8 to 5.3	09/24/2014	**206**	J		
114CC-A'10A-SW	114-A'10A-0.5-1.0-SW	0.5 to 1.0	10.2 to 9.7	06/19/2012	**33.9**	J		
114CC-A'1A-SW	114-A'1A-0.5-1.0-SW	0.2 to 0.7	9.6 to 9.1	07/09/2012	**51.0**	J		
114CC-A1B-SW	114-A1B-0.5-1.0-SW	0.5 to 1.0	9.4 to 8.9	07/16/2012	**103**	J		
114CC-A1B-SW	114-A1B-2.5-3.0-SW	2.5 to 3.0	7.4 to 6.9	07/16/2012	**22.2**	J		
114CC-A'2A-SW	114-A'2A-0.5-1.0-SW	0.5 to 1.0	9.2 to 8.7	07/05/2012	**42.2**	J		
114CC-A'2A-SW	114-A'2A-2.5-3.0-SW	2.5 to 3.0	7.2 to 6.7	07/05/2012	**67.5**	J		
114CC-A2B-PB	114-A2B-6.0-6.5-PB	5.9 to 6.4	4.8 to 4.3	07/18/2012	**504**	J		
114CC-A'3A-SW	114-A'3A-2.5-3.0-SW	2.5 to 3.0	7.0 to 6.5	07/02/2012	**39.6**	J		
114CC-A3B-SW	114-A3B-2.5-3.0-SW	2.5 to 3.0	7.7 to 7.2	07/19/2012	**44.4**	J		
114CC-A'4A-SW	114-A'4A-0.5-1.0-SW	0.5 to 1.0	9.0 to 8.5	06/28/2012	**1260**	J		
114CC-A'4A-SW	114-A'4A-2.5-3.0-SW	2.5 to 3.0	7.0 to 6.5	06/28/2012	**21.5**	J		
114CC-A4B-PB	114-A4B-6.0-6.5-PB	6.0 to 6.5	4.9 to 4.4	07/23/2012	**24.0**	J		
114CC-A4B-SW	114-A4B-1.2-1.7-SW	1.2 to 1.7	9.1 to 8.6	07/23/2012	**188**	J		
114CC-A'5A-SW	114-A'5A-0.5-1.0-SW	0.5 to 1.0	9.3 to 8.8	06/27/2012	**96.6**	J		
114CC-A'5A-SW	114-A'5A-2.5-3.0-SW	2.5 to 3.0	7.3 to 6.8	06/27/2012	**42.3**	J		
114CC-A'5A-SW	114-A'5A-4.5-5.0-SW	4.5 to 5.0	5.3 to 4.8	06/27/2012	**47.4**	J		
114CC-A5B-PB	114-A5B-6.0-6.5-PB	6.0 to 6.5	5.0 to 4.5	07/24/2012	**864**	J		
114CC-A5B-SW	114-A5B-1.0-1.5-SW	1.0 to 1.5	9.5 to 9.0	07/24/2012	**169**	J		
114CC-A5B-SW	114-A5B-2.5-3.0-SW	2.5 to 3.0	8.0 to 7.5	07/24/2012	**91.4**	J		
114CC-A6B-PB	114-A6B-6.0-6.5-PB	6.0 to 6.5	5.1 to 4.6	07/26/2012	**374**	J		

Exhibit B-2B
Restricted Area Data Table - Restricted Area B
Clean Fill Soil Cap
Garfield Avenue
Jersey City, Hudson County, New Jersey

				Analyte	CHROMIUM (HEXAVALENT)		ANTIMONY	
				CAS RN	18540-29-9		7440-36-0	
				CrSCC	20		N/A	
				RDCSRS	N/A		31	
				NRDCSRS	N/A		450	
				Units	mg/kg		mg/kg	
Location ID	Sample ID	Sample Depth Interval (ft bgs)	Sample Elevation Interval (ft NAVD88)	Date Collected	Result	Qualifier	Result	Qualifier
114CC-A6B-SW	114-A6B-0.5-1.0-SW	0.5 to 1.0	10.1 to 9.6	07/26/2012	**49.3**	J		
114CC-A6B-SW	114-A6B-2.5-3.0-SWX	2.5 to 3.0	8.1 to 7.6	07/26/2012	**59.4**	J		
114CC-A6B-SW	114-A6B-2.5-3.0-SW	2.5 to 3.0	8.1 to 7.6	07/26/2012	**75.6**	J		
114CC-A6B-SW	114-A6B-4.5-5.0-SW	4.5 to 5.0	6.1 to 5.6	07/26/2012	**101**	J		
114CC-A7B-PB	114-A7B-6.0-6.5-PB	6.0 to 6.5	5.4 to 4.9	07/27/2012	**1530**	J		
114CC-A7B-SW	114-A7B-2.5-3.0-SW	2.5 to 3.0	8.0 to 7.5	07/27/2012	**156**	J		
114CC-A7B-SW	114-A7B-4.5-5.0-SW	4.5 to 5.0	6.0 to 5.5	07/27/2012	**92.7**	J		
114CC-A8B-SW	114-A8B-0.5-1.0-SW	0.5 to 1.0	10.3 to 9.8	07/30/2012	**102**	J		
114CC-A8B-SW	114-A8B-2.5-3.0-SW	2.5 to 3.0	8.3 to 7.8	07/30/2012	**213**	J		
114CC-A8B-SW	114-A8B-4.5-5.0-SW	4.5 to 5.0	6.3 to 5.8	07/30/2012	**941**	J		
114CC-A'9A-SW	114-A'9A-0.5-1.0-SW	0.5 to 1.0	9.9 to 9.4	06/20/2012	**26.3**	J		
114CC-A9B-PB	114-A9B-6.0-6.5-PB	6.0 to 6.5	5.5 to 5.0	07/31/2012	**2220**	J		
114CC-A9B-SW	114-A9B-0.5-1.0-SW	0.5 to 1.0	10.6 to 10.1	07/31/2012	**242**	J		
114CC-A9B-SW	114-A9B-2.5-3.0-SW	2.5 to 3.0	8.6 to 8.1	07/31/2012	**95.5**	J		
C9	C9S7-7.5	7.0 to 7.5	4.5 to 4.0	09/03/2003	**4840**	J	**198**	
GA	GA17-17.5	17.0 to 17.5	-5.8 to -6.3	03/15/2004	**24.4**			
GAR-PDI-A'10A	GAR-PDI-A'10A-14.0-14.5	14.0 to 14.5	-2.7 to -3.2	11/10/2016	**40.7**	J		
GAR-PDI-A'10A	GAR-PDI-A'10A-16.0-16.5	16.0 to 16.5	-4.7 to -5.2	11/10/2016	**22.4**	J		
GAR-PDI-A'11A	GAR-PDI-A'11A-12.0-12.5	12.0 to 12.5	-0.5 to -1.0	11/10/2016	**33.8**	J		
GAR-PDI-A'11A	GAR-PDI-A'11A-16.0-16.5	16.0 to 16.5	-4.5 to -5.0	11/10/2016	**28.6**	J		
GAR-PDI-A'11A	GAR-PDI-A'11A-18.0-18.5	18.0 to 18.5	-6.5 to -7.0	11/10/2016	**30.6**	J		
GAR-PDI-A'12A	GAR-PDI-A'12A-12.0-12.5X	12.0 to 12.5	-0.8 to -1.3	11/09/2016	**69.2**	J		
GAR-PDI-A'12A	GAR-PDI-A'12A-12.0-12.5	12.0 to 12.5	-0.8 to -1.3	11/09/2016	**61.7**	J		
GAR-PDI-A'12A	GAR-PDI-A'12A-14.0-14.5	14.0 to 14.5	-2.8 to -3.3	11/09/2016	**87.9**	J		
GAR-PDI-A'12A	GAR-PDI-A'12A-16.0-16.5	16.0 to 16.5	-4.8 to -5.3	11/09/2016	**39.7**	J		
GAR-PDI-A'12A	GAR-PDI-A'12A-18.0-18.5	18.0 to 18.5	-6.8 to -7.3	11/09/2016	**31.5**	J		
GAR-PDI-A'13A	GAR-PDI-A'13A-14.5-15.0	14.5 to 15.0	-3.5 to -4.0	11/09/2016	**27.6**	J		
GAR-PDI-A'13A	GAR-PDI-A'13A-16.5-17.0	16.5 to 17.0	-5.5 to -6.0	11/09/2016	**28.5**	J		
GAR-PDI-A'13A	GAR-PDI-A'13A-17.0-17.5	17.0 to 17.5	-6.0 to -6.5	11/09/2016	**27.8**	J		
GAR-PDI-A6B	GAR-PDI-A6B-10.0-10.5	10.0 to 10.5	1.1 to 0.6	11/29/2016	**131**	J		
GAR-PDI-A6B	GAR-PDI-A6B-12.0-12.5	12.0 to 12.5	-0.9 to -1.4	11/29/2016	**114**	J		
GAR-PDI-A6B	GAR-PDI-A6B-14.0-14.5	14.0 to 14.5	-2.9 to -3.4	11/29/2016	**153**	J		
GAR-PDI-A6B	GAR-PDI-A6B-16.0-16.5	16.0 to 16.5	-4.9 to -5.4	11/29/2016	**101**	J		
GAR-PDI-A6B	GAR-PDI-A6B-18.0-18.5	18.0 to 18.5	-6.9 to -7.4	11/29/2016	**110**	J		
GAR-PDI-A6B	GAR-PDI-A6B-7.5-8.0	7.5 to 8.0	3.6 to 3.1	11/29/2016	**209**	J		
GAR-PDI-A6B	GAR-PDI-A6B-7.5-8.0X	7.5 to 8.0	3.6 to 3.1	11/29/2016	**168**	J		
GAR-PDI-A6B	GAR-PDI-A6B-8.0-8.5	8.0 to 8.5	3.1 to 2.6	11/29/2016	**154**	J		
GAR-PDI-A'8A	GAR-PDI-A'8A-14.0-14.5	14.0 to 14.5	-3.2 to -3.7	11/10/2016	**151**	J		

Exhibit B-2B
Restricted Area Data Table - Restricted Area B
Clean Fill Soil Cap
Garfield Avenue
Jersey City, Hudson County, New Jersey

