Environment

Prepared for:
PPG Industries
Allison Park, Pennsylvania

Prepared by:
AECOM
Piscataway, New Jersey

Project No. 60149955.4010A
September 2012

Remedial Action Work Plan

Non-Residential Chromate Chemical Production Waste Sites – Site 174, Dennis P. Collins Park Bayonne, New Jersey

Environment

Prepared for:
PPG Industries
Allison Park, Pennsylvania

Prepared by:
AECOM
Piscataway, New Jersey
Project No. 60149955.4010A
September 2012

Remedial Action Work Plan

Non-Residential Chromate Chemical Production Waste Sites – Site 174, Dennis P. Collins Park Bayonne, New Jersey

Contents

List of Tables

List of Figures

List of Appendices

1 Introduction

1.1 Remedial Action Status and Objectives

This Remedial Action Work Plan ("RAWP") was prepared by AECOM on behalf of PPG Industries, Inc. ("PPG") to provide the proposed scope of work for conducting a Remedial Action ("RA") at Hudson County Chromium ("HCC") Site 174 ("the Site") – Dennis P. Collins Park in Bayonne, Hudson County, New Jersey (Figure 1). Table 1 provides a property location summary for Site 174. Site 174 belongs to Orphan Group 1 and is located at West 1st Street in the City of Bayonne, New Jersey. West 1st Street is also shown on some maps and referenced as "First Street" or "West First Street" in some documents; for consistency, "West 1st Street" is used in this RAWP. The Site occupies the following tax parcels: Block 383, Lots 1 through 8 and Block 384, Lots 1 and 2 (Figure 2). The Site was identified as a Non-Residential Hudson County Chromate ("HCC") site by the New Jersey Department of Environmental Protection ("NJDEP"). The NJDEP Site Remediation Program ("SRP") Program Identification Number ("SRP-PI") for Site 174 is G000011472. It should be noted that Site 174 occupies only part of Dennis P. Collins Park; the park itself extends farther east and west of the Site (Figure 1).

In 1990, PPG and the NJDEP entered into an Administrative Consent Order ("ACO") to investigate and remediate locations where chromate chemical production waste ("CCPW") or CCPW-impacted materials related to former PPG operations may be present. On June 26, 2009, NJDEP, PPG, and the City of Jersey City entered into a Judicial Consent Order ("JCO") with the purpose of remediating the soils and sources of contamination at these HCC sites expeditiously. Site 174 is a former NJDEP "Orphan" Site that PPG accepted responsibility for under the Orphan Sites Settlement, and was subsequently added as one of the JCO Sites.

The objective for this Site 174 – Dennis P. Collins Park RA is to remediate CCPW, including total chromium ("Cr") and hexavalent chromium ("Cr^{+6}") contamination, and other CCPW related metals exceeding NJDEP remediation in soil and groundwater at the Site, where the other metals are detected in association with Cr contamination (i.e. within the chrome "envelope").

This RAWP is considered a dynamic document that may be revised by addenda where necessary to complete the remediation of the CCPW and associated impacts. Upon completion of the RA, an RA Report ("RAR") will be prepared to present the results of the RA and will be submitted to the NJDEP in accordance with the JCO for review and approval.

1.2 Remedial Action Requirements

This RAWP was prepared in accordance with the following requirements:

- Technical Requirements for Site Remediation ("TRSR"), N.J.A.C. 7:26E- 5.5 (2009b; May 7, 2012);
- Appendix F of the 1990 NJDEP Administrative Consent Order ("ACO");
- June 26, 2009 Partial Consent Judgment ("JCO"); and,
- July 5, 2012 letter from NJDEP indicating that the RAWP is administratively complete, provided that the following conditions are incorporated:
    - All visible CCPW will be removed during soil excavation activities.

- o Post-remediation soil sampling must be in accordance with the NJDEP's Soil Investigation Guidance Document dated February 12, 2012.
- o The Alternative and Clean Fill Guidance for SRP Sites (NJDEP, December 29, 2011) must be followed for fill imported to the site.
- o Due to the lag between excavation and site restoration, PPG shall provide and maintain temporary erosion control measures during the period between backfilling the excavation and the final restoration.

NJDEP Soil Investigation Technical Guidance, Site Investigation/Remedial Investigation/Remedial Action (SI/RI/RA), February 21, 2012.

Soil analytical results were compared to NJDEP Soil Remediation Standards ("SRS") at N.J.A.C. 7:26D last amended on May 7, 2012 for soil delineation purposes. Currently there are no SRS for total Cr or Cr^{+6}; however, NJDEP expects to develop SRS for these compounds at some point in the future. Therefore, Cr and Cr^{+6} were compared to the NJDEP's February 8, 2007 and September 2008 Chromium Soil Cleanup Criteria ("CrSCC"). The CrSCC of 20 milligrams per kilogram ("mg/kg") for Cr^{+6} and 120,000 mg/kg for trivalent chromium ("Cr^{+3}") will be utilized for soil remediation compliance during this RA.

The concentrations of other metals found in association with CCPW were compared to the most stringent SRS, or to the default Impact to Groundwater ("IGW") soil screening levels ("SSL") in accordance with the NJDEP *Guidance Document for the Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation* (NJDEP, 2008). Comparison of contaminants to the IGW criteria was conducted only in unsaturated soils in accordance with NJDEP guidance. Available statewide Historic Fill data are drawn from N.J.A.C. 7:26E-4.6, Table 4-2 (Note that Table 4-2 has been deleted from the latest version of N.J.A.C. 7:26E (May 7, 2012); however, since the RI was completed prior to May 2012, the previous reference Table is still utilized herein as a line of evidence to establish the presence of historic fill,).

Previous investigations (NJDEP, 1992; LMS, 1994; Kimball, 2001; Berger, 2003) have focused on various forms of chromium (total Cr, Cr^{+6}, and Cr^{+3}) as well as Target Analyte List ("TAL") short list of metals (also referred to as the "TAL subset metals"), specifically, antimony ("Sb"), beryllium ("Be"), cadmium ("Cd"), nickel ("Ni"), thallium ("Tl"), and vanadium ("V"). Potentially applicable evaluation criteria for the TAL short list metals include:

Contaminant	RDC SRS	NRDC SRS	Historic Fill Maximum	Historic Fill Average
Sb	31 mg/kg	450 mg/kg	NA	NA
Be *	16 mg/kg	140 mg/kg	80	1.23
Cd *	78 mg/kg	78 mg/kg	510	11.15
Ni	1,600 mg/kg	23,000 mg/kg	NA	NA
Tl	5 mg/kg	79 mg/kg	NA	NA
V	78 mg/kg	1,100 mg/kg	NA	NA

NA – Criterion not available
RDC SRS – Residential Direct Contact Soil Remediation Standard
NRDC SRS – Non-Residential Direct Contact Soil Remediation Standard
Historic Fill criteria from N.J.A.C. 7:26E-4.6, Table 4-2 (Note that Table 4-2 has been deleted from the latest version of N.J.A.C. 7:26E
* PPG is not responsible for delineation or clean up of Be and Cd impacts

Groundwater results for total Cr were compared to the Total Cr GWQS of 70 micrograms per liter ("µg/L"). The groundwater data for other metals were compared to the NJDEP Groundwater Quality Standards ("GWQS") at N.J.A.C. 7:9C (NJDEP, 2010).

A site-specific Cr^{+6} criterion for the allergic contact dermatitis endpoint is not required for this RA in accordance with NJDEP's February 8, 2007 Chromium Cleanup Policy (NJDEP, 2007a).

1.3 Report Organization

Appendix F of the ACO sets forth information to be included in the RAWP for non-residential CCPW sites. This RAWP is organized to address these items and the requirements established in the NJDEP TRSR as follows:

- Section 1 provides the introduction and objectives of the proposed RA;
- Section 2 identifies key RA personnel and describes their roles;
- Section 3 provides a summary of remedial activities previously performed at the Site;
- Section 4 provides a summary of the physical setting at the Site and the surrounding area;
- Section 5 presents a technical analysis of RI activities;
- Section 6 provides the findings and conclusions of RI activities;
- Section 7 includes a summary of the procedures utilized during remedial action selection;
- Section 8 includes a description of proposed remedial activities/sampling/monitoring for the Site;
- Section 9 identifies the reference documents used during the preparation of this report; and,
- Section 10 includes the signed and notarized report certification in accordance with N.J.A.C. 7:26C-1.5.

Supplemental information is presented in the RAWP Appendices.

2 Project Team

The key RA project personnel are presented in the following table. Their roles and responsibilities are further described below.

Project Team	Personnel	Address	Phone
PPG:			
Project Director	Mark Terril	PPG Industries, Inc. 4325 Rosanna Drive, Bldg. C Allison Park, PA 15101-2009	O (412) 492-5466 C (412) 606-5459
Legal Contact	Joseph F. Lagrotteria	LeClair Ryan One Riverfront Plaza 1037 Raymond Boulevard, Sixteenth Floor Newark, NJ 07102	O (973) 491-3516
Facility Contact:			
Dennis T. Collins Park (HCC Site 174)	Gary Chmielewski	Director of Department of Public Works, City of Bayonne. 630 Avenue C Bayonne, NJ 07002-3898	O (201) 858-6070 O (201) 858-6152
AECOM:			
Program Manager	Scott Mikaelian, P.E.	30 Knightsbridge Rd., Suite 520 Piscataway, NJ 08854	O (732) 564-3624 C (732) 757-9425
Project Manager (Non-Garfield Ave. Sites)	Alfred LoPilato, CHMM, LSRP	Rusten Corporate Park 100 Red Schoolhouse Rd. Suite B-1 Chestnut Ridge, NY 10977-6715	O (845) 425-4980 C (748) 772-8474
RA Lead	William Spronz, P.G.	30 Knightsbridge Rd., Suite 520 Piscataway, NJ 08854	O (732) 564-3917 C (908) 377-7226
Field Operations Leader	Richard Feinberg, P.G.	30 Knightsbridge Rd., Suite 520 Piscataway, NJ 08854	O (732) 564-3610 C (732) 233-4552
Field Task Leader/ Site Geologist/Engineer	To be provided when selected	30 Knightsbridge Rd., Suite 520 Piscataway, NJ 08854	O (732) 564-3600
Regional Health & Safety Officer	Phil Platcow	250 Apollo Drive Chelmsford, MA 01824	C (617) 371-4461
Sampling Technicians	To be provided when selected		
Health & Safety Technicians			
Subcontractors:			
Excavation Surveying Laboratory Waste Hauler (IDW) Disposal Facility (IDW)	To be provided when selected		
JCO Team:			
Site Administrator	Michael McCabe	4 Normandy Drive Chadds Ford, PA19317	O (201) 777-2099

Project Team	Personnel	Address	Phone
Project Manager	Brian McPeak	208 Winding Way South Little Silver, NJ 07739	O (732) 216-6364
NJDEP	Thomas Cozzi	401 E. State Street Trenton, NJ 08625	O (609) 292-1250
Technical Consultant to NJDEP	Weston Solutions	205 Campus Drive Edison, NJ 08837	O (201) 777-2099

Project positions have been established to provide a means of delegating authority and responsibility for the RA. One person may serve in more than one role at any time during the RA, and management may change the roles and responsibilities of the RA team as needed to complete the work.

2.1 JCO Project Team

The JCO Project Team provides regulatory and legal oversight of the RAs for the PPG HCC sites. The JCO team includes the Site Administrator, Mr. Michael McCabe, and the JCO Project Manager, Mr. Brian McPeak, who were appointed by the court to oversee implementation of the RAs under the JCO.

Mr. Thomas Cozzi of the NJDEP will provide regulatory oversight for approval of the RAWP and regulatory review and approval of the RA implementation and reporting. Weston Solutions will serve as the NJDEP's technical consultant for review of the RA plans and procedures under the JCO.

2.2 Management

The PPG Project Director is Mr. Mark Terril. Mr. Terril is the PPG manager responsible for implementation of remedial investigation ("RI")/RA activities at each PPG non-residential HCC site.

AECOM is PPG's selected environmental consultant for the non-residential HCC sites. Mr. Scott Mikaelian, P.E., is the AECOM Program Manager responsible for the overall design, scheduling, and implementation of RAs at PPG's non-residential HCC sites.

Mr. Alfred LoPilato, CHMM, LSRP is the AECOM Project Manager in charge of the RA. Mr. LoPilato is responsible for design, scheduling, and implementation of the RA at Site 174.

Mr. William Spronz, P.G., is the AECOM RA Lead. Mr. Spronz is responsible for planning and implementation of the RA at Site 174.

2.3 Field Operations Leader

Fieldwork will be performed under the supervision of the Field Operations Leader ("FOL"), Mr. Richard Feinberg, P.G. The FOL will be responsible for supervising AECOM field crews and implementing the RAWP in compliance with the NJDEP-approved FSP-QAPP. The FOL reports directly to the RA Lead and Project Manager.

2.4 Field Task Leader/Site Geologist/Engineer

The Field Task Leader ("FTL") is responsible for subcontractor oversight, day to day field operations, and the collection of environmental samples during the RA. The site geologist will be the FTL for Site 174 RA. The FTL will be responsible for collecting engineering, geological, and environmental data and documenting daily field activities in accordance with the FSP-QAPP and this RAWP. The FTL will be responsible for initiating and documenting changes to field procedures in accordance with the FSP-QAPP when field conditions indicate that revisions are warranted. The FTL reports directly to the FOL.

2.5 Site Safety Officer

The AECOM Site Safety Officer ("SSO") will be responsible for monitoring and enforcing compliance with the site specific health and safety plan ("HASP"). The SSO may delegate responsibility to onsite personnel as appropriate. The SSO authority will also have completed an 8-hour supervisor's health and safety training course.

2.6 Sampling and Health and Safety Technicians

Sampling technicians are responsible for the collection and documentation of environmental samples as described in the FSP-QAPP and RAWP. Sampling technicians may also serve as Health and Safety Technicians ("HST"), and will report directly to the SSO. The SSO and/or the HST will set-up, calibrate, and monitor health and safety instrumentation for field activities in accordance with the HASP. The HST will record events/excursions pertaining to Health and Safety issues in the project field book and on appropriate field forms.

Site personnel will have at least six months of field experience or be supervised by an experienced FTL. Site personnel will have completed the OSHA required 40-hour training program and the requisite current 8-hour annual refresher courses. At least one member of each field crew will have current certifications in first aid and cardiopulmonary resuscitation ("CPR") training.

2.7 Subcontractors

Drilling, excavation, backfilling, grading, direct-push services, surveying, analytical laboratory, data validation, waste hauling, waste disposal, and other RA activities will be conducted by subcontractors selected and supervised by AECOM and PPG. Only subcontractors with the appropriate licenses, credentials, and safety record will work on this RA. The subcontractors for the RA have not yet been identified. AECOM and PPG will submit a list of selected subcontractors to the JCO Site Administrator prior to conducting the RA field work.

3 Remedial Investigation Report

3.1 Background Information

Pursuant to N.J.A.C. 7:26E-4.9, below is a summary of the remedial investigation reports previously submitted to the Department. The following subsections provide information regarding site history, ownership, previous environmental investigations, RAs, and enforcement actions for HCC Site 174.

There have been four previous investigations and RAs that occurred at the Dennis P. Collins Park site (Berger, 2003), which include:

- New Jersey Department of Environmental Protection and Energy ("NJDEPE") conducted a soil investigation in 1992 at the Site in response to a citizen complaint.

- Lawler, Matusky & Skelly Engineers ("LMS") conducted an investigation at the Site in 1992 and 1993 to delineate Cr contamination.

- L. Robert Kimball and Associates ("Kimball") were retained by the NJDEP to perform a preliminary site characterization ("PSC") and to provide recommendations for final site characterization (2001).

- The Louis Berger Group, Inc. ("Berger") was retained by the NJDEP to perform a remedial investigation and remedial alternatives selection evaluation ("RI/ RASE") at Site 174 (Berger, 2003). The Berger Report includes a list of Interim Remedial Measures ("IRMs") installed during the mid-1990s.

Only two of the complete investigation reports were available for review at the time this RAWP was prepared:

- Kimball (2001) Preliminary Site Characterization Report with Final Site Characterization Recommendations; and

- Berger (2003) Final Remedial Investigation and Remedial Alternatives Selection Evaluation.

Data from the NJDEP 1992 investigation were located in the Kimball (1998a) Background Investigation Report. Data from the 1992 and 1993 LMS sampling were compiled in a sample results report (LMS 1994) which was excerpted in Kimball (1998a). Relevant excerpts from these reports are provided in Appendix C to this RAWP.

Further in 2011, potential contaminated historic fill was suspected on the property in the area of the ball fields at the west side of the Park, and it was proposed by NJDEP that this area of the Park be further investigated. The investigation work was commenced in March 2012 and the sampling results are discussed in Section 3.5.5

3.1.1 Site History

The Dennis P. Collins Park site was created in the early to mid-1900s by filling the Kill Van Kull shoreline with miscellaneous fill materials (Kimball, 1998a). Historic drawings from the Office of the City Engineer, Bayonne, indicate that wooden barges were positioned along the former Kill Van Kull shoreline, scuttled to allow sinking, and then covered with fill materials. An 1869 historical City map depicted the Site as a narrow strip of land between West 1st Street and the Kill Van Kull, with the majority of the Site beneath the waters of the Kill. From the 1970s onward, the Site was developed as a public park with current structures and service roads. The contour of the shoreline appears to have remained the same since the mid-1970s (Berger, 2003).

According to Kimball (2001), historical documentation indicates that CCPW was used in 1954 and 1955 construction of the Jersey City/Bayonne Sewerage Construction Project. The Jersey City/Bayonne Sewerage Construction Project began in the mid 1950s and included the construction of two primary sewerage plants, multiple outfalls, and miles of underground interceptor sewers. The sewer outfall structure located along the bank of the Kill Van Kull and its associated 48-inch diameter reinforced concrete piping may have been installed as a part of this project. However, personnel from the Bayonne Sewerage Treatment Plant could not verify this account (Kimball, 1998a).

In the early 1970s, a flood relief project was undertaken at the site that included the construction of a sewerage pumping station with associated piping and an outfall structure. The newly constructed pump station was connected via underground pipes to an existing 30-inch diameter sanitary sewer line located beneath the center of West 1st Street and would transfer overflow from the sewer line to the Kill Van Kull during significant precipitation or flooding. Sewerage overflow handled by the pump station would be discharged to the Kill Van Kull by a 12-inch diameter PVC pipe connected to the previously installed 48-inch outfall structure. Discharges through this outfall were governed by a NJDEP permit (NJ0025836) issued to the City of Bayonne for operation of the Bayonne Sewerage treatment plant (Kimball, 1998a).

3.2 Sanborn Maps

A set of 15 Sanborn maps was obtained from Environmental Data Resources, Inc. ("EDR") for the following years of coverage: 1887, 1898, 1912, 1950, 1979, 1988, 1991, 1994, 1995, 1999, 2001, 2002, 2003, 2005, and 2006. Additionally, the Sanborn map from 1957 was reviewed at the Bayonne Public Library. Available Sanborn maps are provided in Appendix A.

The 1887 and 1898 Sanborn maps depict the Site area as a narrow strip of land between West 1st Street and the Kill Van Kull, with the majority of the Site beneath the waters of the Kill.

In 1912, two piers appear in the western portion of the Site across from Humphreys Avenue, extending into the Kill Van Kull for 380 feet and 400 feet. Various stands and a restaurant are located approximately 300 feet to the west from the foot of Newman Avenue and continue to Zabriskie Avenue.

By 1950, the western portion the Site was filled extending approximately 350 feet into the Kill Van Kull from West 1st Street. There is also a series of apartment buildings (identified as Veterans Housing Project) present to the northeast between West 1st Street and West 2nd Street. A small structure and a wooden bridge are present in the center of the Site.

The 1957 Sanborn map depicts the eastern portion of the Site as being filled approximately 200 feet into the Kill Van Kull. An archery range, Ferris Wheel, tilt-a-whirl, and a scooter field were present in the eastern portion of the Site and were most likely associated with an amusement park (Uncle Milty's). A pool and two shelters were present in the western portion of the Site.

The 1979 Sanborn map shows no piers in the eastern portion of the Site; rather, the Site shoreline extends east parallel to the West 1st Street. A playground is depicted in the eastern portion of the Site.

No structures were present in the western portion of the Site. A dry cleaning facility was located across West 1st Street to the northeast of the Site at the foot of Zabriskie Avenue.

The 1988 Sanborn Map and subsequent Sanborn maps depict the Site as the Kill Van Kull Park. The current restroom facilities are depicted in the center of the Site on the former location of a small structure previously identified in the 1957 Sanborn Map. The shoreline appears to be unchanged from 1957 through 2006 according to the Sanborn maps, but this information contradicts historic aerial photographs and historical Bayonne City maps reviewed in the Bayonne Public Library (see below).

3.3 Interpretive Aerial History

A series of twelve aerial photographs from the years 1931 to 2006 were reviewed . The aerial photographs were acquired from EDR and Nationwide Environmental Title Research, LLC ("NETR") and were reviewed to provide information about the Site history, land use, onsite structures, visible utilities, material storage, and other site characteristics. Copies of photographs for the years 1931, 1943, 1954, 1966, 1976, 1979, 1980, 1984, 1987, 1991, 1995, and 2006 are included in Appendix B to this RAWP.

The aerial photographs indicate that the western portion of the Site was partially filled by 1931; there are docks and barges visible along the west side of the property. By 1943, the majority of the Site was filled in its current outline, the land appears vacant, and there are barges present near the western side of the property. The 1954 photograph shows more of the site filled, two small structures located in the center of the Site in the location of the current basketball courts, and some structures present at the western part of the Site. More structures were present to the west of the Site. The 1966 aerial photograph shows Site 174 filled almost to its current outline. There is a structure present in the northern part of the property. From 1966 through 2006 the shoreline seems largely unchanged. From 1991 to the 2006 the main Site features remain unchanged.

On April 28, 2011, AECOM personnel reviewed the stereo photograph pairs at [NJDEP] offices in Trenton, NJ. No additional information was gleaned from this review.

3.4 Historic Time Line

AECOM reviewed Bayonne city maps as well as newspaper articles and books on Bayonne history available from the Bayonne Public Library in search for information related to the Site construction, ownership, sewer and storm water line installation, pump station construction, etc. for the period from 1887 through 2001, in addition to the review of Sanborn maps and historic aerial photographs.

Below is a timeline summarizing findings of the historical investigation:

1887 – 1909 The majority of the Site is under water, except for a thin strip of land which was present along West 1st Street.

1912 Two piers (380 and 400 feet long) and a dock extending approximately 70 feet into the Kill Van Kull were present on the western portion of the Site, across from Humphreys Avenue.

1931 The 1931 aerial photograph (NETR, 2011) shows a portion of the Site with dimensions of approximately 300 feet north to south and 450 feet west to east and filled in the western portion, adjacent to the two piers.

1937 A “pleasure park” was present between Humphreys and Newton Avenues, extending from West 2nd Street into Kill Van Kull (map, Clarkson, 1937).

1943 The 1943 aerial photograph (EDR, 2011) indicates shoreline between the two piers and the Ferry Station at the foot of Avenue C being filled. Ships or barges were visible near the piers in the western portion of the Site 174. The Site appears to be largely undeveloped and no buildings were present between West 1st and West 2nd Streets.

1954 The 1954 aerial photograph (EDR, 2011) shows no piers in the western portion of the Site where the piers were located previously. A playground with a pool and two shelters is visible in the central portion of the Site. The shoreline in the eastern portion of the Site leading to the ferry station was narrower than in 1943, extending into the Kill Van Kull for less than 50 feet. High density residential buildings are present across from the Site, between West 1st and West 2nd Streets.

1966 The 1966 aerial photograph (EDR, 2011) shows western part of the Site filled approximately 200 feet into the Kill Van Kull and structures present at that part of the Site. Parts of the sunken barges are visible off the western shoreline of the Site, at the foot of Humphreys Avenue. Newspaper articles and other sources make a reference to Uncle Milty’s Amusement Park (also referred to as Uncle Milty’s Playland) which operated in that area, west of the ferry station from about 1954 through 1969. The ferry station itself seems abandoned.

1979 The 1979 aerial photograph (NETR, 2011) shows foundations of the demolished structures of Uncle Milty’s Amusement Park in the eastern portion of the Site. There is a fenced-off set of small structures that looks like a pump station located off the West 1st Street. The shoreline of the Site had not changed since 1966.

3.5 Historic Site Investigations and Remedial Actions

3.5.1 1992 NJDEPE Investigation

The first investigative activities performed at the Site occurred in summer 1992, when the NJDEPE conducted soil sampling at the Site in response information from a citizen (NJDEPE, 1992; Berger, 2003). Upon inspection of the site, the NJDEPE discovered a pocket of material, possibly indicative of the presence of CCPW, at an approximate depth of 2 feet below ground surface (“ft bgs”) in the face of an embankment along the shoreline at the Site. One soil sample was collected on June 18, 1992 for total Cr analysis. Total Cr was detected at a concentration of 4,760 mg/kg. The investigation did not include analysis for Cr^{+6}. Based on this result, which exceeded the then-current NJDEP guidance value for total Cr in soil, the Site was added to the list of known CCPW sites as Site Number 174. In a letter to the Mayor of Bayonne, NJDEPE indicated that they believed that possible CCPW was located beneath 18 inches of clean topsoil, and that there should be no exposure to the public (NJDEPE, 1992). Further sampling of the upper 6 inches of soil was also proposed. Five soil samples were subsequently collected on July 15, 1992. Total Cr was detected at concentrations ranging from 16.7 to 808 mg/kg. The locations of the soil samples were not provided in the documentation reviewed (Berger, 2003); the specific locations could not be identified after further research conducted by AECOM as part of the preparation of this RAWP. Information on the Site was forwarded to the NJDEPE Bureau of Site Management for inclusion in IRM Design and RI/FS Request for Proposals (Berger, 2003).

The 1992 NJDEPE data are shown on Table 2.

3.5.2 1992-1993 NJDEP Investigation – LMS Engineers

LMS Engineers conducted a field sampling and analysis program at the Site in October and December 1992 and April 1993 (Berger, 2003). The dates of the LMS sampling at Site 174 were incorrectly identified in Kimball (1998a) as September and October 1992 and April and August 1993. The purpose of the investigation was to vertically delineate total Cr contamination in excess of 75 mg/kg, which was the cleanup level for total Cr at that time. During the first two sampling events, surface soil samples (0 to 6 inches bgs) were collected at 22 locations and analyzed for total Cr. In samples from the first event (October 1992), total Cr concentrations ranged from 17.7 to 1,630 mg/kg, with concentrations in five samples exceeding the 75 mg/kg cleanup level. In the 11 samples (plus one duplicate) collected during the second event (December 1992), total Cr was detected at concentrations ranging from 51.5 to 407 mg/kg, with concentrations in 10 samples exceeding the 75 mg/kg criterion. During the third sampling event in April 1993, eight samples were collected from soil borings for Cr^{+6} analysis. It appears that these samples were taken at a subset of the locations which were sampled previously for total Cr analysis, although the LMS (1994) report does not state this explicitly. Cr^{+6} concentrations ranged from not-detected to 13.2 mg/kg. The areas with the highest concentrations of total Cr and Cr^{+6} were located along the 48-inch diameter underground sewer piping southwest of the restroom and adjacent to the Kill Van Kull.

Based on the results of the LMS investigations, LMS implemented two IRMs at the Site in the mid-1990s (Kimball, 1998a; Berger, 2003). Based on plans developed by LMS, it appears that one IRM consisted of the placement of approximately 300 tons of rip-rap material along a portion of the Kill Van Kull shoreline near the sewer outfall in order to limit exposure to CCPW (LMS, 1993, as provided in Kimball, 1998a). The second IRM consisted of the installation of approximately 600 square feet of a bituminous concrete/Permalon liner cap approximately 10 feet southwest of the restroom structure (Figure 2) (LMS, 1993, as provided in Kimball, 1998a). The cap was placed upon the ground surface above soil exhibiting the highest concentrations of total Cr and Cr^{+6}. Kimball reported that City of Bayonne Health Department personnel indicated that approximately 3 cubic yards of chromium-contaminated soil was removed and disposed onsite during IRM activities; however, this information could not be verified (Kimball, 1998a).

The 1992 and 1993 LMS sample locations are shown on Figure 2 and the data are summarized on Table 3.

3.5.3 1998-2001 NJDEP Investigation – L. Robert Kimball and Associates

Field work for a Preliminary Site Characterization ("PSC") was performed by Kimball between June 1998 and January 2000 (Kimball, 2001). The PSC investigation included soil, groundwater, surface water, and sediment investigations. Kimball submitted the results of this work to NJDEP in June 2001 and those results are summarized below. Sampling locations are presented on Figure 2.