				Analyte	CHROMIUM (HEXAVALENT)		ANTIMONY	
				CAS RN	18540-29-9		7440-36-0	
				CrSCC	20		N/A	
				RDCSRS	N/A		31	
				NRDCSRS	N/A		450	
				Units	mg/kg		mg/kg	
Location ID	Sample ID	Sample Depth Interval (ft bgs)	Sample Elevation Interval (ft NAVD88)	Date Collected	Result	Qualifier	Result	Qualifier
GAR-PDI-A'8A	GAR-PDI-A'8A-16.0-16.5	16.0 to 16.5	-5.2 to -5.7	11/10/2016	**31.9**	J		
GAR-PDI-A8B	GAR-PDI-A8B-10.0-10.5	10.0 to 10.5	1.3 to 0.8	11/21/2016	**861**			
GAR-PDI-A8B	GAR-PDI-A8B-12.0-12.5	12.0 to 12.5	-0.7 to -1.2	11/21/2016	**30.8**			
GAR-PDI-A8B	GAR-PDI-A8B-12.5-13.0	12.5 to 13.0	-1.2 to -1.7	11/21/2016	**115**			
GAR-PDI-A8B	GAR-PDI-A8B-14.0-14.5	14.0 to 14.5	-2.7 to -3.2	11/21/2016	**56.1**			
GAR-PDI-A8B	GAR-PDI-A8B-16.0-16.5	16.0 to 16.5	-4.7 to -5.2	11/21/2016	**40.1**			
GAR-PDI-A8B	GAR-PDI-A8B-18.0-18.5	18.0 to 18.5	-6.7 to -7.2	11/21/2016	**64.6**			
GAR-PDI-A8B	GAR-PDI-A8B-8.0-8.5	8.0 to 8.5	3.3 to 2.8	11/21/2016	**1820**			
GAR-PDI-A8B	GAR-PDI-A8B-8.0-8.5X	8.0 to 8.5	3.3 to 2.8	11/21/2016	**1640**			
GAR-PDI-A'9A	GAR-PDI-A'9A-14.0-14.5	14.0 to 14.5	-2.9 to -3.4	11/10/2016	**62.1**	J		
GAR-PDI-A'9A	GAR-PDI-A'9A-18.0-18.5	18.0 to 18.5	-6.9 to -7.4	11/10/2016	**45.6**	J		
GAR-PDI-B10B	GAR-PDI-B10B-10.0-10.5	10.0 to 10.5	1.6 to 1.1	12/08/2016	**3490**	J		
GAR-PDI-B10B	GAR-PDI-B10B-10.0-10.5X	10.0 to 10.5	1.6 to 1.1	12/08/2016	**3340**	J		
GAR-PDI-B10B	GAR-PDI-B10B-12.0-12.5	12.0 to 12.5	-0.4 to -0.9	12/08/2016	**2290**	J		
GAR-PDI-B10B	GAR-PDI-B10B-7.5-8.0	7.5 to 8.0	4.1 to 3.6	12/02/2016	**3550**	J		
GAR-PDI-B10B	GAR-PDI-B10B-8.0-8.5	8.0 to 8.5	3.6 to 3.1	12/02/2016	**3870**	J		
GAR-PDI-B11B	GAR-PDI-B11B-13.5-14.0	13.5 to 14.0	-1.6 to -2.1	11/30/2016	**1450**	J		
GAR-PDI-B11B	GAR-PDI-B11B-8.0-8.5	8.0 to 8.5	3.9 to 3.4	11/30/2016	**1790**	J		
GAR-PDI-B9B	GAR-PDI-B9B-6.0-6.5	6.0 to 6.5	5.6 to 5.1	11/21/2016	**601**			
GAR-PDI-B9B	GAR-PDI-B9B-8.0-8.5	8.0 to 8.5	3.6 to 3.1	11/21/2016	**1240**			
GAR-PDI-C11B	GAR-PDI-C11B-9.0-9.5	9.0 to 9.5	3.0 to 2.5	12/02/2016	**4470**	J		
GAR-PDI-C11B	GAR-PDI-C11B-9.0-9.5X	9.0 to 9.5	3.0 to 2.5	12/02/2016	**3360**	J		
GAR-PDI-C12B	GAR-PDI-C12B-10.5-11.0	10.5 to 11.0	1.8 to 1.3	02/15/2017	**1500**	J		
GAR-PDI-C12B	GAR-PDI-C12B-16.0-16.5	16.0 to 16.5	-3.7 to -4.2	02/15/2017	**59.0**	J		
GAR-PDI-C12B	GAR-PDI-C12B-18.0-18.5	18.0 to 18.5	-5.7 to -6.2	02/15/2017	**25.7**	J		
GAR-PDI-C12B	GAR-PDI-C12B-8.5-9.0	8.5 to 9.0	3.8 to 3.3	02/15/2017	**1870**	J		
GAR-PDI-C12B	GAR-PDI-C12B-9.0-9.5	9.0 to 9.5	3.3 to 2.8	02/15/2017	**1450**	J		
P4-GA-A'1A	114-GA-A`1A-6.0-6.5X	6.0 to 6.5	3.3 to 2.8	08/20/2014	**355**	J		
P4-GA-A2B	114-GA-A2B-12.0-12.5	12.0 to 12.5	-2.6 to -3.1	08/20/2014	**23.3**	J		
P4-GA-A2B	114-GA-A2B-14.0-14.5x	14.0 to 14.5	-4.6 to -5.1	08/20/2014	**21.2**	J		
P4-GA-A'4A	114-GA-A`4A-18.0-18.5	18.0 to 18.5	-9.5 to -10.0	08/19/2014	**92.0**	J		
P4-GA-A5B	114-GA-A5B-10.5-11.0	10.5 to 11.0	-1.0 to -1.5	08/21/2014	**99.8**	J		
P4-GA-A5B	114-GA-A5B-11.0-11.5	11.0 to 11.5	-1.5 to -2.0	08/21/2014	**78.9**	J		
P4-GA-A5B	114-GA-A5B-13.0-13.5	13.0 to 13.5	-3.5 to -4.0	08/21/2014	**82.4**	J		
P4-GA-A5B	114-GA-A5B-15.0-15.5	15.0 to 15.5	-5.5 to -6.0	08/21/2014	**140**	J		
P4-GA-A5B	114-GA-A5B-5.5-6.0	5.5 to 6.0	4.0 to 3.5	08/21/2014	**143**	J		
P4-GA-A5B	114-GA-A5B-7.5-8.0	7.5 to 8.0	2.0 to 1.5	08/21/2014	**120**	J		
P4-GA-A5B	114-GA-A5B-9.5-10.0	9.5 to 10.0	0.0 to -0.5	08/21/2014	**21.4**	J		

Exhibit B-2B
Restricted Area Data Table - Restricted Area B
Clean Fill Soil Cap
Garfield Avenue
Jersey City, Hudson County, New Jersey

				Analyte	CHROMIUM (HEXAVALENT)		ANTIMONY	
				CAS RN	18540-29-9		7440-36-0	
				CrSCC	20		N/A	
				RDCSRS	N/A		31	
				NRDCSRS	N/A		450	
				Units	mg/kg		mg/kg	
Location ID	Sample ID	Sample Depth Interval (ft bgs)	Sample Elevation Interval (ft NAVD88)	Date Collected	Result	Qualifier	Result	Qualifier
P4-GA-A7B	114-GA-A7B-10.0-10.5	10.0 to 10.5	-0.6 to -1.1	08/22/2014	**664**			
P4-GA-A7B	114-GA-A7B-12.0-12.5	12.0 to 12.5	-2.6 to -3.1	08/22/2014	**199**			
P4-GA-A7B	114-GA-A7B-14.0-14.5	14.0 to 14.5	-4.6 to -5.1	08/22/2014	**148**			
P4-GA-A7B	114-GA-A7B-16.0-16.5	16.0 to 16.5	-6.6 to -7.1	08/22/2014	**64.5**			
P4-GA-A7B	114-GA-A7B-5.5-6.0	5.5 to 6.0	3.9 to 3.4	08/22/2014	**868**			
P4-GA-A7B	114-GA-A7B-5.5-6.0X	5.5 to 6.0	3.9 to 3.4	08/22/2014	**723**			
P4-GA-A7B	114-GA-A7B-6.0-6.5	6.0 tp 6.5	3.4 to 2.9	08/22/2014	**668**			
P4-GA-A7B	114-GA-A7B-8.0-8.5	8.0 to 8.5	1.4 to 0.9	08/22/2014	**28.7**			

Notes:
bgs - below ground surface
CAS RN - Chemical Abstracts Service Registry Number
CrSCC - Chromium Soil Cleanup Criteria
ft - feet
J - Indicates 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
N/A - not applicable
NAVD88 - North American Vertical Datum of 1988
NRDCSRS - Non-Residential Direct Contact Soil Remediation Standard
RDCSRS - Residential Direct Contact Soil Remediation Standard
Bold font indicates a hexavelent chromium result exceeds the CrSCC or the antimony result exceeds the RDCSRS.
Blank font indicates that the analyte was not analyzed or the result did not not exceed the RDCSRS and/or NRDCSRS.
"X" at the end of a Sample ID indicates a field duplicate sample.

EXHIBIT C

Narrative descriptions of the institutional controls and engineering controls

Exhibit C-1: Notice in Lieu of Deed Notice as Institutional Control

Exhibit C-2: Narrative Description of the Restricted Area A Engineering Control: Existing Asphalt/Concrete Cap

Exhibit C-3: Narrative Description of the Restricted Area B Engineering Control: Clean Fill Soil Cap

EXHIBIT C

Narrative descriptions of the institutional and engineering controls

Exhibit C-1: Notice in Lieu of Deed Notice as Institutional Control

(A) Description and estimated size of the Restricted Areas:

The Notice in Lieu of Deed Notice is for soil (Soil Restricted Area A and Soil Restricted Area B), located within the right-of-way of Garfield Avenue in Jersey City, New Jersey, as depicted on **Exhibits B-1A** through **B-1D**.

In Restricted Area A, the contaminants of concern are hexavalent chromium (Cr^{+6}) and visible Chromate Chemical Production Waste (CCPW), which is a potential source of Cr^{+6} and CCPW metals (antimony, chromium, nickel, thallium, and vanadium). The estimated size of the Soil Restricted Area A is 24,859 square feet (ft^2) (0.57 acres).

In Restricted Area B, the contaminants of concern are Cr^{+6}, visible CCPW, which is a potential source of Cr^{+6} and CCPW metals (antimony, chromium, nickel, thallium, and vanadium), and antimony (Sb). The estimated size of the Soil Restricted Area B is 9,551 square feet (ft^2) (0.22 acres).

(B) Descriptions of the restrictions on the Property by operation of this Notice in Lieu of Deed Notice:

The restrictions in this Notice in Lieu of Deed Notice minimize exposure to the contaminants of concern identified above in **Exhibit C-1** (**A**), which include Cr^{+6}, visible CCPW, which is a potential source of Cr^{+6} and CCPW metals (antimony, chromium, nickel, thallium, and vanadium), and Sb. Through the use of this Notice in Lieu of Deed Notice and implementation of engineering controls, exposure to humans and the potential impact to the environment are reduced.

(C) Objective of the restrictions:

The objective of the restrictions in this Notice in Lieu of Deed Notice is to permit continued use of the Property while reducing the exposure of humans to, and the potential impact to the environment from, Cr^{+6}, visible CCPW, which is a potential source of Cr^{+6} and CCPW metals (antimony, chromium, nickel, thallium, and vanadium), and Sb in soil at concentrations greater than the unrestricted use standards.

Exhibit C-2: Narrative Description of the Restricted Area A Engineering Control: Existing Asphalt/Concrete Cap

(A) Description of the engineering control:

Asphalt/concrete, with a minimum thickness of 4 inches, is present within Soil Restricted Area A as an engineering control. The extent of the Existing Asphalt/Concrete Cap Engineering Control is depicted on **Exhibits B-1A** and **B-1C.** A detail (typical section) of the Existing Asphalt/Concrete Cap Engineering Control is shown on **Exhibit B-1E**.

(B) The objective of the engineering control:

The objective of the Existing Asphalt/Concrete Cap Engineering Control is to protect human health and the environment by restricting access and eliminating exposure to underlying soil with Cr^{+6} concentrations greater than the unrestricted use standards and to visible CCPW, which is a potential source of Cr^{+6} and CCPW metals (antimony, chromium, nickel, thallium, and vanadium).

(C) How the engineering control is intended to function:

The Existing Asphalt/Concrete Cap Engineering Control is intended to function as a barrier that prevents direct contact with and incidental exposure to the underlying soil containing Cr^{+6} at concentrations greater than the unrestricted use standards and visible CCPW, which is a potential source of Cr^{+6} and CCPW metals (antimony, chromium, nickel, thallium, and vanadium).

Exhibit C-3: Narrative Description of the Restricted Area B Engineering Control: Clean Fill Soil Cap

(A) Description of the engineering control:

Following excavation of soils within the Soil Restricted Area B, dense-graded aggregate (DGA) backfill material was placed at the bottom of the excavation and compacted at a thickness of 2 feet as the Clean Fill Soil Cap Engineering Control. Additional DGA was placed on top of the Clean Fill Soil Cap to reach final grades, but is not considered to be part of the Clean Fill Soil Cap Engineering Control. The extent of the Clean Fill Soil Cap Engineering Control is depicted on **Exhibits B-1B** and **B-1D.** A detail (typical section) of the as-built Clean Fill Soil Cap Engineering Control is shown on **Exhibit B-1E**. As depicted on Exhibit B-1E, a high-density polyethylene (HDPE) liner is present within Restricted Area B at elevations ranging from 8.4 to 11.0 feet in the North American Vertical Datum of 1988 (NAVD88); this liner does not serve as an engineering control for soil but does serve as a capillary break.

(B) The objective of the engineering control:

The objective of the Clean Fill Soil Cap Engineering Control is to protect human health and the environment by restricting access and eliminating exposure to underlying soil containing

Cr^{+6} and Sb at concentrations greater than the unrestricted use standards and to visible CCPW, which is a potential source of Cr^{+6} and CCPW metals (antimony, chromium, nickel, thallium, and vanadium).

(C) How the engineering control is intended to function:

The Clean Fill Soil Cap Engineering Control is intended to function as a barrier that prevents direct contact with and incidental exposure to the underlying soil containing Cr^{+6} and Sb at concentrations greater than the unrestricted use standards and to visible CCPW, which is a potential source of Cr^{+6} and CCPW metals (antimony, chromium, nickel, thallium, and vanadium).

UTILITY WORK COORDINATION MANUAL

AECOM

Prepared for:
PPG
Monroeville, PA

Prepared by:
AECOM
Piscataway, NJ
Project #: 60580814
August 2022

Utility Work Coordination Manual
Final (Revision 1)

Coordination of Utility Work in Presence of CCPW and CCPW-Impacted Soil and Groundwater

Existing and Future Municipal Right-of-Ways and Easements
Adjacent to or Within PPG Hudson County Chromate Sites
Jersey City and Bayonne, New Jersey

Document No. GAG-161

Contents

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List of Acronyms and Abbreviations

ACO	Administrative Consent Order
CCPW	Chromate Chemical Production Waste
COPR	Chromite Ore Processing Residue
CrSCC	Chromium Soil Cleanup Criterion
Cr^{+3}	trivalent chromium
Cr^{+6}	hexavalent chromium
GA	Garfield Avenue
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCC	Hudson County Chromate
JCMUA	Jersey City Municipal Utilities Authority
JCO	Judicial Consent Order
µg/m³	micrograms per cubic meter
mg/kg	milligrams per kilogram
NJDEP	New Jersey Department of Environmental Protection
NRDCSRS	Non-Residential Direct Contact Soil Remediation Standards
OSHA	Occupational Safety and Health Administration
POTW	publicly-owned treatment works
ROW	right-of-way

1.0 Introduction

On behalf of PPG, AECOM has prepared this Utility Work Coordination Manual. This manual is applicable to existing and future municipal right-of-ways (ROWs) adjacent to PPG Hudson County Chromate (HCC) sites in Jersey City and Bayonne, New Jersey where PPG has implemented a Notice in Lieu of Deed Notice for Chromate Chemical Production Waste (CCPW)-related impacts (herein referred to as applicable ROWs).