3.5.3.1 Kimball Soil Investigation

The RIWP (Kimball, 1998) proposed 46 borings (SB-01 through SB-46). One boring (SB-01, planned for the northwest corner of the Site) was not advanced due to the presence of overhead high voltage lines, three planned borings located on the baseball field (SB-02, SB-05, and SB-06) were not advanced at the request of the City of Bayonne, and two borings planned for inside the restroom facility (SB-19 and SB-21) were not advanced due to absence of evidence of CCPW (Kimball, 2001). A total of 40 borings were advanced throughout the Site, focusing on waterway, sewage pump station, and restroom facility areas. Borings were advanced from ground surface to first native material. Only 39 boring logs were located; the log for SB-46 was not present in any of the available copies for the Kimball PSC report. Soil samples were analyzed for metals, organic compounds, particle size distribution, and waste characteristics. CCPW was observed as a waste/fill mixture between the

Permalon liner and 0.8 ft bgs in soil boring SB-20, at the front of the restroom (Figure 2). The information from the boring logs, including depth to water, depth of fill intervals, and summary descriptions of the fill, is summarized on Table 4.

The Kimball soil analytical results are presented in the Table 5A & 5B which includes comparison of the data to NJDEP RDC, NRDC, and IGW SRS or the CrSCC for Cr.

A total of 213 soil samples (including 15 duplicates) were analyzed for a subset TAL metals including Sb, Be, Cd, total Cr, Cr^{+6}, Ni, and V. After the initial soil boring program was completed, some locations were re-sampled in October 1999 and January 2000 due to either sample data quality issues (data were rejected during validation) or samples were lost at the laboratory. These resample data were identified with the prefix “S” (rather than SB), followed by a three-digit boring location, and a three digit depth identifier (e.g., S017040 is a resample at SB-17 starting at 4 ft bgs). Total Cr was detected in nearly every sample, with a maximum concentration of 937 mg/kg in the 15-16 ft bgs sample at SB-46. The higher total Cr concentrations were generally on the eastern part of the site. Cr^{+6} concentrations ranged from not detected to 30.5 mg/kg. The single Cr^{+6} concentration exceeding the CrSCC for Cr^{+6} of 20 mg/kg was detected in sample S020034 (boring SB-20 location) at a depth of 3.4 to 4 ft bgs at a concentration of 30.5 mg/kg.

Other TAL subset metals were detected in the soil samples at concentrations exceeding NJDEP criteria.

- Antimony concentrations in the Kimball soil samples ranged from not detected to 18.1 mg/kg at SB-46 15-16 ft bgs interval. All Sb concentrations were less than the RDC SRS (31 mg/kg) and the NRDC SRS (450 mg/kg).

- Beryllium concentrations in the Kimball soil samples ranged from not detected to 38.3 mg/kg at SB-34 4-4 ft bgs interval. Be concentrations exceeded the RDC SRS (16 mg/kg) in three samples at a maximum concentration of 38.3 mg/kg. All Be detections were less than the NRDC SRS (140 mg/kg) and less than the maximum value reported in historic fill (80 mg/kg; N.J.A.C. 7:26E Table 4-2).

- Cadmium concentrations in the Kimball soil samples ranged from not detected to 6.6 mg/kg in SB-34 3-4 ft bgs interval (Table 5A). All Cd concentrations were less than the RDC SRS and the NRDC SRS (78 mg/kg for both). Cd concentrations were less than the maximum (510 mg/kg) and average (11.15 mg/kg) values reported by NJDEP for “typical historic fill material” (N.J.A.C. 7:26E Table 4-2).

- Nickel concentrations in Kimball soil samples ranged from 3.6 to 4550 mg/kg in the 3-4 ft bgs sample from SB-38. Ni concentrations exceeded RDC SRS (1600 mg/kg) in four samples (Table 5A and Figure 3), but Ni concentration were less than the NRDC SRS in all samples analyzed.

- Thallium was not one of the TAL subset metals analyzed as part of the Kimball investigation. However, three samples from SB-20 (0-0.2 and 0.2-1.0 ft bgs, plus one duplicate) were analyzed for full TAL metals, including Tl. Tl was not detected (at a reporting limit of 1.6 mg/kg) in any of the three samples analyzed.

- Vanadium concentrations ranged from 4.6 to 134 mg/kg. V concentrations exceeded RDC SRS of 78 mg/kg in four samples at concentrations ranging from 80.8 to 134 mg/kg (Table 5A and Figure 3). All V concentrations were less than the NRDC SRS (1100 mg/kg).

The 1998 – 2000 Kimball soil data are summarized on Table 5A & 5B, along with the NJ RDC and NRDC SRS and CrSCC.

3.5.3.2 Kimball Surface Water and Sediment Investigation

Surface water and sediment sampling was performed on December 6 and 7, 1999 as a part of ecological evaluation of the Site conditions. Sampling results are presented in Tables 20 through 32 of the Kimball PSC (Kimball, 2001).

Fourteen unfiltered surface water samples were collected for analysis at low and high tide from four locations along the Site shoreline and from a storm sewer discharge into the Kill Van Kull. The surface water samples were analyzed for Cr^{+6} , TAL metals, total solids, total suspended solids, total organic carbon, TCL volatile organic compounds ("VOCs") +10 tentatively identified compounds ("tics"), TCL semi-volatile organic compounds ("SVOCs") +20 tics, pesticides, polychlorinated biphenyls ("PCBs"), and total petroleum hydrocarbons ("TPH"). Cr^{+6} was not detected in the surface water, and the highest total Cr concentration detected was 4.6 µg/L, less than the then-current human health criteria for total Cr in saline surface water of 750 µg/L. Elevated Tl concentrations, greater than the current human health criteria of 0.47 µg/L, were detected in a majority of the samples but it is most likely attributable to the fact that Kill Van Kull is located in one of the most industrialized areas of the US, an area of multiple historical spills and is currently on New Jersey's 303(d) List of Impaired Waters (NJDEP, 2006). The Jersey Journal article (October 2006) indicated that less than 0.5 miles east of Site 174 there is a property (Duraport, on East Second Street, between Hobart and Ingham Avenues, and adjacent to the former Standard Tank Cleaning site) contaminated with a range of chemicals and toxins found at the site and in surface water runoff in the Kill Van Kull including trichloroethylene, perchloroethylene, vinyl chloride, arsenic and Tl, all in amounts that exceed DEP's cleanup criteria (Jersey Journal, October 4, 2006).

Ten sediment samples were collected from four locations in Kill Van Kull approximately 20 yards off-shore and the storm sewer outfall, analyzed and compared to NJDEP Marine/Estuarine Sediment Screening Guidelines - Effects Range - Low ("ER-L") and Effects Range - Medium ("ER-M"). The sediment samples collected from the top of each boring were analyzed for Cr^{+6}, TAL metals, total organic carbon ("TOC"), pH, TCL VOCs +10 tics, TCL SVOCs +20 tics, pesticides, PCBs, and TPH. Sediment samples collected from intermediate depths were analyzed for Cr^{+6}, TOC, pH, total Cr, Sb, Be, Cd, Ni, and V (Kimball, 2001). A subset of the sediment samples were analyzed for waste characteristics and particle size distribution. Total Cr concentrations ranged from 19.6 mg/kg to 85.3 mg/kg in the surface sediments, with the total Cr concentration in one sample slightly exceeding the ER-L ecological screening criterion of 81 mg/kg. Total Cr concentrations did not exceed the ER-M of 370 mg/kg for total Cr in any of the sediment samples. Cr^{+6} was not detected in any of the sediment samples.

Several metals were detected in the sediment samples. Cd was detected at a concentration above the ER-L in one of 10 samples. Ni concentrations in surface sediments ranged from 20.5 to 144 mg/kg, with concentrations in seven sediment samples exceeding the ER-L and concentrations in four samples exceeded the ER-M ecological screening criteria of 21 mg/kg. V and Sb were both detected but at concentrations less than the applicable ER-L ecological screening criteria. Kimball evaluated the levels of contamination observed in sediment and surface water samples as typical for urban impacts observed throughout the local area (Kimball, 2001). These data are consistent with the Newark Bay Study (HydroQual, 2006) which indicate that throughout the Newark Bay/Kill Van Kull in surface sediments approximately 80 percent of samples exceeded ER-L criteria for total Cr, and 85 percent of samples exceeded ER-L criteria for Ni in Kill Van Kull (HydroQual, Inc., 2006).

3.5.3.3 Kimball Groundwater Investigation

Initial groundwater investigation activities at the Dennis P. Collins Park Site were performed from October 18 through December 9, 1999. The groundwater investigation included installation and sampling of three groundwater monitoring wells (MW-01, MW-02 and MW-03). Groundwater level measurements were monitored for a 25-hour tidal cycle in the Kill Van Kull and the three groundwater monitoring wells, beginning on December 6, 1999, using electronic data loggers to determine whether tidal influences affect the water table underlying the Site. A 4.5 to 5.3 foot fluctuation of surface water was observed between low and high tide in Kill Van Kull. This range corresponded well with the ranges predicted for the Bayonne Bridge Tide Station of 4.8 and 5.6 feet for the sampling date. The tidal monitoring study also indicated that the change in the elevation of tide of the Kill Van Kull causes significant fluctuation of the elevation and flow of groundwater at monitoring well MW-03 (Berger, 2003). According to Kimball, tidal influence was limited to the near shore area and did not extend to AOC-1.

Unfiltered groundwater samples were collected from the three monitoring wells (plus a duplicate, field blank and trip blank) and were analyzed for TCL VOCs, SVOCs, pesticides, PCBs, TAL metals, TOC, total suspended solids, and total solids. In addition, filtered samples were collected from the three wells (plus a duplicate and a field blank) and analyzed for Cr^{+6}, TAL metals, and TOC. Total Cr concentrations were less than the total Cr GWQS of 70 µg/L in all samples analyzed. Tl concentrations exceeded the current GWQS in MW-02 and MW-03, and the concentration of Ni exceeded the current GWQS in MW-03 (Figure 5). Ni concentrations in groundwater samples ranged from not detected to 236 µg/L, and Tl concentrations ranged from not detected to 9.9 µg/L. Concentrations of VOCs, SVOCs, pesticides, PCBs, and TAL subset metals including Cr^{+6}, did not exceed the applicable GWQS.

The Kimball investigation groundwater data are shown on Table 6.

3.5.4 2002 NJDEP Investigation – The Louis Berger Group

The Louis Berger Group performed a remedial investigation for NJDEP to investigate data gaps identified as part of the PSC Report (Kimball, 2001), specifically delineation of a single Cr^{+6} exceedance of CrSCC in soil in Kimball boring SB-20.

Berger conducted a soil sampling program between February 12 and February 21, 2002. Five soil borings were advanced to a depth of 12 to 14 ft bgs southwest of the restroom near the location where an elevated Cr^{+6} concentration was previously reported in soil boring SB-20. Soil samples were collected continuously until native material was encountered at depths ranging from 10 to 12 feet bgs. Material identified as “Fill (Possible Chromium)” was reported in two of the borings (174S02 at 2 to 6 ft bgs, and 174 S04 at 2 to 3 ft bgs) (Berger, 2003; Drilling Logs), as shown on Table 4.

A total of 32 samples including one duplicate were selected for analysis. Samples selected for analysis from each boring included a surface sample, any sample where CCPW was suspected based on visual observation, the soil sample immediately above water table, and the soil samples immediately above and within the first native geologic unit. The samples were analyzed for Cr^{+6} and TAL metals. The 2002 Berger soil investigation data are summarized on Table 7A & 7B, along with the NJDEP RDC, NRDC, and IGW SRS. Data from the unsaturated zone only (defined as the interval between 0 and 8 ft bgs, the median depth at which saturated soils were encountered) are compared to the IGW SSLs on Table 7B.

- Total Cr was detected in every sample analyzed at concentrations ranging from 6.6 to 2130 mg/kg (174S02, 0-1 ft bgs interval). Cr^{+6} concentrations ranged from not detected to 8.7 mg/kg

(174S01, 1-2 ft interval). Total Cr and Cr^{+6} concentrations were less than the CrSCC in all samples analyzed.

- Antimony concentrations ranged from not detected to 67.4 mg/kg (174S02, 0-1 ft bgs sample). Sb concentrations in two surficial soil samples exceeded the RDC SRS (31 mg/kg) but were less than the NRDC SRS in all samples.

- Beryllium concentrations in Berger soil samples ranged from not detected to 1.9 mg/kg at 174S05, 0-1 ft bgs interval. Be concentrations were below the RDC SRS (16 mg/kg) in all samples analyzed. All Be detections were also less than the NRDC SRS (140 mg/kg) and less than the maximum value reported in historic fill (80 mg/kg; N.J.A.C. 7:26E Table 4-2).

- Cadmium concentrations ranged from not detected to 4.8 mg/kg at 174S01, 6-7 ft bgs interval. Cd concentrations were below the RDC SRS in all samples.

- Nickel concentrations ranged from ND to 388 mg/kg (174-S02, 0-1 ft bgs), but the results were less than the RDC SRS (1600 mg/kg) in all samples (Table 7A).

- Vanadium was detected in all the Berger soil boring samples at concentrations ranging from 7.3 to 512 mg/kg. The concentration of V in three soil samples exceeded the RDC SRS (78 mg/kg) but concentrations in all samples were below the NRDC SRS.

The tables, figures, and boring logs from the 2002 investigation are included in Appendix C.

3.5.5 2012 PPG Investigation - AECOM

AECOM performed a remedial investigation on the western portion (ball field) of Dennis Collins Park on behalf of PPG to investigate data gaps identified originally by L. Robert Kimball and Associates in 1998 - 2001. These borings could not be completed at that time due to site access issues at the baseball field.

The following scope of the work was completed on March 20, 2012 in the baseball field at Dennis Collins Park to complete the Site Investigation:

- Advancement of 3 soil borings to native material or a maximum depth of 16 feet below ground surface (SB-121, SB-122 & SB-123);

- Collection of soil samples every 2-foot interval from each boring.

Soil samples were analyzed for hexavalent chromium, Eh, pH, and CCPW metals (antimony, chromium, nickel, thallium, and vanadium), and the results are as shown in Table 8A & 8B.

The boring locations are presented in Figure 3. Soil samples were submitted to TestAmerica Laboratories, located in Edison, New Jersey for analysis

In summary, the investigation identified the following:

- Hexavalent Chromium: No hexavalent chromium results were detected above the interim NJDEP chromium soil cleanup criteria (“CrSCC”) of 20 milligrams per kilogram (“mg/kg”);

- Antimony: Only one sample had a concentration of antimony (39 mg/kg) greater than the 31 mg/kg NJDEP residential direct contact (“RDC”) soil remediation standard (“SRS”);

- Total Chromium: No chromium was detected at a concentration greater than the CrSCC for trivalent chromium, the criteria generally used to compare total chromium results. One soil sample had a chromium concentration of 193 mg/kg. All of the remaining samples had results less than 68 mg/kg;

- Nickel: All nickel results were below the RDC SRS of 1,600 mg/kg;

- Thallium: nearly all of the thallium results were below the method detection limit (“MDL”) and are considered as not-detected (“ND”);

- Vanadium: Most of the vanadium results were between 1.2 and 34.8 mg/kg, well below the RDC SRS of 78 mg/kg for vanadium.

Based upon these results, no further investigation activities are proposed in the baseball field at Dennis Collins Park. The data reports from this investigation are in Appendix I, J and K.

3.5.6 Ownership and Operator History

Figure 2 presents the Block and Lot boundaries for the Site 174 portion of Dennis P. Collins Park. The Site encompasses Block 383, Lots 1 through 8, and Block 384, Lots 1 and 2. The City of Bayonne currently owns all of these properties. These properties had multiple owners and were acquired by the City of Bayonne between 1938 and 1978 (Kimball, 1998a). The eastern portion of the Site (Block 384, Lot 2) was leased in 1954 to Milton Tone by the State of New Jersey for 15 years and was utilized as Uncle Milty’s Amusement Park.

3.5.7 Raw Material, Products, Hazardous Substances, Wastes, and Pollutants

Site 174 was formed as a result of filling the Kill Van Kull with miscellaneous fill material (Kimball, 1998a). There is a single exceedance of CrSCC criteria for Cr^{+6} in one soil boring where potential CCPW was also identified (although at a different depth interval). No total Cr exceedances of the CrSCC were reported at the Site. No known Cr-related raw materials, products, wastes or hazardous substances were identified during remedial investigations, with the exception of the CCPW-related impacts encountered in SB-20. Metal concentrations exceed the RDC SRS criteria at various locations at the Site, but these concentrations were attributed to the urban fill material rather than CCPW-related impacts (Kimball, 2001; Berger, 2003).

3.5.8 Present and Past Production Processes

No production processes have been identified at the Site 174 during previous remedial investigations. Presently the Site is used as a public park.

3.5.9 Former and Current Storage Tanks and Bulk Storage Areas

No known above or below ground storage tanks or bulk storage areas have been identified onsite during previous surveys and remedial investigations.

3.5.10 Known Discharges

Five known points of discharges have been identified based on NJDEP geospatial layer NJDEP Surface Water Discharges in New Jersey, Version 2011 along the southern border of the Site in the Kill Van Kull. The table below summarizes the discharge sources and applicable permits.

Facility Name	Pipe	Discharge Type	Receiving Waters	NJPDES Permit Number
Bayonne MUA	001A	IMI	Kill Van Kull	NJ0003085
Bayonne MUA	001V	IMI	Kill Van Kull	NJ0003085
Bayonne MUA	003A	CSO	Kill Van Kull	NJG0109240
Bayonne MUA	010A	CSO	Kill Van Kull	NJG0109240
Bayonne MUA	024A	CSO	Kill Van Kull	NJG0109240

CSO – Combined Sewer Outfall

IMI – Industrial Minor – based on the amount of pollutant(s) in the effluent

MUA – Municipal Utilities Authority

NJPDES General Permit NJG0109240 was re-issued by the Division of Water Quality on August 1, 2009 for Bayonne Municipal Utilities Authority.

Based on the NJDPE geographic information system map, a spill/discharge by Standard Tank Cleaning Corporation into the Kill Van Kull was identified in close proximity to the Site. A search for historic information based on the company name indicated that such spills were common in Kill Van Kull in the 1980s through the early 1990s. The Standard Tank Cleaning Corporation ceased operations in 1993.

3.5.11 Previous Remediation Activities

There have been four previous investigations and one RA (consisting of two IRMs) that occurred at the Dennis P. Collins Park site (Berger, 2003), which include:

- The NJDEPE conducted an initial soil investigation in 1992 as a response to information received from a citizen complaint (NJDEPE, 1992a).
- LMS Engineers conducted an investigation at the Site to delineate Cr concentrations at the Site.
- At some point in the mid-1990s (subsequent to the LMS investigation), two IRMs were implemented.

- Kimball was retained by the NJDEP to perform preliminary site characterization and to provide recommendations for final site characterization.

- Berger was retained by the NJDEP to perform a remedial investigation and remedial alternatives selection ("RI" and "RAS") at Site 174.

A summary of previous investigations by NJDEP (1992), LMS (1992 – 1994), Kimball (2001), and Berger (2003) is presented above in Sections 3.5.1 through 3.5.4. Both the Kimball and Berger reports are available in Appendix C.

3.5.12 Previously Approved Remedies

Based on the results of the LMS investigations, two IRMs were implemented at the Site in the mid-1990s (Berger, 2003). One IRM consisted of the placement of approximately 300 tons of rip-rap material along a portion of the Kill Van Kull shoreline near the sewer outfall in order to limit exposure to possible CCPW. The second IRM consisted of the installation of approximately 600 square feet of a bituminous concrete/Permalon liner cap approximately 10 feet southwest of the restroom structure (Figure 2). The cap was placed atop soil exhibiting the highest concentrations of total Cr and Cr^{+6}. According to Kimball (1998a), City of Bayonne Health Department personnel reported that approximately 3 cubic yards of Cr-contaminated soil was excavated and disposed onsite during IRM activities; however, no supporting documentation was available (Kimball, 1998a).

3.5.13 Existing Environmental Sampling Data

A summary of the soil sampling data from NJDEP, LMS, Kimball, and Berger investigations is presented in Tables 2, 3, 5A, 5B, 7A, and 7B. A summary of information from the boring logs for the Kimball and Berger investigations is presented in Table 4. Available groundwater data (Kimball, 2001) is presented in Table 6. Results from AECOM's 2012 investigation are included in Table 8A & 8B. Appendix C contains sampling results for soil, sediment, groundwater, and surface water investigation by Kimball (2001), soil investigation by Berger (2003). Appendix I, J and K contains the results and data from the ball field soil investigation by AECOM (2012).

3.5.14 Known Changes in Site Conditions

There are no known changes in the Site conditions since the installation of the IRM and subsequent remedial investigations.

3.5.15 Federal, State, and Local Permits

The list of existing Surface Water Discharge permits which apply to Site 174 and immediately adjacent to its shoreline is presented in Section 3.5.9.

3.5.16 Enforcement Actions

NJDEP issued an ACO on July 19, 1990 and a summary of the actions preceding this agreement between PPG and NJDEP is as follows:

January 22, 1985: NJDEP directed PPG, among others, to arrange for the removal of hazardous substances, including Cr and Cr-related compounds, at 42 sites in Hudson County, and pay for NJDEP's costs of a Remedial Investigation and Feasibility Study ("RI/FS") at those sites.

July 22, 1986: PPG and NJDEP executed an ACO concerning the RI/FS. Pursuant to the ACO, PPG agreed to participate in the Chromium Sites Study Committee that NJDEP created to oversee and manage the RI/FS.

December 2, 1988: NJDEP issued a Directive to PPG, among others, pursuant to the Spill Compensation and Control Act, to undertake interim remedial actions at 86 sites in Hudson County. In response to this Directive, PPG agreed to implement IRMs at 10 high priority and 5 medium priority sites.

December 27, 1988: NJDEP issued an administrative subpoena to PPG to obtain additional information.

July 19, 1990: PPG Industries and NJDEP signed an ACO regarding cleanup of the residential and non-residential sites. Note that Site 174 had not yet been identified as a HCC site.

June 26, 2009: PPG Industries, NJDEP, and the City of Jersey City signed a Partial consent Judgment (generally referred to as the JCO) regarding cleanup of the residential and non-residential sites. PPG accepted responsibility for Site 174 as part of this agreement.

An on-line search of the NJDEP Office of Public Records data for enforcement actions at Site 174 indicated no such cases. However, the IRM was implemented at the Site in mid-1990s as a response to the results of the LMS investigations (Berger, 2003), possibly as a result of enforcement actions by NJDEP.

3.5.17 Non-Indigenous Fill Areas

Review of historical information dated from 1887 through 2006 indicates that Site 174 was historically part of the Kill Van Kull waterway. Between 1912 and 1954, the majority of the area was filled in to its current outline. Kimball (2001) references a historic drawing from the Office of the City Engineer, Bayonne, NJ which indicated that wooden barges were positioned along the former Kill Van Kull shoreline, scuttled, and covered with fill materials. Results of Kimball's remedial investigation also identify large wooden obstructions at or slightly below mean sea level elevations, therefore confirming the use of barges during historic site filling operations.

According to Kimball, historical documentation indicates that CCPW was used at numerous sites in the surrounding area as fill and pipe bedding in connection with the Jersey City/Bayonne Sewerage Construction Project in the mid-1950s (Kimball, 1998a), although there is no specific information indicating that Site 174 was one of the sites at which such fill was placed. The Jersey City/Bayonne Sewerage Construction Project included the construction of two primary sewerage plants, multiple outfalls and miles of underground interceptor sewers. The sewer outfall structure located along the bank of the Kill Van Kull and associated 48-inch diameter reinforced concrete piping may have been installed as a part of this project. However, personnel from the City of Bayonne could not verify this account (Kimball, 1998a).

Extensive investigations were performed at the Site 174 by Kimball (2001) and Berger (2003) and included the installation of 45 soil borings, collection of soil samples, and visual and analytical assessment for the presence of CCPW throughout Site 174. The Kimball investigation focused on areas of potential concern, such as the shoreline, the existing restroom facility, and the sewer pump station and sewer line. Possible CCPW was observed in only one of the 40 borings (SB-20) advanced by Kimball, at a depth of 0.2 to 0.8 ft bgs (Table 4). SB-20 is located in front of the restroom under the existing IRM. Cr^{+6} was not detected in the soil sample collected from the 0.2 to 1 ft bgs interval; however, Cr^{+6} was detected at 30.5 mg/kg in a deeper sample interval (3.4 to 4 ft bgs) at this boring. The Berger investigation was focused on the area around the potential CCPW reported by Kimball and included the installation of five soil borings (S01 through S05) near Kimball boring SB-20. Some soil discoloration was noted in two soil borings advanced by Berger (S02 and S04); however, Cr and Cr^{+6} concentrations in samples from the Berger borings were less than the NJ CRSCC (Tables 4, 7A, and 7B).

AECOM performed a remedial investigation in March 2012 to investigate data gaps identified originally by L. Robert Kimball and Associates in 1998 – 2001 on the westerns portion of the Site. These borings could not be completed at that time due to site access issues at the baseball field. Three borings (SB121, SB122, and SB123) were advanced to a depth of 16 ft bgs in the baseball field, as shown in Figure 3. Soil samples were analyzed for hexavalent chromium, Eh, pH, and CCPW metals (antimony, chromium, nickel, thallium, and vanadium), and the results are discussed in Section 3.5.5. In summary, none of the contaminants of concerns were found to exceed their respective SRS with exception of Antimony in a single sample.

3.5.18 Site Water Process Budget

Current water usage at the Site 174 is limited to public restrooms and a subsurface irrigation system for watering the grass.

Dennis P. Collins Park includes several paved parking areas, walking paths, and recreation areas which influence surface drainage. The majority of precipitation at the Site flows southward to the Kill Van Kull or into the storm sewer collection system installed primarily along the paved walkways and parking areas at the Site. The storm water collection system discharges to the Kill Van Kull, which borders the site to the south. Precipitation falling onto unpaved areas will likely percolate into the surface soil, entering the groundwater and eventually discharging to the Kill Van Kull (Kimball, 2001).

3.5.19 Summary of Previous ECRA Submissions

There are no known Environmental Cleanup Responsibility Act (“ECRA”) documents previously submitted for Site 174.

4 Physical Settings

The following subsections provide background information for HCC Site 174, located at West 1st Street, Bayonne, Hudson County, New Jersey.

4.1 Site Description

Site 174 is located along West 1st Street, Bayonne, Hudson County, New Jersey (Figure 1). The Site occupies properties currently identified as Block 383, Lots 1 through 8 and Block 384, Lots 1 and 2, as indentified on the City of Bayonne Tax Map (Figure 2). These parcels of land are currently owned by the City of Bayonne. The Site is bordered to the north by West 1st Street and to the south by the Kill Van Kull waterway. Site 174 is approximately 9 acres in size and is currently used as a recreational park. The area identified as Site 174 is only a part of the Dennis P. Collins, which extends farther east and west of the Site. The part of the park within Site 174 contains two basketball courts, two tennis courts, a baseball field, a children's play area with interconnecting macadam walkways, a restroom facility, a fenced sewage pump station, and a paved parking lot located off West 1st Street. A site plan showing existing site features is provided on Figure 2.

4.2 Local and Regional Geology

The Site was constructed by filling marshland and tidal flats along the Kill Van Kull with miscellaneous soil, rock and other fill material. A thin layer of sod and topsoil covers the majority of the Site. Bituminous concrete parking areas, walkways, basketball courts, and children's playgrounds are located throughout the Site.

The overburden geology of the Dennis P. Collins Park site is comprised of miscellaneous urban fill extending to a depth of approximately 10 to 12 ft bgs consisting primarily of sand, with some silt and gravel, silty sand, and sandy silt. The strata are predominantly black in color with some brownish soil at the surface, including coal, cinders, ash, slag, brick, glass, broken concrete, plastic, and wood fragments (Table 4). Underlying the fill are fluvial and glacial deposits comprised of sand, silt, and clay with gravel and cobbles. According to Kimball (2001), historic drawings of the Site indicate that wooden barges were positioned along the former Kill Van Kull shoreline scuttled, then covered with fill materials.

The Bedrock Geologic Map of Northern New Jersey indicates that the uppermost bedrock consists of medium to coarse-grained dark greenish-grey diabase intrusions of Early Jurassic age (Figure 4). It is expected that bedrock is approximately 40 ft bgs based on the thickness of glacial sediments in the area (Berger, 2003). No borings from either the investigations by Kimball or Berger were advanced to bedrock.