Applicable ROWs in Jersey City include:

- A portion of Carteret Avenue, between Garfield Avenue and Pacific Avenue;
- A portion of Caven Point Avenue, between Halladay Street Avenue and Pacific Avenue;
- A portion of Forrest Street, northwest of Halladay Street;
- A portion of Garfield Avenue, between Carteret Avenue and the Hudson Bergen Light Rail;
- A portion of Pacific Avenue, between Caven Point Avenue and Carteret Avenue;
- Site 65, which is adjacent to 1 Burma Road and within the Burma Road ROW and the Morris Pesin Drive ROW;
- A portion of Linden Avenue East adjacent to Site 16; and
- Portions of Caven Point Road, north of Chapel Avenue.

Applicable ROWs in Bayonne include:

- Site 174, which includes a portion of W. 1st Street, between Islandview Court and Avenue C and Seaview Court.

Applicable ROWs are presented on **Figures 1a, 1b, 1c, 1d, and 1e**. If PPG implements Notices in Lieu of Deed Notices for CCPW-related impacts on ROWs not listed herein, this manual will be updated to include that ROW and the updated manual will be attached to that ROW's Notice in Lieu of Deed Notice.

The purpose of this manual is to:

- Provide background information on the remediation of CCPW-related impacts by PPG;
- Identify the hazards associated with CCPW-related impacts;
- Identify the regulatory requirements pertaining to the safety of workers performing ground-intrusive activities (e.g., digging, drilling, excavation) in the presence of CCPW-related impacts; and
- Summarize the procedures for coordination between PPG and entities performing ground-intrusive activities in the presence of CCPW-related impacts.

The coordination procedures outlined in this manual are intended to be used by parties performing ground-intrusive activities within applicable ROWs. Entities that may use this manual include the Jersey City Municipal Utilities Authority (JCMUA), Public Service Electric and Gas Company, Comcast, Verizon, and any others performing ground-intrusive activities within the municipal ROWs. References to parties performing ground-intrusive activities include the party's subcontractors.

2.0 Background Information

2.1 Regulatory Background

In 1990, PPG and the New Jersey Department of Environmental Protection (NJDEP) entered into an *Administrative Order on Consent in the Matter of Hudson County Chromate Chemical Production Waste Sites and PPG Industries*, also referred to as the Administrative Consent Order (ACO) (NJDEP, 1990) to investigate and remediate certain HCC Sites. On June 26, 2009, NJDEP, PPG, and the City of Jersey City entered into a *Partial Consent Judgment Concerning the PPG Sites*, also referred to as the Judicial Consent Order (JCO) (Superior Court of New Jersey Law Division – Hudson County, 2009), with the purpose of remediating CCPW-related impacts at HCC Sites.

In accordance with PPG's obligations under the ACO and JCO, PPG has conducted remediation at the Garfield Avenue (GA) Group Sites, which include HCC Site 114 and its adjacent properties and existing and future ROWs, as well non-GA Group Sites.

2.2 Chromate Chemical Production Waste-Related Impacts in Soil and Groundwater

The by-products of the production of chromium from chromite ore are collectively referred to as CCPW. Both hexavalent chromium (Cr^{+6}) and CCPW metals (trivalent chromium [Cr^{+3}], antimony, nickel, thallium, and vanadium) may potentially be found in CCPW. CCPW, analytically-detected Cr^{+6} and CCPW metals in soil, concrete, and groundwater exceeding applicable standards or criteria are collectively referred to as CCPW-related impacts. The NJDEP soil criterion for Cr^{+6} in soil, known as the Chromium Soil Cleanup Criterion (CrSCC), is currently 20 milligrams per kilogram (mg/kg). The applicable standards for the CCPW metals are the NJDEP Non-Residential Direct Contact Soil Remediation Standards (NRDCSRS).[1]

Chromite Ore Processing Residue (COPR) is a specific type of CCPW which historically was utilized as pipe bedding and fill material at the GA Group Sites. COPR contains concentrations of Cr^{+6} as the compound sodium dichromate. COPR is characterized as a reddish-brown, coarse to fine gravel with varying amounts of sand and silt particles. The gravel portion of the matrix is typically defined as nodules from the chromium manufacturing process that range in size from 3/4 to 1/8 inches in diameter. However, nodules have been infrequently detected at diameters greater than an inch. Different-sized nodules may be found cemented together to form larger clusters. The matrix of these clusters may consist of cement-like silt. These nodules can be disintegrated with a hammer and can sometimes be magnetic depending on their composition. Occasionally when detected in the saturated zone, COPR nodules may appear as a fine-grained material that has been weathered.

Green-gray mud is a specific type of CCPW, generally a lime green, dense silt with minor amounts of fine sand and clay. Green-gray mud contains high concentrations of Cr^{+6}. When found in the saturated zone, the grain size of this material may have been affected further due to weathering processes. This

[1] The NRDCSRS for antimony, nickel, and vanadium are 450 mg/kg, 23,000 mg/kg, and 1,100 mg/kg, respectively as presented in the Remedial Action Work Plans for the ROW. There are no NRDCSRS for total chromium or thallium.

can give the material a wet, clayey silt or silty clay appearance with little or no physical or structural integrity.

When CCPW comes into contact with groundwater or infiltrating rainwater, Cr^{+6}, as well as CCPW metals, can solubilize and either adsorb to the surrounding soil or fill material or form precipitates. Soil containing chromium may have a yellow to green coloration. Precipitates may be either a green dust or crystals. Chromium can penetrate porous materials such as concrete, and typically appears in a green coloration.

Groundwater containing chromium most often has a yellow or green discoloration. Hexavalent chromium is a strong oxidant; therefore, groundwater containing Cr^{+6} often has an elevated pH. Representative photographs of COPR and soil and groundwater containing chromium are provided for reference in **Appendix A**.

3.0 Hazard Evaluation

Chemical hazards associated with ground-intrusive activities at applicable ROWs include, among other hazards, the presence of CCPW-related impacts. As described in Section 2.2, the NJDEP CrSCC is currently 20 mg/kg. The NJDEP groundwater quality standard for total chromium is currently 70 micrograms per liter. Health-related threshold concentrations of Cr^{+6} are discussed below.

This hazard evaluation is focused on the chemical exposure hazard posed by the presence of Cr^{+6} in soil and groundwater. The chemical exposure hazards posed by CCPW metals and other hazards associated with ground-intrusive activities are beyond the scope of this manual; however, the party performing ground-intrusive activities should be aware of the potential presence of CCPW metals in concentrations hazardous to human health.

3.1 Locations of Chromium

As described in Section 2.2, Cr^{+6} present in CCPW at any level can be adsorbed to soil or in groundwater. Locations where Cr^{+6} is present in soil at concentrations exceeding the CrSCC are identified in the Notices in Lieu of Deed Notices, to which this manual is attached. This includes locations where either 1) an engineering control is required, or 2) compliance with the CrSCC was attained through spatial averaging and therefor, no engineering control is required. For information on where Cr^{+6} is present in groundwater at concentrations greater than the NJDEP Groundwater Quality Standard (GWQS), the entity performing ground-intrusive activities can contact PPG (see Section 5.0).

3.2 Chromium Exposure Pathways

Cr^{+6} exposure pathways include:

- Inhalation of airborne dust and mist containing Cr^{+6};
- Skin and eye contact and absorption due to direct contact with CCPW-related impacts; and
- Incidental ingestion of CCPW-related impacts.

Of the identified Cr^{+6} exposure pathways, inhalation of airborne dust and mist is the primary exposure pathway. Ground-intrusive activities where CCPW-related impacts are present will likely produce airborne dust and mist containing Cr^{+6} unless dust control measures are implemented. Workers performing utility related or other subsurface work may also inadvertently ingest or expose their skin or eyes to Cr^{+6} without appropriate mitigation measures.

3.3 Chromium Exposure Health Effects

The health effects resulting from exposure to Cr^{+3} and Cr^{+6} are fairly well described in the scientific literature. In general, Cr^{+6} is more toxic than Cr^{+3}. Breathing in high levels (>2 micrograms per cubic meter [µg/m³]) of Cr^{+6}, such as in a compound known as chromic acid or Cr^{+6} trioxide, can cause irritation to the nose, potentially resulting in a runny nose, sneezing, itching, nosebleeds, ulcers, and/or holes in the nasal septum. These effects have primarily occurred in factory workers who make or use Cr^{+6} for several months to many years. The Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit for Cr^{+6} is 5 µg/m³ as an 8-hour, time-weighted average.

Cr^{+6} is a carcinogen in humans. There is evidence that Cr^{+6} compounds cause lung cancer in humans. Sodium dichromate has been shown to cause lung cancer in animals. While sodium dichromate has not been identified as a teratogen or reproductive hazard, Cr^{+6} compounds are teratogens and may also cause reproductive damage, such as reduced fertility and interference with menstrual cycles.

3.4 Additional Information

The following fact sheets with information on chromium, potential health hazards, and precautions to prevent exposure are provided in **Appendix B**:

- Agency for Toxic Substance and Disease Registry Fact Sheet on Chromium;
- OSHA Fact Sheet on Health Effects of Hexavalent Chromium; and
- New Jersey Department of Health and Senior Services Right to Know Hazardous Substance Fact Sheet.

4.0 Health and Safety Regulatory Requirements

Workers performing ground-intrusive activities where contaminated materials are present may be potentially exposed to such materials; therefore, OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) standard (29 CFR 1910.120) may be applicable to these activities. Compliance with the HAZWOPER standard typically involves:

- Development and implementation by the workers' employer of a work plan covering the aspects of the work to be performed;
- Development and implementation by the workers' employer of a written Health and Safety Plan (HASP) which typically includes a site characterization, risk assessment for the aspects of the work to be performed, personal protective equipment requirements, medical surveillance requirements, air monitoring and environmental sampling requirements, site control measures, decontamination procedures, and an emergency response plan; and
- Completion by the workers of HAZWOPER 40-hour training and 8-hour annual refresher training.

5.0 Procedure for Coordination of Work

PPG has prepared the following procedure for whenever a party conducts utility-related, ground-intrusive work at applicable ROWs. Adherence to this procedure will:

- Enable PPG to remediate CCPW-related impacts in soil in accordance with PPG's obligation under the ACO and JCO; and
- Mitigate chemical exposure hazards caused by the presence of CCPW-related impacts in the work area.

A diagram of the procedure is presented in **Figure 2**.

The party performing the work initiates the procedure whenever the party plans to conduct work or must undertake emergency, unplanned work. When work at an applicable ROW is identified, the party performing the work notifies PPG via an answering service. The following sections detail the procedure and include steps that are dependent on whether the work is planned or in response to an emergency.

It should be noted that the extents of CCPW-related impacts in soil, as well as any associated engineering controls, are presented in the Notice in Lieu of Deed Notice for the ROW. The Notice in Lieu of Deed Notice should be reviewed to determine the lateral extents and depths of CCPW-related impacts in soil and engineering controls.

5.1 Administrative Requirements and Linear Construction Guidance

The NJDEP Administrative Requirements for the Remediation of Contaminated Sites (ARRCS, N.J.A.C. 7:26C) Subchapter 16 lists specific requirements for an entity conducting a linear construction project. Linear construction projects may include certain types of projects to maintain or alter a roadway, railroad, or utility.

The NJDEP Site Remediation Program Linear Construction Technical Guidance Section 2.3 states that the entity conducting a linear construction project (as defined within the guidance) should coordinate the disturbance of the [engineering] control with the person that is responsible for that control (PPG in this case).

The procedure for coordination of work presented herein is intended to help the entity performing ground-intrusive activities follow the ARRCS and NJDEP Site Remediation Program Linear Construction Technical Guidance.

5.2 PPG Public Information Line

PPG maintains a 24/7 hotline known as the PPG Public Information Line for the Company's Chromium Cleanups in Jersey City and Bayonne (Public Information Line) (201-938-0909). The PPG Public Information Line is the initial point of contact for the party performing the work, whether the work is planned or in response to an emergency. When contacted via the PPG Public Information Line, the answering service will record the message and forward it to the appropriate PPG representative for follow up.

5.3 Planned Work

For planned work at applicable ROWs, the PPG representative will request information pertaining to the work's scope, proposed location, and schedule. PPG will evaluate the information provided and confirm whether the work will be conducted in areas where CCPW-related impacts are present and whether the work will be conducted in restricted areas affected by a Notice in Lieu of Deed Notice or where engineering controls are present. If PPG confirms that CCPW-related impacts are present in the work area, PPG will notify the party conducting the work that the work should be conducted in accordance with the procedure; otherwise, PPG will let the party conducting the work know that the work can proceed without further coordination.

During the planning process, PPG may coordinate with the party performing the work and other stakeholders, on a case-by-case basis, to expand the excavation beyond the extents necessary to complete the planned work, to remove additional CCPW-related impacts.

For planned work in areas where CCPW-related impacts are present, PPG assumes that the party performing the work will conduct the necessary excavation and dewatering, dispose of any excavated materials and dewatered groundwater in accordance with applicable laws and regulations, backfill, and restore the work area to existing conditions. During the work and if applicable, PPG will provide technical assistance and field oversight and support. Following completion of the work, PPG will coordinate with the party performing the work to obtain waste documentation, waste volumes, and/or daily construction logs that will be used to prepare a summary report for the project file. PPG will also report to NJDEP and other relevant parties as applicable per Notice in Lieu of Deed Notice or regulatory requirements.

If engineering controls are present (e.g., clean fill, geotextile liner, landscaping and/or paving), restoration of the area shall involve replacement-in-kind of those controls, in accordance with the Notice in Lieu of Deed Notice. PPG will provide additional information on the proper restoration of the engineering controls (e.g., specifications, instructions, potential vendors, and potential subcontractors) on a case-by-case basis. Site backfilling and restoration work may also include measures (e.g., placement of geotextile liner along the sides of the excavation zone) to prevent recontamination of new fill from surrounding contaminated fill, to the extent practicable and allowable by utility owners.

5.4 Emergency Work

For emergency work at applicable ROWs, the PPG representative will request information pertaining to the work's scope, proposed location, and schedule. Because the timeframe for emergency work precludes PPG from determining whether CCPW-related impacts are present, CCPW-related impacts should be assumed to be in the work area.

The timeframe for emergency work does not allow for any planned expansion of the excavation's extents to remove additional CCPW-related impacts.

For emergency work, PPG assumes that the party performing the work will conduct the necessary excavation and dewatering, dispose of any excavated materials and dewatered groundwater in accordance with applicable laws and regulations, backfill, and restore the work area to existing conditions. During the work, if time allows and if applicable, PPG will provide technical assistance and field oversight and support. Following completion of the work, PPG will coordinate with the party performing the work to obtain waste documentation, waste volumes, and/or daily construction logs that will be used to prepare a summary report for the project file. PPG will also report to NJDEP and other relevant parties as applicable per Notice in Lieu of Deed Notice or regulatory requirements.

If engineering controls are present (e.g., clean fill, geotextile liner, landscaping and/or paving), restoration of the area will involve replacement-in-kind of those controls. PPG may request that the party performing the work delay backfill and/or restoration until those materials can be acquired and replaced.

5.5 Cost Reimbursement

Cost reimbursement details will be addressed in a cooperative manner between PPG and the party performing the work. In general, PPG will reimburse the party performing the work for the incremental cost increases due to the presence of CCPW-related impacts in the work area. Incremental cost increases will be identified using a combination of quotes and/or invoices. Examples of incremental costs that PPG will reimburse include:

- Costs for waste disposal at a facility that accepts CCPW-related impacts, minus the estimated cost of waste disposal if the material was non-hazardous;
- Costs for the excavation of the work area using OSHA 40-hour trained personnel, minus the estimated cost of excavation using personnel without the OSHA 40-hour training;
- Incremental costs associated with the handling of CCPW-impacted dewatered groundwater, such as the cost of pretreatment prior to discharge or the increase in cost of disposal due to CCPW-impacts;
- Costs for the use of additional personal protective equipment necessary to mitigate exposure to CCPW-related impacts; and
- Costs for the use of engineering controls that are necessary to mitigate exposure to CCPW-related impacts, such as misting/spraying the excavation.

Note that if waste classification of CCPW-impacted soil is non-hazardous, there is no incremental increase in the cost of disposal due to the presence of CCPW-impacts, and therefore there will be no reimbursement for waste disposal.

The party performing the work is responsible for providing PPG with sufficient information to identify the incremental costs. Cost sharing for CCPW-related impacts commingled with other impacts will be addressed in separate agreements between PPG, the party performing the work, and/or other responsible parties. These agreements will be established prior to the work being conducted if feasible.

5.6 811 Call Notification System

PPG recognizes that it is possible that not all entities performing ground-intrusive work at applicable ROWs will review this manual and, therefore, has implemented a supplemental system that notifies PPG when a call to “811” (New Jersey One Call) is placed for the applicable ROWs. This system will relay the details of the 811 call to PPG, including the contact information for the entity performing the ground-intrusive work. When PPG receives this notification, it will contact and proactively coordinate with the entity that made the 811 call.

5.7 Other Regulatory Requirements

Entities performing ground-intrusive work are responsible for complying with all applicable federal, state, and local laws, regulations, and/or ordinances. Additionally, entities performing ground-intrusive work are responsible for complying with the requirements presented in the Notice in Lieu of Deed Notice for the ROW. The procedure presented herein was not prepared to ensure compliance with all applicable federal, state, and local laws, regulations, and/or ordinances.

Specifically, both federal and state regulations govern the transportation and disposal of excavated material and dewatered groundwater. Excavated material containing CCPW impacts may be a hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). According to RCRA, the entity that excavates a hazardous waste is the hazardous waste generator and, therefore, is responsible for handling, transportation, and disposal of waste in accordance with RCRA requirements.[2] Regulations related to the United States Environmental Protection Agency's RCRA program are codified in the U.S. Code of Federal Regulations, Title 40, Parts 260-299. RCRA hazardous waste cannot be returned to the excavation.

The indirect discharge of dewatered groundwater to a publicly-owned treatment works (POTW) is regulated by the NJDEP's New Jersey Pollution Discharge Elimination System (NJPDES) Program. Any entity that discharges dewatered groundwater to a POTW should ensure the discharge is conducted in compliance with the NJPDES program. Other regulations may apply to the transportation and disposal of dewatered groundwater that is either discharged to a POTW or containerized for disposal or treatment by other means.

Entities performing ground-intrusive work should review any Notice in Lieu of Deed Notices that are applicable to their work area. The Notice in Lieu of Deed Notices, which are agreed to by the ROW's owner (usually the Jersey City Division of Engineering, Traffic, and Transportation), state that no person shall make, or allow to be made, any alteration, improvement, or disturbance in, to, or about the Property that disturbs the engineering control at the ROW without first retaining a Licensed Site Remediation Professional.

[2] Please note that this does not apply to Site 65, whereby PPG entered into a separate settlement agreement which controls responsibility for disposal of the CCPW-impact material.

6.0 References

NJDEP, 1990. *Administrative Order on Consent in the Matter of Hudson County Chromate Chemical Production Waste Sites and PPG Industries, Inc*. July 19, 1990.

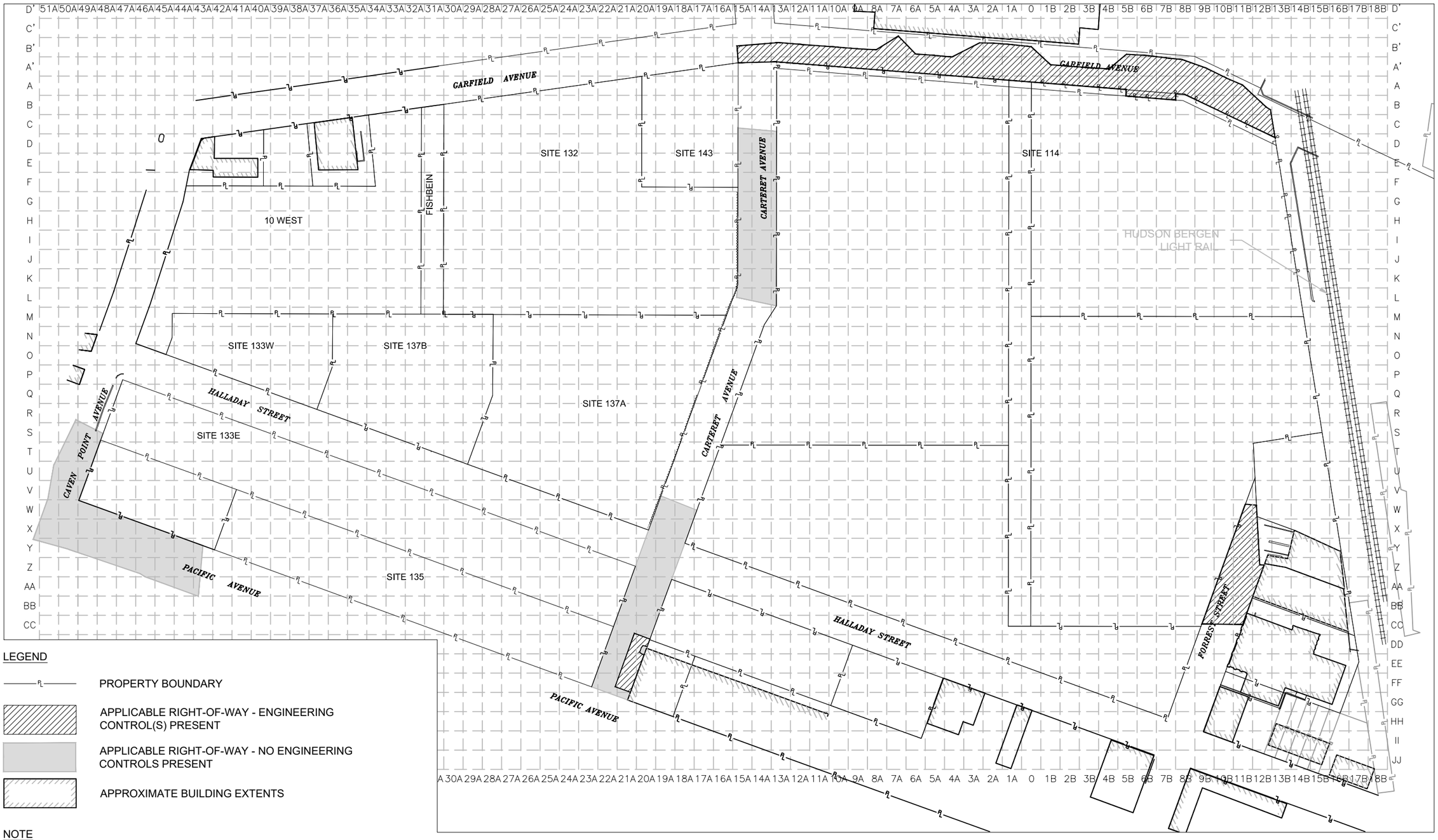
Superior Court of New Jersey, Law Division – Hudson County, 2009. *Partial Consent Judgment Concerning the PPG Sites*. June 26, 2009.

Table

Table 1
List of Utility Companies
Utility Work Coordination Manual
PPG, Jersey City and Bayonne, New Jersey

Utility Company	Utility	Point of Contact	Contact Information
Comcast Cablevision	Telecommunications	Customer Service	(800) 934-6489
Enbridge (Fomerly Spectra Energy)	Gas	Emergency Only	(800) 726-8383
Jersey City Municipal Utility Authority	Water and Sewer	Joe Cunha	201-432-1150 j.cunha@jcmua.com
		Rich Haytas	201-432-1150 r.haytas@jcmua.com
PSEG	Electric	Senior Engineering Plant Supervisor	201-330-6582 James.Lizer@pseg.com
Veolia (Formerly Suez) - Jersey City	Water and Sewer	Customer Service	(800) 575-4433
Veolia (Formerly Suez) - Bayonne	Water and Sewer	Customer Service	(888) 434-0518
Verizon Telephone	Telecommunications	Customer Service	(800) 837-4966

Figures



LEGEND

- PROPERTY BOUNDARY
- APPLICABLE RIGHT-OF-WAY - ENGINEERING CONTROL(S) PRESENT
- APPLICABLE RIGHT-OF-WAY - NO ENGINEERING CONTROLS PRESENT
- APPROXIMATE BUILDING EXTENTS

NOTE

- THE LOCATIONS OF CHROMATE CHEMICAL PRODUCTION WASTE-RELATED IMPACTS WITHIN APPLICABLE RIGHT-OF-WAYS CAN BE FOUND ON THE RIGHT-OF-WAYS' NOTICES IN LIEU OF DEED NOTICES.

AECOM

75 0 150

GRAPHIC SCALE IN FEET

PPG
UTILITY WORK COORDINATION MANUAL
JERSEY CITY, NEW JERSEY

APPLICABLE RIGHT-OF-WAYS:
GARFIELD AVENUE GROUP

DATE: 07/11/2022	DRWN: ALC			FIGURE 1A

BLOCK 21503, LOT 11
a.k.a.
BLOCK 2154.4, LOT 4
a.k.a.
BLOCK 1497. LOT 4

MORRIS PESIN DRIVE

BURMA ROAD

BLOCK 24304
LOT 8

BLOCK 24304
LOT 1

LEGEND

- PROPERTY BOUNDARY
- CURB
- APPLICABLE RIGHT-OF-WAY
- APPROXIMATE BUILDING EXTENTS

NOTES

- THE APPLICABLE RIGHT-OF-WAY AND APPROXIMATE BUILDING EXTENTS SHOWN ON THIS FIGURE WERE PROVIDED TO AECOM BY APTIM, AND CAN BE FOUND ON THE APTIM FIGURE TITLED "JERSEY CITY RIGHT-OF WAY, BURMA ROAD AND MORRIS PESIN DRIVE, JERSEY CITY, NEW JERSEY", DATED 2/26/2019.
- PROPERTY BOUNDARIES ARE SOURCED FROM THE APTIM FIGURE REFERENCED ABOVE AND GIS COVERAGES. PROPERTY BOUNDARIES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY.