4.3 Hydrogeology

The groundwater table at the site is typically present at 8 ft bgs, although it varies from 4 to 10 ft bgs (Table 4). Groundwater is expected to locally flow to the south towards the Kill Van Kull, which borders the site to the south. There is some evidence of tidal influence from the Kill Van Kull on the local shallow groundwater. According to Kimball, tidal influence was limited to the near shore area and did not extend to AOC-1. As such, groundwater flow direction and flow potential at the Dennis P. Collins Park Site fluctuates with the tide to a certain extent. Additionally, due to widespread non-indigenous fill and subsurface utility lines, there may be significant variation in shallow groundwater flow characteristics, such as preferential flow along more permeable granular pipe bedding material, infiltration into utility pipes, and/or obstructed horizontal groundwater flow. Groundwater in the fill and glacial sediment is generally considered to have low hydraulic yields and poor quality.

4.4 Topography

The Dennis P. Collins Park is generally flat with minor undulations across the Site due to landscaping. The Site is moderately sloped in a southeasterly direction toward the Kill Van Kull with most of the Site lying between 7 and 10 feet above mean sea level (Berger, 2003). Figure 1 shows the regional topography near the Site on a USGS Topographic Map. Onsite topography is illustrated in Figure 2.

4.5 Surface Water and Wetlands

The Dennis P. Collins Park site contains several paved areas, which influence surface drainage. The majority of precipitation at the site flows southward to the Kill Van Kull or into the storm sewer collection system installed primarily along the paved walkways and parking areas at the Site. The collection system discharges to the Kill Van Kull, which borders the Site to the south (Kimball, 2001). Precipitation falling onto unpaved areas will likely percolate into the surface soil, entering the groundwater and eventually discharging to the Kill Van Kull. Figure 5 shows surface water bodies within ½-mile of the Site.

Wetland maps from the New Jersey Geographic Information System (“NJ GIS”) show no wetlands located within the Site boundaries; the closest wetlands are located about 1900 ft west of the Site 174 (Figure 6). According to the U.S. Department of the Interior, Fish and Wildlife’s National Wetland Inventory (“NWI”) map an Estuarine and Marine Wetland exists along the Kill Van Kull shoreline, south of the Site (Figure 6).

4.6 Well Search

There are no known potable water supply wells in Hudson County, New Jersey. Berger (2003) reported that the bedrock formations underlying the Site are brackish water-bearing zones that provide non-potable water to a few industrial wells in the area. However, an updated well search was obtained through the NJDEP Division of Water Resources Office Records for the area within a 1-mile radius of the Site and no active industrial, production, or irrigation wells were reported.

4.7 Boring Logs from Onsite Construction

No geotechnical boring logs from construction of existing or previous onsite structures were found during the background investigation for this RAWP or identified by previous consultants (e.g., Berger, 2003; Kimball, 1998a). Boring logs from onsite remedial investigations by Kimball (2001) and Berger (2003) are included in Appendix C and summarized in Table 4.

A total of 45 borings were advanced at the Site during the Kimball and Berger investigations. Lithologic characterization was performed continuously throughout the borings. The presence or absence of CCPW-related material was recorded on the logs. Review of the available boring logs indicates fill material is present in 44 out of 45 borings installed during the Site investigations in 1998/1999 and 2002. Boring SB-28 is the only boring in which no fill material was reported. Fill material was observed from 0.2 to 17 feet bgs. Possible CCPW-related material was observed as a waste/fill mixture between the Permalon liner and 0.8 ft bgs in soil boring SB-20, at the front of the restroom, during the Kimball investigation in 1999. Possible CCPW-related material was identified in two of the five borings, S02 and S04, advanced by Berger in 2002 (Table 4) to delineate the extent of the potential CCPW identified by Kimball.

From AECOM's 2012 investigation in the ball field, the three borings (SB121, SB122, and SB123) were advanced to a depth of 16 ft bgs in the baseball field. Review of the boring logs indicates fill material is present in all the three borings. Boring logs are included in Appendix I.

4.8 Surrounding Land Use

According to the City of Bayonne Master plan (2000), the areas surrounding Dennis P. Collins Park to the east and west are classified as Residential consisting of one- and two-family structures. Areas to the north are zoned as Public/Semi-Public.

The future land use for the area is designated as Park/Open Space. The area north of the site is designated as High Density Residential, and land use for the areas to the east and west is planned as Detached/Attached Residential (City of Bayonne, 2000).

4.9 Ecological Investigation

Surface water and sediment investigations were conducted by Kimball (2001) as a part of the ecological investigation based on the presence of the environmentally sensitive natural resources immediately adjacent to the Site (Kill Van Kull) and a potential migration pathway. Results of this investigation are presented in Section 3.5.3.2 of this RAWP. Sediment and surface water sampling locations are shown on Figure 2. A more detailed description of the ecological investigation and its results are presented in the Sections 3.4 and 3.5 of the Kimball PSC, included in Appendix C.

4.10 Baseline Ecological Evaluation

Baseline Ecological Evaluations ("BEE") were completed by both Kimball (Section 3.6 of Kimball [2001]) and Berger (2003). The results are presented in Appendix C. The Kimball BEE concluded:

> Environmentally sensitive areas were not identified onsite. Contaminants of environmental concern exist onsite. Dissolved constituents may migrate with groundwater to adjoining environmentally sensitive areas. The level of contamination observed in site groundwater and the Kill Van Kull sediment and surface water are evaluated as typical for the urban impacts observed throughout the local area. The limited presence of CCPW and lack of significant impact directly related to the waste result in an opinion that further ecological assessment is not warranted (Kimball, 2001).

Based on the Kimball analytical data, Berger (2003) updated the BEE and concluded:

> Based on the presence of potential migratory pathways within the area of influence of the site's contaminants of environmental concern, the likelihood exists that adverse ecological effects may occur or are occurring. There were exceedances of aquatic toxicological criteria for several metals in surface water and sediment samples collected from the Kill Van Kull during the PSC (Kimball, 2000 [*sic*]). The analytes are, however, representative of regional urban pollutants at levels typically seen in the Kill Van Kull. Thus, impacts from site contamination are expected to be minor. Thus, no further ecological assessments are believed to be necessary.

An updated BEE based on the most recent applicable NJDEP requirements will be provided under separate cover, as indicated below.

4.10.1 Contaminants of Ecological Concern

Contaminants of ecological concern ("COEC"s) are those site-specific contaminants that exhibit the ability to biomagnify or bioaccumulate, or contaminants with concentrations that exceed applicable standards recommended for use in conducting ecological evaluations as presented in the NJDEP's *Ecological Evaluation Technical Guidance* (August 2011).

COECs at the Site coincide with COCs indicated in the Section 1.1 and include Cr^{+6} and five USEPA TAL metals: Sb, Cr, Ni, Tl, and V.

The nearest environmentally sensitive area is the Kill Van Kull and its associated estuarine and marine wetlands at the southern edge of the Site. Based on the presence of environmentally sensitive natural resources immediately adjacent to the Site (i.e., the Kill Van Kull), an investigation into potential migration pathways, permitted discharges from the sewer line to the sediment, and a surface water investigation was conducted by Kimball (2001). Impacts from Site contamination were expected to be minor. Based on these results, no further ecological evaluations for the site were considered necessary (Berger, 2003).

4.11 Potential Areas of Concern

Three potential Areas of Concern (AOCs) were identified at the Site during the investigations of CCPW and related materials:

1) Area of a reported Cr^{+6} exceedance
2) Site-wide non-indigenous fill
3) Site-wide groundwater

4.11.1 AOC 1 – Chromate Chemical Production Waste (CCPW)

During the Kimball investigation, a single Cr^{+6} exceedance of the CrSCC was reported in a sample from SB-20. The sample with the Cr^{+6} exceedance was located below the existing cap/Permalon cover at a depth of 3.4 to 4 ft bgs. Possible CCPW was observed at this same location between the Permalon cover and 0.8 ft bgs during the Kimball (2001) remedial investigation. Berger (2003) delineated the area of elevated Cr^{+6} by advancing five borings around SB-20 in 2002. In the five soil borings advanced by Berger, Cr^{+6} concentrations ranged from not detected to 8.7 mg/kg while total Cr ranged from 6.6 to 2130 mg/kg. All total Cr and Cr^{+6} concentrations detected during the Berger remedial investigation were less than the applicable CrSCC. Antimony concentrations exceeded the NJDEP RDC SRS in several samples from the Berger investigation, but did not exceed the RDC SRS in samples elsewhere onsite (i.e., outside of AOC-1).

Based on these results, Berger established AOC-1 as occupying a portion of Block 383, Lots 6 and 8, and encompassing an area of approximately 550 square feet. The original Kimball boring SB-20, advanced in 1999, along with the five Berger delineation borings, advanced in 2002, are considered to be part of AOC-1. Due to exceedances of Sb criteria in S02 (0-1 ft interval) and S05 (5-6 ft bgs), the full extent of potential CCPW-related metals has not yet been fully delineated.

4.11.2 Potential AOC 2 – Non-Indigenous Fill Material

Visible CCPW was encountered in only 1 of 40 soil borings advanced at Site 174 during the Kimball investigation. The material was described as a soil/waste mix located in the interval between the Permalon cover and 0.8 ft bgs by Kimball (2001). No Cr^{+6} or total Cr concentrations in samples collected outside of AOC-1 exceeded the CrSCC. Cr^{+6} concentrations in soil samples from the non-indigenous fill area (excluding AOC-1) had a range of not detected to 18.5 mg/kg between 7 and 8 ft bgs at boring B-40, as reported by Kimball (2001). AECOM believes this maximum concentration of

18.5 mg/kg was inadvertently transposed and concentrations should be 9.5 mg/kg Cr^{+6} and 18.5 mg/kg total Cr, as Cr^{+3} was reported as being 9 mg/kg and total Cr cannot be less than Cr^{+6} plus Cr^{+3}.

Concentrations of TAL subset metals did not exceed NJDEP RDC SRS values in borings advanced in locations where placement of chromate fill was considered most likely: 1) borings SB-04, SB-06, and SB-11 along the northern sewer line, and 2) borings SB-18 and SB-31 by the sewage pumping station (Figure 3). Antimony concentrations exceeded the RDC SRS in several samples within AOC-1 but did not exceed the RDC SRS elsewhere onsite.

Nickel concentrations exceeded the RDC SRS in two samples each from SB-38 and SB-40 located in the west-central part of the Site. The concentrations in these samples (> 4,000 mg/kg) are more than an order of magnitude greater than the highest concentration of nickel detected in any of the AOC-1 samples (388 mg/kg maximum). Total Cr concentrations are low (< 70 mg/kg) in the SB-38 and SB-40 samples with the high Ni concentrations; thus, the presence of nickel appears to be unrelated to Cr or CCPW.

Vanadium concentrations exceeded the RDC SRS, but did not exceed the NRDC SRS, in several samples both within and outside of AOC-1. Vanadium is ubiquitous across the Site, and was detected in every sample analyzed as part of the Kimball and Berger investigations. The highest concentration was detected in a surface soil sample just outside the rest room in the Berger investigation (512 mg/kg in 174S02, 0-1 ft bgs). In other samples, the V concentrations only slightly exceeded the RDC of 78 mg/kg. Exceedances ranged from 80.8 to 134 mg/kg in SB-38 (5-6 ft bgs), the same sample in which the highest nickel concentration was detected.

Based on the absence of visible CCPW and lack of Cr or Cr^{+6} concentrations greater than the CrSCC in soil samples collected from borings located outside of AOC-1, the non-indigenous fill is not considered a chromate-related AOC. However, three soil borings located in the baseball field in the western part of Site 174 could not be completed during the Kimball or Berger investigations due to access issues at that time.

AECOM performed a remedial investigation on the western portion (ball field) of Dennis Collins Park on March 20, 2012 to complete the Site Investigation that was held incomplete by Kimball or Berger investigations. Three soil borings were advanced to native material or a maximum depth of 16 ft bgs (SB-121, SB-122 & SB-123) and soil samples were collected every 2-foot interval from each boring. The samples were analyzed for hexavalent chromium, Eh, pH, and CCPW metals (antimony, chromium, nickel, thallium, and vanadium), and the results are as shown in Tables 8A & 8B.

In summary, the investigation identified the following:

- Hexavalent Chromium: No hexavalent chromium results were detected above the interim NJDEP chromium soil cleanup criteria (“CrSCC”) of 20 milligrams per kilogram (“mg/kg”);
- Antimony: Only one sample had a concentration of antimony (39 mg/kg) greater than the 31 mg/kg NJDEP residential direct contact (“RDC”) soil remediation standard (“SRS”);
- Total Chromium: No chromium was detected at a concentration greater than the CrSCC for trivalent chromium, the criteria generally used to compare total chromium results. One soil sample had a chromium concentration of 193 mg/kg. All of the remaining samples had results less than 68 mg/kg;

- Nickel: All nickel results were below the RDC SRS of 1,600 mg/kg;
- Thallium: Nearly all of the thallium results were below the method detection limit (“MDL”) and are considered as not-detected (“ND”);
- Vanadium: Most of the vanadium results were between 1.2 and 34.8 mg/kg, well below the RDC SRS of 78 mg/kg for vanadium.

4.11.3 Potential AOC 3 – Site-Wide Groundwater

Groundwater has been characterized across Site 174 through the installation of three groundwater monitoring wells (Figure 2). These wells were installed with well screens spanning the water table (MW-01 screened from 4.2 to 9.8 ft bgs; MW-02 and MW-03 screened from 4 to 14 ft bgs) and extend vertically through the full depth of fill. MW-01 was installed in SB-20, the located of the Cr^{+6} soil exceedance. MW-02 is located about 50 ft southwest of MW-01 and about 30 ft west-southwest of AOC-1. MW-03 is located about 160 ft southeast of MW-01 and within about 20 ft of the embankment along the Kill Van Kull shoreline. One round of paired filtered and unfiltered groundwater samples was collected during the 1999 investigation. Exceedances of groundwater quality standards are illustrated on Figure 7.