AECOM

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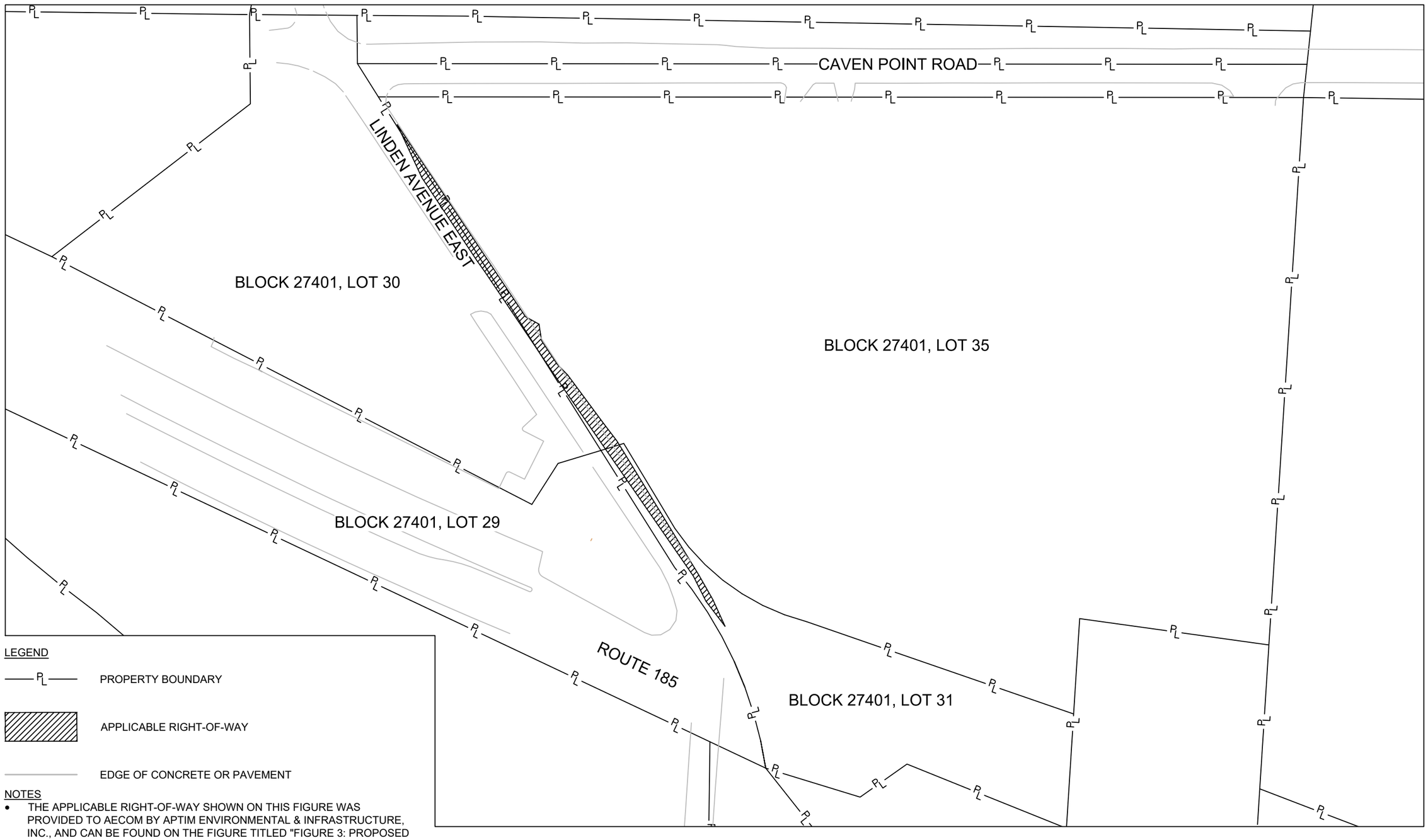
GRAPHIC SCALE IN FEET

PPG
UTILITY WORK COORDINATION MANUAL
JERSEY CITY, NEW JERSEY

APPLICABLE RIGHT-OF-WAYS:
SITE 65

DATE: 07/12/2022	DRWN: ALC			FIGURE 1B



LEGEND

PROPERTY BOUNDARY

APPLICABLE RIGHT-OF-WAY

EDGE OF CONCRETE OR PAVEMENT

NOTES

- THE APPLICABLE RIGHT-OF-WAY SHOWN ON THIS FIGURE WAS PROVIDED TO AECOM BY APTIM ENVIRONMENTAL & INFRASTRUCTURE, INC., AND CAN BE FOUND ON THE FIGURE TITLED "FIGURE 3: PROPOSED REMEDIAL ACTION AREA: AOC-4", DATED 9/27/2018.
- PROPERTY BOUNDARIES ARE SOURCED FROM GIS COVERAGES. THE EDGE OF CONCRETE AND PAVEMENT ARE SOURCED FROM THE APTIM FIGURE REFERENCED ABOVE, AND PROVIDED FOR CONTEXT. PROPERTY BOUNDARIES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY.

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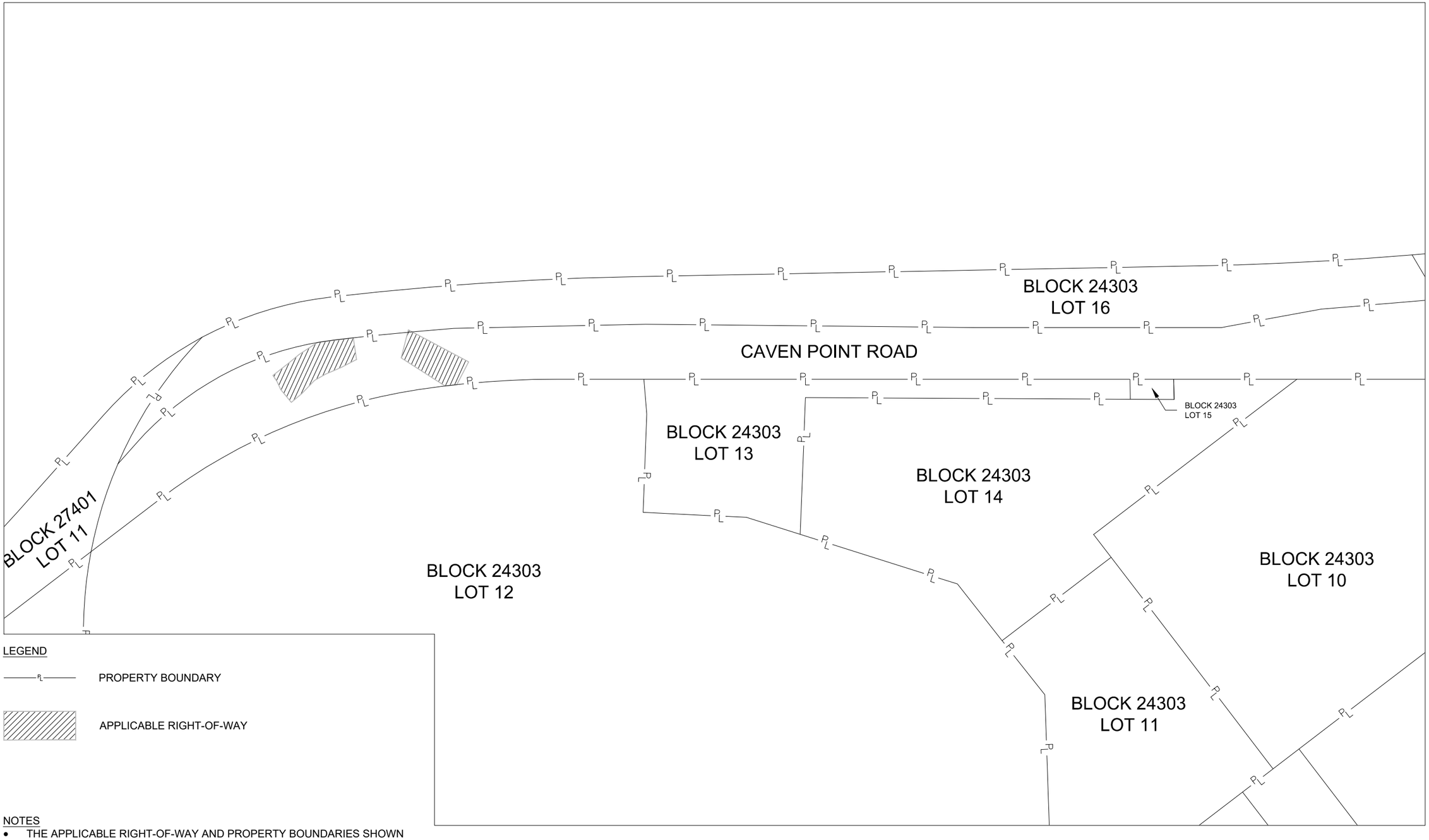
GRAPHIC SCALE IN FEET

PPG
UTILITY WORK COORDINATION MANUAL
JERSEY CITY, NEW JERSEY

APPLICABLE RIGHT-OF-WAYS:
LINDEN AVENUE EAST

DATE: 07/01/2020	DRWN: ALC			FIGURE 1C



LEGEND

PROPERTY BOUNDARY

APPLICABLE RIGHT-OF-WAY

NOTES

- THE APPLICABLE RIGHT-OF-WAY AND PROPERTY BOUNDARIES SHOWN ON THIS FIGURE WERE PROVIDED TO AECOM BY POTOMAC-HUDSON ENVIRONMENTAL, INC. (PHE), AND CAN BE FOUND IN THE SOIL REMEDIAL ACTION PERMIT FOR LIBERTY NATIONAL - TANKPORT (ULTRAMAR PETROLEUM INC., HUDSON COUNTY CHROMATE SITES 002, 003, 004, 005, 008, 066, & 112), SRP #015203, PERMIT #RAP160003, ISSUED 03/27/2019.
- PROPERTY BOUNDARIES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY.

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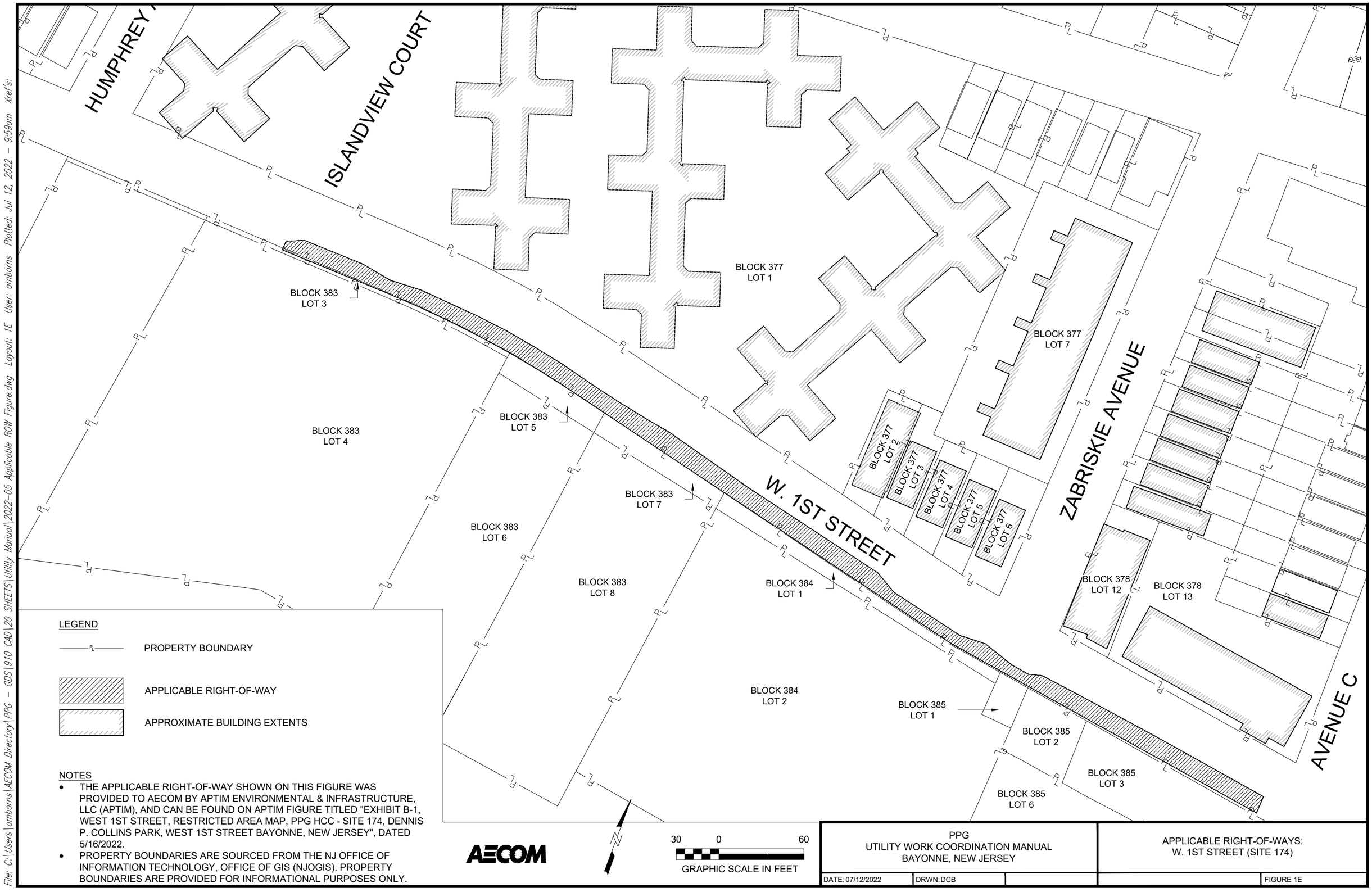
GRAPHIC SCALE IN FEET