- Total Cr concentrations in groundwater ranged from not detected to 13.2 µg/L in the unfiltered sample from MW-01. Total Cr concentrations were below the total Cr GWQS of 70 µg/L in all three wells. Cr^{+6} was not detected (reporting limit of 50 µg/L) in any of the groundwater samples analyzed.
- Antimony was not detected in any of the groundwater samples at a reporting limit of 4 µg/L, below the GWQS of 6 µg/L.
- Beryllium was not detected in any of the groundwater samples at a reporting limit of 1 µg/L, less than the GWQS of 20 µg/L.
- Cadmium was not detected in any of the groundwater samples at a reporting limit of 1 µg/L, less than the GWQS of 4 µg/L.
- The concentration of Ni exceeded the GWQS (100 ug/L) in the filtered and unfiltered samples from MW-03 with concentrations of 214 and 236 µg/L in the filtered and unfiltered samples, respectively (Kimball, 2001; Table 6). Nickel concentrations did not exceed the GWQS in MW-02, located within AOC-1 (at SB-20), or at MW-02, located only about 30 ft southwest of AOC-1. The only GWQS Ni exceedance was reported in well MW-03, located about 130 ft southeast of AOC-1 near the Kill Van Kull shoreline. It is unlikely that the Ni concentration in MW-03 is related to the presence of CCPW in AOC-1. It is likely related to the well’s proximity to the Kill Van Kull and/or the urban fill materials that make up the Site.
- Thallium was detected in the filtered sample from MW-02 at an estimated concentration of 6.3 µg/L. Thallium was not detected in the corresponding unfiltered sample at reporting limit of 6 µg/L at MW-02. The reporting limit for Thallium for the 1999 groundwater samples was 6 µg/L, which is greater than the current GWQS of 2 µg/L. Thallium was detected in the unfiltered sample and its unfiltered duplicate sample from MW-03 (6.3 and 9.9 µg/L, respectively). However, Tl was not detected in the filtered sample or it’s duplicate. Thallium was not detected in either the filtered or unfiltered sample from MW-01.

- Vanadium was detected at concentrations ranging from non-detect to 3.3 µg/L, all less than the GWQS of 60 µg/L. All the detections of V were in samples from MW-03.

Chromium concentrations were less than the GWQS in all of the groundwater samples analyzed. Concentrations of Ni and Tl exceeded the GWQS with the highest concentrations and reported in MW-03, the well farthest from the CCPW-related soil contamination in AOC-1. Therefore, Site-wide groundwater is not considered a chromate-related AOC and is not discussed further in the RAWP.

4.12 Historic Fill Material Investigation

Historical information indicates that the Site 174 was constructed by placing fill material on the former riverbank sediments. A total of 45 borings were installed during field investigations between 1998 and 2002 and the presence of fill or fill-related material including ash, cinders, brick, slag, glass, wood, plastic, concrete pieces, and coal fragments at depths of up to 17 feet bgs, was noted in 44 of the 45 borings (Table 4). Kimball noted that:

> Review of historical maps and aerial photographs indicate that the Site was developed by filling former river shoreline and marshland. Results of our investigation confirm the reports the Site was filled with miscellaneous urban fill (Kimball, 2001).

Berger (2003) did not develop any new information regarding the presence, nature, or extent of fill at the Site due to the limited nature of the Berger investigation. Berger utilized information and conclusions from the draft Kimball PSC (July 2000) to assess the extent and nature of fill at Site 174. However, the western edge of Site 174 was not fully characterized, due to Kimball's inability to collect samples from the ball field area. In March 2012, AECOM conducted three soil borings to additionally characterize the fill material in the ball field area. . The borings were extended to native or a maximum of 16 ft. bgs. Review of the boring logs indicates fill or fill-related material is present in all the three borings up to 16 ft. bgs. With the completion of this additional investigation, the requirements for a historical fill investigation have been met.

5 Technical Overview

5.1 Sampling, Laboratory Analysis, and Data Quality Objectives

5.1.1 Previous Investigations

Sampling methodology, laboratory analysis and data quality control for the Preliminary Site Characterization by Kimball (2001), Berger (2003) and AECOM (2012) are included in Appendix C.

5.1.2 Remedial Action Pre-Excavation Sampling Procedures

Soil sampling will be conducted prior to the initiation of RA in AOC-1 to establish the limits of CCPW-related soil contamination and to pre-characterize the material that will be excavated during the RA so that the excavation can be backfilled immediately without leaving the excavation open while awaiting analytical results. These samples will also serve as the post-excavation confirmation samples.

Kimball had collected a waste classification sample near SB-20 within AOC-1, and determined that the soil was not hazardous (Section 3.2.6 of Kimball, 2001). Pre-excavation soil sampling and analysis during the RA will be conducted to fully delineate the lateral extent of CCPW-related metals. Soil samples will be collected at several depth intervals for use as post-excavation sidewall samples and two samples will be collected from a depth comparable to the proposed excavation floor. Sampling will be conducted in accordance with the FSP-QAPP (AECOM, 2010a). The FSP-QAPP is included as Appendix D. Sampling will also be performed in accordance with the Health and Safety Plan ("HASP") (AECOM, 2010b), included as Appendix E of this RAWP.

Visual classification of soil samples will be performed during soil sampling activities. Pre-excavation samples corresponding to the planned bottom depth (about 5 ft bgs) will be collected from within the RA area.

The AOC-1 excavation area proposed in Berger Figure 8 (2003) had a perimeter of about 90 ft. This is expected to increase slightly due to the presence of Sb concentration exceedances of the current SRS in Berger borings S02 and S05. The limits of the excavation will be expanded to address visible evidence of CCPW if it is observed during remediation.

Berger reported that soil boring B03 was 'clean' (criteria not exceeded). However, no soil samples were collected and analyzed within the one to five foot depth range. Therefore, a pre-excavation soil sample will be collected at this location from about 3.5 to 4 ft bgs, based on the Cr^{+6} exceedance in SB-20. The excavation will be bounded by the southwest corner of the restroom, proposed boring S113, Berger boring S04, proposed boring S112 (former Berger boring S03), proposed boring S111, and the southeast corner of the restroom. With these limits, there will be at least one analytical sample collected for every 30 feet of linear distance from a depth corresponding to the sidewall interval of the highest potential contamination.

Based on the limits described above, the proposed excavation area will be about 1,180 square feet ("sf"). Therefore, two bottom samples will be collected to verify that the impacted material has been removed. To achieve this, two pre-excavation soil borings (S114 and S115) will be advanced within the proposed excavation area and soil samples will be collected from the depth interval corresponding to the proposed excavation floor. Additional soil samples from the middle of these two borings (2-3 ft bgs) for waste characterization analysis.

The proposed location of the pre-excavation samples and the rationale for each sample, are presented on Table 9 and illustrated in Figure 2.

5.1.3 Sample Analysis and Quality Assurance

Soil samples for laboratory analysis will be placed in pre-cleaned containers provided by the analytical laboratory. The containers will be clearly labeled with the sample identification, depth, date of collection, and analysis to be performed. Standard chain-of-custody procedures will be followed. Post-excavation soil samples will be analyzed for total Cr and Cr^{+6} (including Eh and pH). One waste classification will be collected and waste characterization parameters will be based on the requirements of the offsite disposal facility.

Sample analyses will be performed by a NJ-certified laboratory. Analyses will be performed in accordance with EPA- and NJDEP-approved analytical protocols and the revised FSP-QAPP. Quality assurance analytical measures will be implemented in accordance with the *Technical Requirements for Site Remediation* (N.J.A.C. 7:26E-2) and will comply with the requirements for a NJDEP-certified laboratory. Quality assurance samples (field blanks and field duplicates) will be collected in accordance with the NJDEP FSPM. Quality assurance samples are not required for waste classification sampling activities.

In general, validation of the pre-excavation in-situ characterization sample data will be conducted using NJDEP validation Standard Operating Procedures ("SOP"s) as discussed in the FSP-QAPP. Guidelines will be adapted for SW-846 methodologies where appropriate.

5.2 Summary of Overall Nature of Contamination

Based on the results of the PSC conducted by Kimball in 1998-1999 and subsequent delineation sampling by Berger in 2002, the primary concern at the Site is the Cr^{+6} contamination located near the existing restroom facility. A Cr^{+6} concentration of 30.5 mg/kg was detected in one soil sample (SB-20, 3.4-4 ft bgs), which exceeded the NJDEP CrSCC of 20 mg/kg. The exceedance was located approximately 15 feet southwest of the restroom at a depth of 3.4 to 4 feet bgs. The location of the exceedance is underneath an asphalt/Permalon liner cap placed at the Site in the mid-1990s to serve as an IRM (Figure 2).

Soil sampling was conducted by Berger in February, 2002 to delineate Cr^{+6} contamination near soil boring SB-20. Field activities were conducted in accordance with the NJDEP-approved *Final Site Characterization Workplan* (Berger, 2003). The investigation included the advancement of five soil borings around SB-20 and the collection and analysis of 32 soil samples. Soil samples were collected continuously from ground surface to native soil at approximately 10 to 12 ft bgs. Possible CCPW was observed in two of the five borings.

The analytical data indicate that Cr^{+6} contamination in the soil is limited to the single exceedance at SB-20 previously reported by Kimball (2001) (Table 5A). Based on horizontal and vertical delineation established from samples at the five locations surrounding the exceedance, the maximum extent of Cr^{+6} contamination (AOC-1) was estimated by Berger to be about 100 cubic yards (about 150 tons). This comprises an area of approximately 550 sf and a depth of 5 ft bgs (Figure 8). In the initial Kimball boring at SB-20, no concentrations of TAL subset metals other than Cr^{+6} exceed NJDEP CrSCC or residential or non-residential criteria. Other TAL subset metals analytes were detected at concentrations exceeding NJDEP criteria at various locations throughout the Site. These concentrations are also typical of historic fill, which is documented to have been used to create this park. Additional sampling proposed to establish the limits of TAL subset metals Sb and V associated with Cr^{+6} in SB-20 may increase these area and volume estimates.

The apparent presence of CCPW in the vicinity of SB-20 does not appear to have adversely impacted groundwater beneath the Site. Cr^{+6} was not detected in any of the groundwater samples collected during previous site investigations (Table 6). Groundwater concentrations of total Cr were less than the applicable NJDEP GWQS. Other TAL metals, including Ni and Tl, were detected above the GWQS; however, these are considered either natural, associated with historic fill beneath the Site, or an effect of regional contamination in the Kill Van Kull, whose surface water is tidally connected with groundwater beneath the Site (Kimball, 2001). The majority of the GWQS exceedances were in MW-03, which is the monitoring well farthest from AOC-1 and closest to the Kill Van Kull.

5.3 Significant Events

No significant events have been identified for Site 174 following the issuance of the RI report by Berger in October 2003.

5.4 Rationale for Variances

Kimball's deviations from the Site Characterization work plan during the PSC are presented in the PSC Report (Appendix C).

Variations from the soil investigation work plan reported by Kimball (2001) include one soil boring that was not advanced due to the presence of overhead utilities and three soil borings that could not be advanced because the City of Bayonne would not allow drilling equipment onto the baseball field. One sample delivery group was lost by the laboratory but the borings were re-sampled at a later date. Several other borings were re-sampled due to quality assurance issues (i.e., rejected analytical data).

Sediment cores were not advanced to the proposed depth of 4 ft bgs due to presence of subsurface obstructions. Sediment samples were not collected at the low tide line due to presence of large boulders placed as shore protection. Oxidation/reduction potential readings obtained during sediment sampling were evaluated as unreliable due to recurrent exceedance of instrument range.

No variations were noted during groundwater sampling and surface water sampling by Kimball (2001).

No variations were noted during the soil investigation by Berger (2003).

5.5 Treatability, Bench Scale, and Pilot Studies

No treatability, bench scale, or pilot studies with the purpose of CCPW remediation have been completed to date at Site 174.

5.6 Data Results to Develop Permit Limitations

No information was collected at the Site 174 for the purpose of developing permit limitations.

5.7 Receptor Evaluations

There are environmentally sensitive areas and/or sensitive receptors located adjacent to the Site, primarily associated with the public parkland and athletic fields (Figure 2). High density residential areas are located north of the Site, across West 1st Street. Potential human receptors include park maintenance personnel and the adjacent businesses or construction workers conducting excavations at the Site that may be exposed to dust impacted by Cr^{+6}. No Cr-related impacts have been observed in the buildings located onsite 174 (Berger, 2003).

An updated receptor evaluation as pursuant to N.J.A.C. 7:26E-1.12 will be submitted under separate cover.

6 Findings/Recommendations

This section was prepared pursuant to N.J.A.C. 7:26E-5.5.

6.1 Soil

6.1.1 AOC 1 - Chromate Chemical Production Waste

Results of the PSC by Kimball (2001) identifiedCr^{+6} contamination near the Denis P. Collins Park restroom facility. The Cr^{+6} concentration in a single soil sample collected from 3.4-4 ft bgs in boring SB-20 was 30.5 mg/kg Cr^{+6}, exceeding the NJDEP CrSCC of 20 mg/kg.

SB-20 is located approximately 15 ft southwest of the park's restroom facility. Visual evidence of CCPW was also noted in the SB-20 interval between the asphalt/Permalon liner cap and 0.8 ft bgs. Additional RI work performed by Berger in 2003 delineated the previously identified Cr^{+6} exceedance reported by Kimball. Based on horizontal and vertical delineation established from samples at five locations surrounding the SB-20 Cr^{+6} exceedance, the maximum extent of Cr^{+6} contamination is estimated at 100 cubic yards (about 150 tons). This comprises an area of approximately 550 sf and to a depth of 5 ft bgs, which is above water table. No additional soil investigation was deemed necessary by Berger (2003).

The focus of this RA is the removal of the Cr^{+6}-impacted material to the established extent.

6.1.2 Non-Indigenous Fill Material

The approximate Site area is 9 acres. Several metals, including Sb, Be, Cd, Ni, and V, were reported at concentrations greater than the most stringent NJDEP cleanup criteria across Site 174 (Figure 3). Due to limited extent of Cr^{+6} and potential CCPW identified at the Site, these TAL metals exceedances appear to be associated with of the non-indigenous urban fill that was used to create the park. Subsurface investigations at the Site confirmed the presence of historic fill material in 44 out of 45 soil boring locations throughout the Site area. Based on Berger's 2003 RI report, no additional soil investigation was deemed necessary.

AECOM investigation of the westerns portion of the Site in March 2012 showed none of the contaminants of concerns exceeded their respective SRS with exception of Antimony in a single sample, and confirmed the presence of historic fill material in all the three borings.

6.2 Groundwater

6.2.1 Site-Wide Groundwater

The presence of CCPW and/or CCPW-impacted material has not adversely impacted groundwater beneath the Site. Cr^{+6} was not detected in any of the groundwater samples collected by Kimball. Total Cr was not detected at concentrations greater than the NJDEP GWQS.