PPG
UTILITY WORK COORDINATION MANUAL
JERSEY CITY, NEW JERSEY

APPLICABLE RIGHT-OF-WAYS:
CAVEN POINT ROAD

DATE: 07/07/2022 | DRWN: ALC | | | FIGURE 1D



LEGEND

PROPERTY BOUNDARY

APPLICABLE RIGHT-OF-WAY

APPROXIMATE BUILDING EXTENTS

NOTES

- THE APPLICABLE RIGHT-OF-WAY SHOWN ON THIS FIGURE WAS PROVIDED TO AECOM BY APTIM ENVIRONMENTAL & INFRASTRUCTURE, LLC (APTIM), AND CAN BE FOUND ON APTIM FIGURE TITLED "EXHIBIT B-1, WEST 1ST STREET, RESTRICTED AREA MAP, PPG HCC - SITE 174, DENNIS P. COLLINS PARK, WEST 1ST STREET BAYONNE, NEW JERSEY", DATED 5/16/2022.
- PROPERTY BOUNDARIES ARE SOURCED FROM THE NJ OFFICE OF INFORMATION TECHNOLOGY, OFFICE OF GIS (NJOGIS). PROPERTY BOUNDARIES ARE PROVIDED FOR INFORMATIONAL PURPOSES ONLY.

AECOM

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GRAPHIC SCALE IN FEET

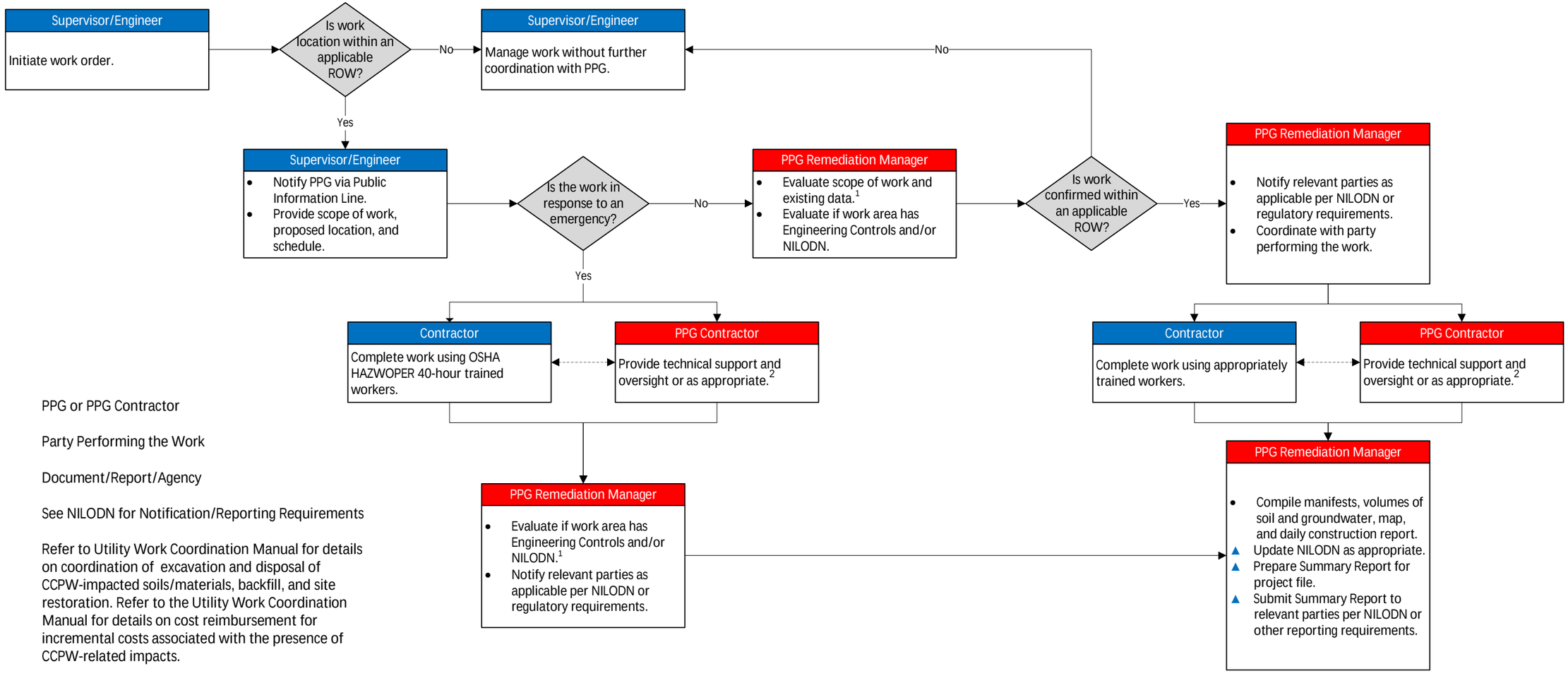
PPG
UTILITY WORK COORDINATION MANUAL
BAYONNE, NEW JERSEY

APPLICABLE RIGHT-OF-WAYS:
W. 1ST STREET (SITE 174)

DATE: 07/12/2022 | DRWN: DCB | | | FIGURE 1E

File: C:\Users\amborns\AECOM Directory\PPG - GDS\910 CAD\20 SHEETS\Utility Manual\2022-05 Applicable ROW Figure.dwg Layout: 1E User: amborns Plotted: Jul 12, 2022 - 9:59am Xref's:

Figure 2
Procedure for Coordination of Work where CCPW-Related Impacts are Present



Legend:

	PPG or PPG Contractor
	Party Performing the Work
▲	Document/Report/Agency
1	See NILODN for Notification/Reporting Requirements
2	Refer to Utility Work Coordination Manual for details on coordination of excavation and disposal of CCPW-impacted soils/materials, backfill, and site restoration. Refer to the Utility Work Coordination Manual for details on cost reimbursement for incremental costs associated with the presence of CCPW-related impacts.

Points of Contact:

PPG Public Information Line (24/7 hotline):	201-938-0909
PPG Remediation Manager or Representative:	Rich Feinberg: 732-233-4552
AECOM Representative:	Laura Kinsey: 201-572-7139
APTIM Representative:	Crystal Leavy: 609-680-4982

Acronyms:

CCPW	Chromate Chemical Production Waste
HAZWOPER	Hazardous Waste Operations and Emergency Response
NILODN	Notice in Lieu of Deed Notice
OSHA	Occupational Safety and Health Administration
ROW	Right-of-Way

Appendix A
Reference Photographs of CCPW Impacts in Soil and Groundwater

Photo 1:

Chromite Ore Processing Residue (COPR) nodules

Photo 2:

Hexavalent chromium-impacted groundwater in base of test pit.

Photo 3:

Hexavalent chromium-impacted groundwater samples.

Photo 4:

View of test pit excavation. Note: green-gray mud and COPR (red streaks) along with other fill materials (brick) visible in test pit sidewall.

	**Photo 5:** Soil containing hexavalent chromium with yellow to green coloration.
	**Photo 6:** View of hexavalent chromium-impacted concrete.

Appendix B
Chromium Exposure Hazards Fact Sheets

Chromium - ToxFAQs™

CAS # 7440-47-3

This fact sheet answers the most frequently asked health questions (FAQs) about chromium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and cause cancer. Ingesting high levels of chromium(VI) may result in anemia or damage to the stomach or intestines. Chromium(III) is an essential nutrient. Chromium has been found in at least 1,127 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, and soil. It can exist in several different forms. Depending on the form it takes, it can be a liquid, solid, or gas. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- Chromium can be found in air, soil, and water after release from the manufacture, use, and disposal of chromium-based products, and during the manufacturing process.
- Chromium does not usually remain in the atmosphere, but is deposited into the soil and water.
- Chromium can easily change from one form to another in water and soil, depending on the conditions present.
- Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

- Eating food containing chromium(III).
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Drinking contaminated well water.
- Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the lining of the nose, nose ulcers, runny nose, and breathing problems, such as asthma, cough, shortness of breath, or wheezing. The concentrations of chromium in air that can cause these effects may be different for different types of chromium compounds, with effects occurring at much lower concentrations for chromium(VI) compared to chromium(III).

The main health problems seen in animals following ingestion of chromium(VI) compounds are irritation and ulcers in the stomach and small intestine and anemia. Chromium(III) compounds are much less toxic and do not appear to cause these problems.

Sperm damage and damage to the male reproductive system have also been seen in laboratory animals exposed to chromium(VI).

Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive tochromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

Chromium

CAS # 7440-47-3

How likely is chromium to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have determined that chromium(VI) compounds are known human carcinogens.

In workers, inhalation of chromium(VI) has been shown to cause lung cancer. Chromium(VI) also causes lung cancer in animals. An increase in stomach tumors was observed in humans and animals exposed to chromium(VI) in drinking water.

How can chromium affect children?

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Some developmental effects have been observed in animals exposed to chromium(VI).

How can families reduce the risk of exposure to chromium?

- Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.
- Chromium is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

Is there a medical test to determine whether I've been exposed to chromium?

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. Chromium can be measured in hair, urine, and blood.

Higher than normal levels of chromium in blood or urine may indicate that a person has been exposed to chromium. However, increases in blood and urine chromium levels cannot be used to predict the kind of health effects that might develop from that exposure.

Has the federal government made recommendations to protect human health?

The EPA has established a maximum contaminant level of 0.1 mg/L for total chromium in drinking water.

The FDA has determined that the chromium concentration in bottled drinking water should not exceed 0.1 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 0.005 mg/m^3 chromium(VI), 0.5 mg/m^3 chromium(III), and 1.0 mg/m^3 chromium(0) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Chromium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

OSHA FactSheet

Health Effects of Hexavalent Chromium

Hexavalent chromium is a toxic form of the element chromium. Hexavalent chromium compounds are man-made and widely used in many different industries.

Some major industrial sources of hexavalent chromium are:

- chromate pigments in dyes, paints, inks, and plastics
- chromates added as anti-corrosive agents to paints, primers and other surface coatings
- chrome plating by depositing chromium metal onto an item's surface using a solution of chromic acid
- particles released during smelting of ferro-chromium ore
- fume from welding stainless steel or nonferrous chromium alloys
- impurity present in portland cement.

How hexavalent chromium can harm employees

Workplace exposure to hexavalent chromium may cause the following health effects:

- lung cancer in workers who breathe airborne hexavalent chromium
- irritation or damage to the nose, throat, and lung (respiratory tract) if hexavalent chromium is breathed at high levels
- irritation or damage to the eyes and skin if hexavalent chromium contacts these organs in high concentrations.

How hexavalent chromium affects the nose, throat and lungs

Breathing in high levels of hexavalent chromium can cause irritation to the nose and throat. Symptoms may include runny nose, sneezing, coughing, itching and a burning sensation.

Repeated or prolonged exposure can cause sores to develop in the nose and result in nosebleeds. If the damage is severe, the nasal septum (wall separating the nasal passages) develops a hole in it (perforation).

Breathing small amounts of hexavalent chromium even for long periods does not cause respiratory tract irritation in most people.

Some employees become allergic to hexavalent chromium so that inhaling chromate compounds can cause asthma symptoms such as wheezing and shortness of breath.

How hexavalent chromium affects the skin

Some employees can also develop an allergic skin reaction, called allergic contact dermatitis. This occurs from handling liquids or solids containing hexavalent chromium. Once an employee becomes allergic, brief skin contact causes swelling and a red, itchy rash that becomes crusty and thickened with prolonged exposure. Allergic contact dermatitis is long-lasting and more severe with repeated skin contact.

Direct skin contact with hexavalent chromium can cause a non-allergic skin irritation. Contact with non-intact skin can also lead to chrome ulcers. These are small crusted skin sores with a rounded border. They heal slowly and leave scars.

How employees can be exposed to hexavalent chromium

Employees can inhale airborne hexavalent chromium as a dust, fume or mist while:

- producing chromate pigments and powders; chromic acid; chromium catalysts, dyes, and coatings
- working near chrome electoplating
- welding and hotworking stainless steel, high chrome alloys and chrome-coated metal
- applying and removing chromate-containing paints and other surface coatings.

Skin exposure can occur during direct handling of hexavalent chromium-containing solutions, coatings, and cements.