Ni and Tl were detected at concentrations greater than the GWQS in monitoring well MW-03, and Tl was detected above the GWQS in monitoring well MW-02. These exceedances are unrelated to Cr^{+6} or CCPW and are related to the non-indigenous urban fill used to create the Site and from contamination within the Kill Van Kull, whose surface water is tidally connected with groundwater beneath the Site. The highest concentrations Ni and Tl were reported in MW-03, the well farthest from AOC-1 and the nearest to the Kill Van Kull. No Ni or Tl GWQS exceedances were reported n well MW-01 located in the center of AOC-1. Based on these results, no additional groundwater investigation activities were deemed necessary by Berger (2003). However, PPG intends to re-sample the three groundwater monitoring wells during the RA via low-flow sampling methods to confirm previous results.

7 Remedial Action Selection Report

7.1 Proposed Remedial Activities

Based on the locations and concentrations of CCPW-related impacts, remedial actions were evaluated for Site 174 in Dennis P. Collins Park. The following remedial actions were evaluated.

Remedial Action – Soil (permanent/non-permanent)	Cost	Short-Term Effectiveness	Implementability	Community Benefit
Excavation and Disposal	*High*	*High*	*Medium*	*High*
Deed Restriction w/ Engineering Controls	Low	Medium	Low	Medium
No Action	Low	Low	High	Low

7.1.1 AOC 1 - Chromate Chemical Production Waste

As discussed in Section 7.1.1, Cr^{+6} was detected in a soil sample from SB-20 at a concentration greater than the 20 mg/kg CrSCC. Boring SB-20 was advanced within the area currently covered by the asphalt cap/Permalon Liner IRM. Due to the limited area of impact and relatively small footprint of the proposed excavation, the IRM will be removed and the area restored as lawn and paved walking paths upon completion of the RA. Although this is the costliest of the remedial alternatives evaluated, the implementation of this remedial action will provide the highest level of short-term effectiveness and highest benefit to the community.

7.1.2 Non-Indigenous Fill Material

Numerous borings installed as part of previous remedial investigations have identified the presence of non-indigenous fill material across the Site; however, CCPW and exceedances of CrSCC were observed only in AOC-1, the area immediately surrounding SB-20. This area is currently proposed for excavation and disposal as discussed in Section 8.1.1. Due to the absence of any chromate or chromate-related waste impacts in the non-indigenous fill, AECOM recommends no further action for the Site soils outside of AOC-1.

7.1.3 Site-Wide Groundwater

Low-level TAL metal contamination of groundwater was reported in monitoring well MW-03. The sampling methodology used at that time is now considered inappropriate for the contaminants of concern at the Site. Therefore, groundwater samples will be collected from the three Site 174 monitoring wells using low-flow sampling methodology to further assess groundwater quality at the Site and confirm the results of previous groundwater investigations. Based upon these results, additional groundwater sampling may be proposed or a No Further Action ("NFA") determination will be requested for this AOC. If additional groundwater sampling indicates CCPW-related contamination exceeding the GWQS is present at the Site, a Classification Exception Area ("CEA") will be proposed.

7.2 Applicable Remedial Standards

The objective of this RA is to remediate CCPW and CCPW-related impacts in soil at the Site. The COCs in the soil include Cr^{+6} and five of the United States USEPA TAL metals: Sb, Cr, Ni, Tl, and V.

As previously stated, the CrSCC of 20 mg/kg for Cr^{+6} and 120,000 mg/kg for Cr^{+3} will be utilized for soil remediation compliance during this RA.

The concentrations of other metals found in association with CCPW were compared to the most stringent SRS, in accordance with the NJDEP *Guidance Document for the Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation* (NJDEP, 2008).

Previous investigations (NJDEP, 1992; LMS, 1994; Kimball, 2001; Berger, 2003) have focused on total Cr, Cr^{+6}, Cr^{+3}, Sb, Be, Cd, Ni, Tl, and V. Potentially applicable evaluation criteria for the TAL short list metals include:

Contaminant	RDC SRS	NRDC SRS	Historic Fill Maximum	Historic Fill Average
Sb	31 mg/kg	450 mg/kg	NA	NA
Be *	16 mg/kg	140 mg/kg	80	1.23
Cd *	78 mg/kg	78 mg/kg	510	11.15
Ni	1,600 mg/kg	23,000 mg/kg	NA	NA
Tl	5 mg/kg	79 mg/kg	NA	NA
V	78 mg/kg	1,100 mg/kg	NA	NA

NA – Criterion not available
RDC SRS – Residential Direct Contact Soil Remediation Standard
NRDC SRS – Non-Residential Direct Contact Soil Remediation Standard
Historic Fill criteria from N.J.A.C. 7:26E-4.6, Table 4-2.
* PPG is not responsible for delineation or clean-up of Be and Cd impacts

Groundwater results for total Cr were compared to the total Cr GWQS of 70 µg/L. The groundwater data for other metals were compared to the NJDEP Groundwater Quality Standards ("GWQS") at N.J.A.C. 7:9C (NJDEP, 2010).

A site-specific Cr^{+6} criterion for the allergic contact dermatitis endpoint is not required for this remedial action in accordance with NJDEP's February 8, 2007 Chromium Cleanup Policy (NJDEP, 2007a).

7.3 Satisfaction of N.J.A.C. 7:26E-5.5(c) through (e)

This RAWP is in compliance with N.J.A.C. 7:26E-5.5 and satisfies all of the requirements therein. Specifically, this RAWP:

- has selected a remedial action that reduces contamination to below applicable remediation standards or eliminates exposure to contamination above the applicable remediation standards based on the current and future land use for the Site; and

- has determined the appropriate remedial action that will reduce or eliminate exposure to contaminants above the applicable remediation standard that is based on protection of public health, safety, and the environment.

7.4 Protectiveness of Remedial Alternative

The proposed remedial action for the Dennis P. Collins Park will address CCPW-related impacts and reduce the potential for direct contact, inhalation, or ingestion of contaminated soils. The proposed RA will also reduce the potential for future impact to groundwater from CCPW-impacted materials.

8 Remedial Action Work Plan

8.1 Post-Remedial Soil Sampling Summary Table

Pursuant to N.J.A.C. 7:26E-4.2, a post-remedial action soil sampling summary table has been prepared and is included as Table 9, Proposed Confirmation Sample Summary and Rationale.

8.2 Remedial Action Requirements pursuant to N.J.A.C. 7:26E-5

This RAWP was prepared in accordance with the following requirements:

- Technical Requirements for Site Remediation (TRSR), N.J.A.C. 7:26E-6 (NJDEP, 2009b; May 7, 2012);
- Appendix F of the 1990 NJDEP ACO;
- The June 26, 2009 JCO; and,
- July 5, 2012 letter from NJDEP indicating that the RAWP is administratively complete, provided that the following conditions are incorporated:
  - All visible CCPW will be removed during soil excavation activities.
  - Post-remediation soil sampling must be in accordance with the NJDEP's Soil Investigation Guidance Document dated February 12, 2012.
  - The Alternative and Clean Fill Guidance for SRP Sites (NJDEP, December 29, 2011) must be followed for fill imported to the site.
  - Due to the lag between excavation and site restoration, PPG shall provide and maintain temporary erosion control measures during the period between backfilling the excavation and the final restoration.
- NJDEP Soil Investigation Technical Guidance, Site Investigation/Remedial Investigation/Remedial Action (SI/RI/RA), February 21, 2012.

8.3 Applicable Remedial Standards

The CrSCC of 20 mg/kg for Cr^{+6} and 120,000 mg/kg for trivalent chromium ("Cr^{+3}") will be utilized for soil remediation purposes. Additional CCPW-related contaminants of concern include the following TAL Metals where these metals are associated with CCPW-impacted material:

Compound	RDC SRS	NRDC SRS
Sb	31 mg/kg	450 mg/kg
Ni	1,600 mg/kg	23,000 mg/kg
Tl	5 mg/kg	79 mg/kg
V	78 mg/kg	1,100 mg/kg

NA – Standard not available
RDC SRS – Residential Direct Contact Soil Remediation Standard
NRDC SRS – Non-Residential Direct Contact Soil Remediation Standard

Groundwater results were compared to the NJDEP GWQS at N.J.A.C. 7:9C (NJDEP, 2009d). Total Cr results were compared to the Total Cr GWQS of 70 µg/L. Additional CCPW-related contaminants of concern include the following TAL Metals where these metals are associated with CCPW-impacted material:

Compound	GWQS
Sb	6 µg/L
Ni	100 µg/L
Tl	2 µg/L
V	60 µg/L

A site-specific Cr^{+6} criterion for the allergic contact dermatitis endpoint is not required for this remedial action in accordance with NJDEP's February 8, 2007 Chromium Cleanup Policy (NJDEP, 2007a).

8.4 Remedial Action Description

8.4.1 AOC 1 – Hexavalent Chromium Contamination

The 2001 Kimball PSC reported the presence of Cr^{+6} contamination 15 feet southwest of the restroom facility at Site 174. A single soil sample collected from 3.4-4.0 feet bgs in soil boring SB-20 reported Cr^{+6} at 30.5 mg/kg, exceeding the NJDEP CrSCC of 20 mg/kg. Kimball also performed waste characterization analysis on samples from SB-20 and determined that the soils within AOC-1 are not hazardous waste. The location of SB-20 is currently beneath an asphalt/Permalon liner placed at the Site in the mid-1990s to serve as an IRM.

The RI performed by Berger (2003) focused on delineating this Cr^{+6} exceedance. Analytical results from the Kimball and Berger investigations reported that Cr^{+6} contamination was limited to the single exceedance identified in SB-20. Based on horizontal and vertical delineation established from samples at the five locations surrounding the SB-20 Cr^{+6} exceedance, the extent of Cr^{+6} contamination was estimated at 100 cubic yards (about 150 tons). This comprises an area of approximately 550 sf and to a depth of 5 ft bgs and is located above the water table. Additional soil remedial investigation was deemed unnecessary by Berger (2003).

The limits of the proposed excavation area will be re-assessed based upon the pre-excavation soil sampling proposed at the AOC-1 perimeter and excavation floor (Section 5.1.3), and the presence of any visible CCPW observed during excavation activities..

The remedial strategy selected for Site 174 includes the excavation and disposal for Cr^{+6} impacted soils in AOC-1, including all visible CCPW, as discussed in Section 8.1.

8.4.2 AOC 2 – Non-Indigenous Fill Material

Forty-five soil borings were advanced at the Site during the Kimball and Berger investigations to evaluate the nature of fill material used to construct the "made-land" area that later became Dennis P. Collins Park. Possible CCPW was observed in only one soil boring, SB-20, along with two of the five borings advanced to delineate the extent of this contamination. AOC-1, the area surrounding boring SB-20, will be excavated and the material disposed of at a permitted facility.

CCPW was not reported in any other borings advanced throughout the Site during the investigations. Forty-four of the forty-five soil borings conducted during these Site investigations confirmed the presence of non-indigenous urban fill material consisting of soil, cinders, ash, slag, brick, glass, concrete, plastic and wood. Three of the four soil borings proposed during the Kimball PSC that could not be advanced at that time will be completed during the RA to complete the characterization of fill material located in the baseball field at the western portion of the Site, as described in Section 5.1.2.

Based upon the information reported in previous investigations and the proposed removal and disposal of the material in AOC-1, soils containing CCPW and/or CCPW-impacted material will be remediated to concentrations below NJDEP SRS and no Engineered Controls or Deed Notice will be necessary.

8.4.3 AOC 3 – Groundwater Quality

Monitoring wells MW-01, MW-02 and MW-03 were last sampled in 1999 by Kimball Associates. Low concentrations of TAL Metals exceeding the NJ GWQS, specifically Ni, were reported. However, these contaminants are commonly associated with the fill material which is present across the Site and appear to be unrelated to the CCPW found in the soils at AOC-1. The GWQS exceedances were reported in well MW-03, which is the most distant well from AOC-1 and is located near the Kill Van Kull shoreline, an area of known surface water contamination. The three monitoring wells will be resampled during the RA using low-flow sampling methodology. If these results confirm that no CCPW-related groundwater contamination is evident at the Site, no further action will be proposed with regard to groundwater quality.

8.5 Conceptual Engineering Design

The conceptual engineering design outlined for AOC-1 below, discusses the excavation and disposal of the Cr^{+6} contaminated soil to address CCPW impacts and reduce the potential for direct contact, inhalation, or ingestion of CCPW.

8.5.1 Phase I – Groundwater Sampling and Monitoring Well Abandonment

A round of groundwater samples will be collected from the three groundwater monitoring wells at the Site. Monitoring well MW-01 will be decommissioned because it is located within the proposed RA excavation area. Data from the wells will be evaluated and if no CCPW-related impacts are reported, the remaining wells, MW-02 and MW-03, will also be decommissioned. The monitoring wells will be abandoned by a licensed contractor in accordance with the requirements of N.J.A.C. 7:9D.

8.5.2 Phase II – Impacted Soil Removal and Disposal

Upon NJDEP approval of this RAWP, soil within the limits of the planned excavation, including all visible CCPW encountered , will be removed via excavation as illustrated in Figure 8. Based upon the results of the pre-excavation in-situ waster characterization, the excavated material will be direct-loaded onto the trucks and disposed of at a permitted solid waste-management facility. The estimated dimensions of the excavation are 20 ft by 30 ft and extend to a depth of 5 ft bgs. Approximately 110 cubic yards of material (about 150 tons) will be generated for off-Site disposal.

The soils proposed for excavation are located above water table. Therefore, dewatering of the excavation and/or drying the material prior to loading will not be necessary. The Remedial Plan is provided as Figure 8. Engineering plan details and cross sections will be provided following completion of the RA.

Pre-excavation soil sampling will be conducted to characterize the soil in-situ and determine the extent of the excavation prior to remedial activities excavation to facilitate direct load-out of the material and eliminate the need to leave the excavation open overnight. The pre-excavation soil samples will be collected at the frequencies stipulated for post excavation. Based on the proposed excavation dimensions, two base samples and eight sidewall samples (four from top of sidewall and four from bottom of sidewall) will be collected. Samples will be collected using methodology prescribed in the 2005 FSPM and will be submitted to a NJ-certified laboratory for analysis. Proposed analytical parameters include Cr^{+6}, pH, and Eh, as well as CCPW-related metals (total Cr, Ni, Sb, Tl, and V).

Pre-excavation soil analytical results will be compared to the CrSCC and the soil remediation standards presented in Section 1.2. Based upon these results, the extent of the excavation may be adjusted to encompass additional potentially impacted material. Additional post-excavation confirmation samples will be collected and analyzed if needed.