Steps OSHA has taken to protect employees from health hazards caused by hexavalent chromium

The new OSHA workplace standard requires employers to:

- limit eight-hour time-weighted average hexavalent chromium exposure in the workplace to 5 micrograms or less per cubic meter of air.
- perform periodic monitoring at least every 6 months if initial monitoring shows employee exposure at or above the action level (2.5 micrograms per cubic meter of air calculated as an 8-hour time-weighted average).
- provide appropriate personal protective clothing and equipment when there is likely to be a hazard present from skin or eye contact.
- implement good personal hygiene and housekeeping practices to prevent hexavalent chromium exposure.
- prohibit employee rotation as a method to achieve compliance with the exposure limit (PEL).
- provide respiratory protection as specified in the standard.
- make available medical examinations to employees within 30 days of initial assignment, annually, to those exposed in an emergency situation, to those who experience signs or symptoms of adverse health effects associated with hexavalent chromium exposure, to those who are or may be exposed at or above the action level for 30 or more days a year, and at termination of employment.

For more complete information:

OSHA Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov

(800) 321-OSHA

DSG 7/2006

Right to Know Hazardous Substance Fact Sheet

Common Name: **CHROMIUM**

Synonyms: Chrome; Metallic Chromium

Chemical Name: Chromium

Date: January 2000 Revision: March 2009

CAS Number: 7440-47-3

RTK Substance Number: 0432

DOT Number: UN 3089

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Description and Use

Chromium is a hard, gray, odorless solid with a metallic luster. It is used in stainless and alloy steels, in making alloys, and as an isotope in medicine and research.

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	2	-
FLAMMABILITY	3	-
REACTIVITY	0	-

FLAMMABLE POWDER
POISONOUS GASES ARE PRODUCED IN FIRE
CONTAINERS MAY EXPLODE IN FIRE

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

Reasons for Citation

- **Chromium** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, DEP, IARC and EPA.
- This chemical is on the Special Health Hazard Substance List.

- **Chromium** can affect you when inhaled.
- Contact can irritate and burn the skin and eyes with possible eye damage.
- Inhaling **Chromium** can irritate the nose and throat.
- Exposure to **Chromium** *fumes* can cause a flu-like illness called *metal fume fever*.
- **Chromium** may cause a skin allergy and an asthma-like allergy
- Inhaling **Chromium** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose.
- **Chromium** may affect the liver and kidneys.
- **Chromium** in *powder* form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 30 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of soap and water.

Inhalation

- Remove the person from exposure
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

Workplace Exposure Limits

OSHA: The legal airborne permissible exposure limit (PEL) is **1 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.5 mg/m^3** averaged over a 8-hour workshift.

ACGIH: The threshold limit value (TLV) is **0.5 mg/m^3** averaged over an 8-hour workshift.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Chromium**:

- Contact can irritate and burn the skin and eyes with possible eye damage.
- Inhaling **Chromium** can irritate the nose and throat causing coughing and wheezing.
- Exposure to **Chromium** *fumes* can cause *"metal fume fever."* This is a flu-like illness with symptoms of metallic taste in the mouth, headache, fever and chills, aches, chest tightness and cough. The symptoms may be delayed for several hours after exposure and usually last for a day or two.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Chromium** and can last for months or years:

Cancer Hazard
- While **Chromium** has been tested, it is not classifiable as to its potential to cause cancer.

Reproductive Hazard
- There is no evidence that **Chromium** affects reproduction. This is based on test results presently available to the NJDHSS from published studies.

Other Effects
- Inhaling **Chromium** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose, sometimes with bleeding, discharge, and/or formation of a crust.
- **Chromium** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- **Chromium** may cause an asthma-like allergy. Future exposure can cause asthma attacks with shortness of breath, wheezing, coughing, and/or chest tightness.
- Prolonged skin contact can cause burns, blisters and deep ulcers
- **Chromium** may affect the liver and kidneys.

Medical

Medical Testing
For frequent or potentially high exposure (half the TLV or greater), the following are recommended before beginning work and at regular times after that:

- Lung function tests. The results may be normal if the person is not having an attack at the time of the test.

If symptoms develop or overexposure is suspected, the following are recommended:

- Examine your skin periodically for little bumps or blisters, the first sign of "chrome ulcers." If not treated early, these can last for years after exposure.
- Evaluation by a qualified allergist can help diagnose skin allergy.
- Liver and kidney function tests

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures
- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Chromium**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Before entering a confined space where **Chromium** *powder* may be present, check to make sure that an explosive concentration does not exist.
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Chromium**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Nitrile and Natural Rubber for gloves, and Tyvek®, or the equivalent, as a protective material for clothing.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- If additional protection is needed for the entire face, use in combination with a face shield. A face shield should not be used without another type of eye protection.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.5 mg/m^3**, use a NIOSH approved negative pressure, air-purifying, particulate filter respirator with an N, R or P95 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Chromium**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential exists for exposure over **5 mg/m^3**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
- Exposure to **250 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **250 mg/m^3** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- Extinguish fire using an agent suitable for type of surrounding fire. **Chromium** itself does not burn.
- **Chromium** in *powder* form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air.
- Use dry sand or dry chemical extinguishing agents to fight **Chromium** *powder* fires.
- POISONOUS GASES ARE PRODUCED IN FIRE.
- CONTAINERS MAY EXPLODE IN FIRE.
- DO NOT get water inside container.

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Chromium** *powder* is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.
- Keep **Chromium** *powder* out of confined spaces, such as sewers, because of the possibility of an explosion.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Chromium** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Chromium** you should be trained on its proper handling and storage.

- **Chromium** may react violently or explosively with AMMONIUM NITRATE; CARBON DIOXIDE ATMOSPHERES; BROMINE PENTAFLUORIDE; LITHIUM; NITROGEN OXIDES; and SULFUR DIOXIDE.
- **Chromium** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC and SULFURIC); and ALKALI METALS (such as SODIUM and POTASSIUM).
- Store in tightly closed containers in a cool, well-ventilated area.
- Sources of ignition, such as smoking and open flames, are prohibited where **Chromium** *powder* is used, handled, or stored.

Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Hydrogen*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **CHROMIUM**

Synonyms: Chrome; Metallic Chromium
CAS No: 7440-47-3
Molecular Formula: Cr
RTK Substance No: 0432
Description: Hard, gray, odorless solid with a metallic luster

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
2 - Health **3 - Fire** **0 - Reactivity** **DOT#:** UN 3089 **ERG Guide #:** 170 **Hazard Class:** 4.1 (Flammable Solid)	Extinguish fire using an agent suitable for type of surrounding fire. **Chromium** itself does not burn. **Chromium** in *powder* form is FLAMMABLE and a DANGEROUS FIRE HAZARD. It may also spontaneously explode in air. Use dry sand or dry chemical extinguishing agents to fight **Chromium** *powder* fires. POISONOUS GASES ARE PRODUCED IN FIRE. CONTAINERS MAY EXPLODE IN FIRE. DO NOT get water inside container.	**Chromium** may react violently or explosively with AMMONIUM NITRATE; CARBON DIOXIDE ATMOSPHERES; BROMINE PENTAFLUORIDE; LITHIUM; NITROGEN OXIDES; and SULFUR DIOXIDE. **Chromium** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE); STRONG BASES (such as SODIUM HYDROXIDE and POTASSIUM HYDROXIDE); STRONG ACIDS (such as HYDROCHLORIC and SULFURIC); and ALKALI METALS (such as SODIUM and POTASSIUM).

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Keep **Chromium** *powder* out of confined spaces, such as sewers, because of the possibility of an explosion.

DO NOT wash into sewer.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Noncombustible solid, Flammable *powder*
Vapor Pressure:	<0 mm Hg at 68°F (20°C) (approximate)
Specific Gravity:	7.2 (water = 1)
Water Solubility:	Insoluble
Boiling Point:	4,788°F (2,642°C)
Melting Point:	3,452°F (1,900°C)
Molecular Weight:	52

EXPOSURE LIMITS

OSHA:	1 mg/m^3, 8-hr TWA
NIOSH:	0.5 mg/m^3, 8-hr TWA
ACGIH:	0.5 mg/m^3, 8-hr TWA
IDLH:	250 mg/m^3

The Protective Action Criteria values are:

PAC-1 = 1.5 mg/m^3 PAC-3 = 250 mg/m^3

PAC-2 = 2.5 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	Nitrile or Natural Rubber
Coveralls:	Tyvek®
Respirator:	>0.5 mg/m^3 - full facepiece APR with High efficiency filters >1.5 mg/m^3 - SCBA

HEALTH EFFECTS

Eyes:	Irritation, burns and possible eye damage
Skin:	Irritation, burns, itching, rash and skin ulcers
Inhalation:	Nose and throat irritation with coughing and wheezing Headache, fever and chills

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

Quickly remove contaminated clothing and wash contaminated skin with large amounts of soap and water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility.

Right to Know Hazardous Substance Fact Sheet

Common Name: **SODIUM DICHROMATE**

Synonyms: Sodium Bichromate

Chemical Name: Chromic Acid, Disodium Salt

Date: April 2000 Revision: November 2009

CAS Number: 10588-01-9

RTK Substance Number: 1695

DOT Number: UN 1479

Description and Use

Sodium Dichromate is an odorless, red or red-orange, crystalline (sand-like) solid. It is used as a corrosion inhibitor and to make other chemicals.

Reasons for Citation

- **Sodium Dichromate** is on the Right to Know Hazardous Substance List because it is cited by OSHA, ACGIH, DOT, NIOSH, NTP, DEP, IARC, IRIS and EPA.
- This chemical is on the Special Health Hazard Substance List.

SEE GLOSSARY ON PAGE 5.

FIRST AID

Eye Contact

- Immediately flush with large amounts of water for at least 30 minutes, lifting upper and lower lids. Remove contact lenses, if worn, while flushing. Seek medical attention.

Skin Contact

- Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

Inhalation

- Remove the person from exposure
- Begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped.
- Transfer promptly to a medical facility.

EMERGENCY NUMBERS

Poison Control: 1-800-222-1222

CHEMTREC: 1-800-424-9300

NJDEP Hotline: 1-877-927-6337

National Response Center: 1-800-424-8802

EMERGENCY RESPONDERS >>>> SEE LAST PAGE

Hazard Summary

Hazard Rating	NJDOH	NFPA
HEALTH	4	-
FLAMMABILITY	0	-
REACTIVITY	0	-

CARCINOGEN
OXIDIZER
POISONOUS GASES ARE PRODUCED IN FIRE
DOES NOT BURN

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

- **Sodium Dichromate** can affect you when inhaled and by passing through the skin.
- **Sodium Dichromate** is a CARCINOGEN. HANDLE WITH EXTREME CAUTION.
- Contact can irritate and burn the skin and eyes with possible eye damage.
- Inhaling **Sodium Dichromate** can irritate the nose, throat and lungs.
- **Sodium Dichromate** may cause a skin allergy and an asthma-like allergy
- Inhaling **Sodium Dichromate** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose.
- **Sodium Dichromate** may damage the liver and kidneys.
- **Sodium Dichromate** is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances.

Workplace Exposure Limits

The following exposure limits are for *Chromium VI compounds* (measured as *Chromium*):

OSHA: The legal airborne permissible exposure limit (PEL) is **0.005 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit (REL) is **0.001 mg/m^3** averaged over a 10-hour workshift.

ACGIH: The threshold limit value (TLV) is **0.05 mg/m^3** (as *water soluble Chromium VI compounds*) averaged over an 8-hour workshift.

- **Sodium Dichromate** is a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.
- The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

Determining Your Exposure

- Read the product manufacturer's Material Safety Data Sheet (MSDS) and the label to determine product ingredients and important safety and health information about the product mixture.
- For each individual hazardous ingredient, read the New Jersey Department of Health Hazardous Substance Fact Sheet, available on the RTK website (www.nj.gov/health/eoh/rtkweb) or in your facility's RTK Central File or Hazard Communication Standard file.
- You have a right to this information under the New Jersey Worker and Community Right to Know Act, and the Public Employees Occupational Safety and Health (PEOSH) Act if you are a public worker in New Jersey, and under the federal Occupational Safety and Health Act (OSHA) if you are a private worker.
- The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard (29 CFR 1910.1200) and the PEOSH Hazard Communication Standard (N.J.A.C. 12:100-7) require employers to provide similar information and training to their employees.

This Fact Sheet is a summary of available information regarding the health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

Health Hazard Information

Acute Health Effects
The following acute (short-term) health effects may occur immediately or shortly after exposure to **Sodium Dichromate**:

- Contact can irritate and burn the skin and eyes with possible eye damage.
- Inhaling **Sodium Dichromate** can irritate the nose, throat and lungs causing coughing, wheezing and/or shortness of breath.

Chronic Health Effects
The following chronic (long-term) health effects can occur at some time after exposure to **Sodium Dichromate** and can last for months or years:

Cancer Hazard
- **Sodium Dichromate** is a CARCINOGEN in humans. There is evidence that *Hexavalent Chromium or Chromium VI compounds* cause lung cancer in humans. **Sodium Dichromate** has been shown to cause lung cancer in animals.
- Many scientists believe there is no safe level of exposure to a carcinogen.

Reproductive Hazard
- While **Sodium Dichromate** has not been identified as a teratogen or a reproductive hazard, *Hexavalent Chromium or Chromium VI compounds* are teratogens and may also cause reproductive damage, such as reduced fertility and interference with menstrual cycles. **Sodium Dichromate** should be handled WITH EXTREME CAUTION.

Other Effects
- **Sodium Dichromate** may cause a skin allergy. If allergy develops, very low future exposure can cause itching and a skin rash.
- Inhaling **Sodium Dichromate** can cause a sore and/or a hole in the "bone" (septum) dividing the inner nose, sometimes with bleeding, discharge, and/or formation of a crust.
- **Sodium Dichromate** may cause an asthma-like allergy. Future exposure can cause asthma attacks with shortness of breath, wheezing, coughing, and/or chest tightness.
- Prolonged skin contact can cause burns, blisters and deep ulcers.
- **Sodium Dichromate** may damage the liver and kidneys.

Medical

Medical Testing
Before first exposure, and every twelve (12) months thereafter, OSHA requires your employer to provide (for persons exposed to levels greater than **2.5 micrograms** of *Chromium VI* **per cubic meter** of air) a work and medical history and exam which shall include:

- Thorough physical examination
- Lung function tests

If symptoms develop or overexposure is suspected, the following are recommended:

- Examine your skin periodically for little bumps or blisters, the first sign of "chrome ulcers." If not treated early, these can last for years after exposure.
- Evaluation by a qualified allergist can help diagnose skin allergy.
- Liver and kidney function tests

OSHA requires your employer to provide you and your doctor with a copy of the OSHA *Chromium VI* Standard (29 CFR 1910.1026).

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under the OSHA Access to Employee Exposure and Medical Records Standard (29 CFR 1910.1020).

Mixed Exposures

- Smoking can cause heart disease, lung cancer, emphysema, and other respiratory problems. It may worsen respiratory conditions caused by chemical exposure. Even if you have smoked for a long time, stopping now will reduce your risk of developing health problems.
- More than light alcohol consumption can cause liver damage. Drinking alcohol can increase the liver damage caused by **Sodium Dichromate**.

Workplace Controls and Practices

Very toxic chemicals, or those that are reproductive hazards or sensitizers, require expert advice on control measures if a less toxic chemical cannot be substituted. Control measures include: (1) enclosing chemical processes for severely irritating and corrosive chemicals, (2) using local exhaust ventilation for chemicals that may be harmful with a single exposure, and (3) using general ventilation to control exposures to skin and eye irritants. For further information on workplace controls, consult the NIOSH document on Control Banding at www.cdc.gov/niosh/topics/ctrlbanding/.

The following work practices are also recommended:

- Label process containers.
- Provide employees with hazard information and training.
- Monitor airborne chemical concentrations.
- Use engineering controls if concentrations exceed recommended exposure levels.
- Provide eye wash fountains and emergency showers.
- Wash or shower if skin comes in contact with a hazardous material.
- Always wash at the end of the workshift.
- Change into clean clothing if clothing becomes contaminated.
- Do not take contaminated clothing home.
- Get special training to wash contaminated clothing.
- Do not eat, smoke, or drink in areas where chemicals are being handled, processed or stored.
- Wash hands carefully before eating, smoking, drinking, applying cosmetics or using the toilet.

In addition, the following may be useful or required:

- Specific actions are required for this chemical by OSHA. Refer to the OSHA *Chromium (VI)* Standard (29 CFR 1910.1026).
- Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
- Use a high efficiency particulate air (HEPA) filter when vacuuming. Do not use a standard shop vacuum.
- Where possible, transfer **Sodium Dichromate** from drums or other containers to process containers in an enclosed system.

Personal Protective Equipment

The OSHA Personal Protective Equipment Standard (29 CFR 1910.132) requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Gloves and Clothing

- Avoid skin contact with **Sodium Dichromate**. Wear personal protective equipment made from material which can not be permeated or degraded by this substance. Safety equipment suppliers and manufacturers can provide recommendations on the most protective glove and clothing material for your operation.
- Safety equipment manufacturers recommend Nitrile and Natural Rubber for gloves, and Tyvek®, or the equivalent, as a protective clothing material.
- All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

- Wear eye protection with side shields or goggles.
- Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

Improper use of respirators is dangerous. Respirators should only be used if the employer has implemented a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing, and medical exams, as described in the OSHA Respiratory Protection Standard (29 CFR 1910.134).

- Where the potential exists for exposure over **0.001 mg/m^3**, use a NIOSH approved negative pressure, air-purifying, particulate filter respirator with a N, R or P100 filter. More protection is provided by a full facepiece respirator than by a half-mask respirator, and even greater protection is provided by a powered-air purifying respirator.
- Leave the area immediately if (1) while wearing a filter or cartridge respirator you can smell, taste, or otherwise detect **Sodium Dichromate**, (2) while wearing particulate filters abnormal resistance to breathing is experienced, or (3) eye irritation occurs while wearing a full facepiece respirator. Check to make sure the respirator-to-face seal is still good. If it is, replace the filter or cartridge. If the seal is no longer good, you may need a new respirator.
- Consider all potential sources of exposure in your workplace. You may need a combination of filters, prefilters or cartridges to protect against different forms of a chemical (such as vapor and mist) or against a mixture of chemicals.
- Where the potential exists for exposure over **1 mg/m^3**, use a NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus or an emergency escape air cylinder.
- Exposure to **15 mg/m^3** is immediately dangerous to life and health. If the possibility of exposure above **15 mg/m^3** exists, use a NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode equipped with an emergency escape air cylinder.

Fire Hazards

If employees are expected to fight fires, they must be trained and equipped as stated in the OSHA Fire Brigades Standard (29 CFR 1910.156).

- **Sodium Dichromate** is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances.
- Use water only. DO NOT USE CHEMICAL or CO_2 as extinguishing agents.
- POISONOUS GASES ARE PRODUCED IN FIRE, including *Sodium Oxides*.
- Use water spray to keep fire-exposed containers cool.
- **Sodium Dichromate** may ignite combustibles (wood, paper and oil).

Spills and Emergencies

If employees are required to clean-up spills, they must be properly trained and equipped. The OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120) may apply.

If **Sodium Dichromate** is spilled, take the following steps:

- Evacuate personnel and secure and control entrance to the area.
- Eliminate all ignition sources.
- Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.
- Ventilate and wash area after clean-up is complete.
- DO NOT wash into sewer.
- It may be necessary to contain and dispose of **Sodium Dichromate** as a HAZARDOUS WASTE. Contact your state Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.

Handling and Storage

Prior to working with **Sodium Dichromate** you should be trained on its proper handling and storage.

- A regulated, marked area should be established where **Sodium Dichromate** is handled, used or stored as required by the OSHA *Chromium (VI)* Standard (29 CFR 1910.1026).
- **Sodium Dichromate** reacts violently with HYDRAZINE; ACETIC ANHYDRIDE; ETHANOL; and SULFURIC ACID.
- **Sodium Dichromate** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and COMBUSTIBLES.
- Store in tightly closed containers in a cool, well-ventilated area.

Occupational Health Information Resources

The New Jersey Department of Health offers multiple services in occupational health. These services include providing informational resources, educational materials, public presentations, and industrial hygiene and medical investigations and evaluations.

For more information, please contact:

New Jersey Department of Health
Right to Know
PO Box 368
Trenton, NJ 08625-0368
Phone: 609-984-2202
Fax: 609-984-7407
E-mail: rtk@doh.state.nj.us
Web address: http://www.nj.gov/health/eoh/rtkweb

GLOSSARY

ACGIH is the American Conference of Governmental Industrial Hygienists. They publish guidelines called Threshold Limit Values (TLVs) for exposure to workplace chemicals.

Acute Exposure Guideline Levels (AEGLs) are established by the EPA. They describe the risk to humans resulting from once-in-a lifetime, or rare, exposure to airborne chemicals.

Boiling point is the temperature at which a substance can change its physical state from a liquid to a gas.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is unique, identifying number, assigned by the Chemical Abstracts Service, to a specific chemical.

CFR is the Code of Federal Regulations, which are the regulations of the United States government.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes destruction of human skin or severe corrosion of containers.

The **critical temperature** is the temperature above which a gas cannot be liquefied, regardless of the pressure applied.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

ERG is the Emergency Response Guidebook. It is a guide for emergency responders for transportation emergencies involving hazardous substances.

Emergency Response Planning Guideline (ERPG) values provide estimates of concentration ranges where one reasonably might anticipate observing adverse effects.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

IARC is the International Agency for Research on Cancer, a scientific group.

Ionization Potential is the amount of energy needed to remove an electron from an atom or molecule. It is measured in electron volts.

IRIS is the Integrated Risk Information System database on human health effects that may result from exposure to various chemicals, maintained by federal EPA.

LEL or **Lower Explosive Limit**, is the lowest concentration of a combustible substance (gas or vapor) in the air capable of continuing an explosion.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the federal Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the New Jersey Public Employees Occupational Safety and Health Act, which adopts and enforces health and safety standards in public workplaces.

Permeated is the movement of chemicals through protective materials.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

Protective Action Criteria (PAC) are values established by the Department of Energy and are based on AEGLs and ERPGs. They are used for emergency planning of chemical release events.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

STEL is a Short Term Exposure Limit which is usually a 15-minute exposure that should not be exceeded at any time during a work day.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

UEL or **Upper Explosive Limit** is the highest concentration in air above which there is too much fuel (gas or vapor) to begin a reaction or explosion.

Vapor Density is the ratio of the weight of a given volume of one gas to the weight of another (usually *Air*), at the same temperature and pressure.

The **vapor pressure** is a force exerted by the vapor in equilibrium with the solid or liquid phase of the same substance. The higher the vapor pressure the higher concentration of the substance in air.

Right to Know Hazardous Substance Fact Sheet

Emergency Responders Quick Reference

Common Name: **SODIUM DICHROMATE**

Synonyms: Sodium Bichromate; Chromic Acid, Disodium Salt
CAS No: 10588-01-9
Molecular Formula: $Na_2Cr_2O_7$
RTK Substance No: 1695
Description: Odorless, red or red-orange, crystalline solid

HAZARD DATA

Hazard Rating	Firefighting	Reactivity
3 - Health **0 - Fire** **0 - Reactivity** **DOT#:** UN 1479 **ERG Guide #:** 140 **Hazard Class:** 6 (Poison)	**Sodium Dichromate** is not combustible, but it is a STRONG OXIDIZER that enhances the combustion of other substances. Use water only. DO NOT USE CHEMICAL or CO_2 as extinguishing agents. POISONOUS GASES ARE PRODUCED IN FIRE, including *Sodium Oxides*. Use water spray to keep fire-exposed containers cool. **Sodium Dichromate** may ignite combustibles (wood, paper and oil).	**Sodium Dichromate** reacts violently with HYDRAZINE; ACETIC ANHYDRIDE; ETHANOL; and SULFURIC ACID. **Sodium Dichromate** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE) and COMBUSTIBLES.

SPILL/LEAKS

Isolation Distance:

Spill: 25 meters (75 feet)

Fire: 800 meters (1/2 mile)

Moisten spilled material first or use a HEPA-filter vacuum for clean-up and place into sealed containers for disposal.

Liquid spills can be neutralized with *Sodium Carbonate*.

DO NOT wash into sewer.

Sodium Dichromate is very toxic to aquatic organisms and may cause long-term effects in the aquatic environment.

PHYSICAL PROPERTIES

Odor Threshold:	Odorless
Flash Point:	Nonflammable
Specific Gravity:	2.35 (water = 1)
Water Solubility:	Soluble
Boiling Point:	752°F (400°C)
Melting Point:	675°F (357°C)
Molecular Weight:	262
pH:	4 (1% solution)

EXPOSURE LIMITS

OSHA:	0.005 mg/m^3, 8-hr TWA
NIOSH:	0.001 mg/m^3, 10-hr TWA
ACGIH:	0.05 mg/m^3, 8-hr TWA
IDLH:	15 mg/m^3

(All the above are for *Chromium VI*)

The Protective Action Criteria values are:
PAC-1 = 20 mg/m^3 PAC-2 = 37.8 mg/m^3 PAC-3 = 37.8 mg/m^3

PROTECTIVE EQUIPMENT

Gloves:	Nitrile and Natural Rubber
Coveralls:	Tyvek®
Respirator:	>0.001 mg/m^3 - full facepiece APR with *High efficiency filters* >1 mg/m^3 - Supplied air >15 mg/m^3 - SCBA

HEALTH EFFECTS

Eyes:	Irritation, burns and possible eye damage
Skin:	Irritation, burns, itching, rash and ulcers
Inhalation:	Nose, throat and lung irritation with coughing, wheezing and shortness of breath
Chronic:	*Hexavalent Chromium* or *Chromium VI compounds* cause lung cancer in humans.

FIRST AID AND DECONTAMINATION

Remove the person from exposure.

Flush eyes with large amounts of water for at least 30 minutes. Remove contact lenses if worn. Seek medical attention.

Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

Begin artificial respiration if breathing has stopped and CPR if necessary.

Transfer promptly to a medical facility