8.5.3 Phase III – Surface Restoration

Approximately 100 cubic yards of certified clean fill will be imported from virgin source to backfill the excavated area to within 6-inches of the ground surface. All applicable requirements of the *Alternative Clean Fill Guidance for SRP Sites* (NJDEP, December 29, 2011), which includes sampling of the material, will be followed for fill imported to the site. The excavation area will be restored to the previous condition with topsoil and grass seed for preexisting lawns or pavement for walkways and aprons.

Other restoration activities will include:

- Removal of the construction access and decontamination pad;
- Clearing truck route roadways of temporary construction equipment;
- Cleaning truck route roadways of residual dust or soil; and,
- Removing temporary signs used for traffic control.

8.6 Soil Reuse Plan

The impacted material excavated from AOC-1 disposed of at a permitted, offsite disposal facility. Therefore, a Soil Reuse Plan is not required.

8.7 Permits

Prior to implementation of RA activities, the following permits will be obtained:

- Permits required by the NJDEP including General Permit GP-15, and an Upland Development Permit;
- Permits required by the City of Bayonne and/or Hudson County including zoning department approval for large excavations, and temporary sidewalk/road closure permits; and,
- Well decommissioning permits.

New Jersey One-Call will be notified prior to intrusive actives to mark out buried utilities. A private utility location/geophysical contractor will be contracted to locate buried utilities in and adjacent to the excavation area. Abandonment or stabilization of subsurface utilities will be coordinated with the appropriate utility companies and the City of Bayonne where necessary. Available utility maps and drawings are in Appendix G.

8.8 Construction Activity Summary

8.8.1 Well Abandonment/Decommissioning

Monitoring well MW-01 is located within the footprint of the proposed excavation and will be decommissioned prior to the implementation of the RA (Figure 2). The well will be decommissioned by a licensed driller in accordance with N.J.A.C. 7:9D. Depending upon the results of groundwater sampling, monitoring wells MW-02 and MW-03 may also be decommissioned during the RA.

Well abandonment reports for the decommissioned wells will be completed by the licensed driller and filed with the NJDEP Bureau of Water Systems and Well Permitting.

8.8.2 Site Preparation and Mobilization

Site preparation activities will include the implementation of soil erosion and sediment control measures, dust control monitoring, and construction of the decontamination/truck washing pad.

The conceptual Site layout including the location of the excavation, exclusion zone, soil loading area, and decontamination pad is provided on Figure 8. Upon selection of the remediation contractor, additional specifications, operation plan, HASP, and contractor-specific documents pertaining to remedial activities will be forwarded to NJDEP.

8.8.3 Site Truck Routes

The remediation consultant will follow the Traffic Safety and Control Plan as documented in this section. The parking lot nearest to the remediation area will be closed to the public during remediation activities. Access to AOC-1 will be through this parking area. In the event multiple trucks are onsite at the same time, all trucks not being loaded will be directed to a designated truck staging area.

A decontamination/truck washing pad will be used for decontamination of construction equipment leaving the exclusion zone. Each truck will be inspected, decontaminated, and have the wheels and undercarriage cleaned prior to leaving the Site to prevent the tracking of soils off Site. Inspection and cleaning of trucks is discussed in the Dust Control Plan (“DCP”) discussed in Section 8.9.2.

8.8.4 Buried Utilities: Location and Handling

Copies of sewer and water utility and design drawings for the park provided by the City of Bayonne will be used to identify buried utilities prior to RA implementation. New Jersey One-Call will be notified prior to the implementation of invasive activities at the Site to mark-out subsurface utilities. A geophysical contractor specializing in subsurface utility location will be hired to provide a more detailed utility survey, particularly in and adjacent to the proposed excavation area in AOC-1. Subsurface utility locations will be clearly marked in the field to avoid damage and to provide the information needed for temporary decommissioning or stabilization where needed.

The remediation consultant will discuss the project directly with the Bayonne Water Department, the local gas company, the local electrical company, and other applicable utility companies. If necessary, the site engineer will meet the utility company’s onsite to discuss the project before beginning the excavation. The remediation manager will have emergency phone numbers for each utility readily available during invasive activities.

A 48-inch concrete sewer pipeline transects the proposed excavation area. Appropriate precautions will be taken so as not to damage this pipeline. Review of utilities drawings for the park improvements (Bayonne Office of the Engineer, 1980) do not indicate the presence of electric or water lines within the excavation area. However, if buried utilities are encountered, work will stop until the utility is temporarily decommissioned or stabilized and it is safe to proceed.

8.8.5 Dewatering

The proposed excavation will extend to about 5 ft bgs, which is expected to be above the groundwater table based upon Berger's 2002 RI. Therefore, dewatering of the excavation is not anticipated. If the excavation is extended below the water table, dewatering activities will be initiated. A sump collection system will be utilized to pump groundwater from the excavation for storage in tanker trucks or temporarily tanks. Water will be disposed of onsite at a permitted disposal facility.

8.8.6 Excavation Protocols, Field Screening, Sampling, and Analysis

Based on the Berger RIR, the total excavation depth is expected to be 5 ft bgs. The excavation will be closely monitored by PPG's remediation consultant.

In-situ waste characterization sampling will be conducted prior to the commencement of the RA within AOC-1. Soil borings will also be advanced prior to RA activities to identify the limits of the excavation and serve as post excavation samples. This pre-excavation characterization and sampling will expedite the remediation, transportation, and disposal of the impacted material and restoration of the Site in a timely manner to minimize impacts on the park and local residents.

Approximately 100 cubic yards of material will be excavated during RA activities. Excavation limits and post-excavation soil sample locations will be surveyed following the completion of the excavation to document the remediated areas. Receiving facility weight tickets will be used to document the quantity of soil disposed.

8.8.7 Loading and Disposal

Excavated materials will be direct-loaded into trucks for onsite disposal. Trucks will be washed with a low pressure rinse and bed liners will be installed in each truck upon entering the Site. Wash water will be collected and routed to temporary onsite storage tanks for disposal. Trucks will then be carefully loaded in the designated loading area within the exclusion zone. Truck drivers will not be allowed to leave their vehicle upon entering the exclusion zone. Once the trucks are filled, the liners will be closed by onsite personnel and each truck will be inspected and decontaminated prior to leaving the Site. Each truck will be inspected prior to leaving the Site and additional washing and/or decontamination will be conducted as needed.

Soil washed from trucks and wash water will be collected in a the decontamination area. Water will be directed to temporary storage tanks and the soil will be placed in drums or a lined roll-off container for disposal at an onsite facility. Applicable manifesting, licensing procedures, transportation requirements, and disposal requirements will be observed.

The excavation and backfilling of AOC-1 is expected to be completed in a single day. Site restoration activities will be conducted during the following few days.

8.8.8 Excavation Demobilization

Excavators and other equipment utilized during excavation activities will be decontaminated by high pressure water and/or steam prior to removal from the Site. Soil and/or water produced during decontamination activities will be containerized and removed from the Site on the same day if possible or secured for removal the next day. Decontamination fluids and solids will be transported to a staging area designated by PPG (i.e. Site 114) for characterization and future disposal. Water storage tanks will be decontaminated and removed from the Site.

The decontamination areas, debris, and trash will be removed and disposed of as appropriate. Infrastructure damaged as a result of RA activities will be returned to pre-existing conditions following conclusion of field activities. Site features will be returned to pre-existing conditions following conclusion of RA field activities.

8.9 Soil Erosion, Sediment Control, and Air Monitoring

Due to the limited extent of the proposed excavation, a Soil Erosion and Sediment Control Plan is not required. However, prudent soil erosion and sediment control procedures will be implemented during remedial activities. PPG shall provide and maintain temporary erosion control measures during the period of time between when backfilling of the excavation and final restoration as described in Section 8.11.

Air monitoring and dust control programs will be implemented to verify that excavation and intrusive activities pose no air quality hazard. The program will consist of perimeter monitoring prior to commencement of field activities to establish baseline conditions, and perimeter, exclusion zone, and personnel monitoring during the excavation. AECOM's generic air monitoring plan for ground intrusive activities for PPG sites is included in Appendix H. Each monitoring procedure is described briefly below.

8.9.1 Air Monitoring Procedures

An air monitoring and dust control program will be implemented for the RA. The program will consist of perimeter and personnel monitoring during the ground-intrusive activities. Exclusion zone and personnel air monitoring procedures are outlined in HASP.

Based on the limited size of the proposed excavation, short duration of remedial activities, and low level of contamination at Site 174, the default National Ambient Air Quality Standard value of 150 micrograms per cubic meter ("µg/m^3") for particulate matter of less than 10 micrometers ("µm") in diameter (PM_{10}) will be applied in the following manner:

- **Alert Level:** If the downwind PM_{10} particulate level is 100 µg/m^3 greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind PM_{10} particulate levels do not exceed 150 µg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

- **Action Level:** If, after implementation of dust suppression techniques, downwind PM_{10} particulate levels are greater than 150 µg/m^3 above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM_{10} particulate concentration to within 150 µg/m^3 of the upwind level and in preventing visible dust migration.

8.9.1.1 Portable Air Monitoring Stations

An air monitoring network will be installed at Site 174 to monitor potential fugitive emissions from remedial activities on a real-time basis. The network will consist of three portable air monitoring ("PAM") stations of which one PAM station set up along the northern Site 174 border between the excavation area and housing complex residents, one station will be used to monitor upwind conditions, and one station will monitor downwind conditions. Locations of air monitoring stations may change to reflect specific Site activities, wind conditions, and/or accessibility.

8.9.1.2 Portable Hand-Held Monitors

During active work periods, measurements from the perimeter monitoring network will be supplemented with data collected by the air monitoring technician at the Site border immediately downwind from the work areas using hand-held measurement devices. Hand-held measurements for PM_{10} will be conducted routinely every one to two hours throughout active work periods. In addition to PM_{10} measurements, the field staff will also make routine observations of visible dust during excavation activities.

8.9.1.3 Meteorological Monitoring

Wind direction will be monitored during invasive activities and the air monitoring program will be modified as appropriate with changing wind direction and weather conditions. Due to the limited scope of work, additional meteorological monitoring is not necessary.

8.9.1.4 Real-Time Notification of Elevated Concentrations

In the events of PM_{10} concentrations exceeding the Alert and/or Action Levels, a field technician will perform an evaluation of Site conditions/equipment calibration records and a preliminary validation of real-time data. If the elevated concentrations are determined to be caused by Site activities, the field technician will inform the remediation consultant so that appropriate actions can be taken. An exceedance of Alert and/or Action Level will result in the mitigation actions previously outlined.

8.9.1.5 Pre- and Post-Remediation Air Monitoring Activities

Real-time air monitoring (PAM, hand-held, and meteorological) sampling will be conducted prior to the start of Site remediation activities. Real-time air monitoring will be conducted for a period of at least one hour prior to implementation of intrusive field activities to establish baseline concentrations for the Site.

8.9.1.6 QA/QC Procedures

Real-Time Air Monitoring – A field log book and instrument calibration field forms, along with data listings, will be maintained by the remediation consultant throughout the sampling effort. Information to be recorded will include a description of field activities, locations of air monitoring equipment, recorded PM_{10} concentrations, calibration results, weather conditions, start and stop times, and any unusual situation which may affect air monitoring.

Instrument Calibration – Air monitoring instrumentation will be calibrated on a daily basis in accordance with the manufacturers' recommended procedures.

Data Review – Air monitoring data are subject to routine QC checks. This will include verification of monitoring periods, equipment operation, and calibration verification.

8.9.2 Dust Control Procedures

As the intrusive activities are expected to occur above the water table, dusty conditions may be encountered. Therefore, the following Dust Control Procedures ("DCP") will be used for Site 174 remedial activities.

8.9.2.1 Potential Sources of Dust

Approximately 150 tons of impacted soil will be removed from the Site from a limited excavation area (Figure 7). The table below describes dust control measures to be conducted during the remedial activities:

Activity	Proposed Controls
Excavation Above Water Table	Water spray/mist, adjust excavation rate, suspend work under unfavorable conditions (very dry/high winds)
Truck Loading	Water/surfactant spray, control loading rate and drop height, load waste into lined truck beds and cover once loading is completed
Clean Backfill Placement	Water spray/mist

8.9.2.2 DCP Goal

The goal of the DCP is to reduce potential dust generation from Site activities to the extent feasible. A tiered approach will be used for dust/air monitoring with specialized equipment. Exclusion zone and perimeter monitoring units will be utilized for dust monitoring and to initiate control activities (Figure 7). The exclusion zone unit will collect 5-minute dust averages which will be compared to the Site-Specific Action Levels and will be considered a first line of defense for managing dust control at the Site. The perimeter air monitoring locations will collect 15-minutes dust averages which will also be compared to the Site-Specific Dust Action Levels.

If the action level at the exclusion zone is exceeded, additional dust control measures will be implemented. Should action levels at the perimeter be exceeded at a sustained level (15-minute average above background) due to onsite activities, the work will be terminated until controls can be enacted which to rectify the situation. Should any visible dust be seen within the exclusion zone or at the Site perimeter, control measures will be implemented immediately, even if action levels have not been exceeded. Air monitoring personnel will be monitoring the perimeter for visible dust emissions.

8.9.2.3 Identification of Proactive and Responsive Controls

Site activities will be confined to the northern part of the Site. Excavation, soil loading, and decontamination will be conducted in this area. Trucks will be allowed to travel only along specified onsite travel routes. Travel routes will be clearly marked in the field. If high winds and/or dry conditions cause dust problems that cannot be mitigated using dust control measures, Site activities will be postponed until more favorable weather conditions return.

8.9.2.4 Dust Control Application Protocols

Workers will be trained to identify potential sources of dust and responsive controls for dust mitigation. Dedicated dust control personnel will operate dust suppression equipment. The work area will be kept clean and free of debris to reduce fugitive dust and dust suppression equipment will be maintained in a proper working order and in assigned work areas. The following general procedures will be implemented to control the generation and migration of dust during remedial activities:

- Water or water/surfactant mixture will be applied directly to the active excavation, loading and/or hauling operations so that fugitive dust is minimized. Water spray/mist will be applied via a typical garden hose nozzle with mister setting.

- In the event trucks have collected dust during loading activities, the affected area(s) will be rinsed off prior to departure from the Site. Rinse water will be collected in containers and managed appropriately.

- Spilled soil material within the loading and work areas will be immediately collected and managed.

8.9.2.5 Personnel

Dedicated dust control personnel will be onsite throughout remedial activities. These personnel will be familiar with dust mitigation protocols, equipment, materials, and methods of application relating to the control of dust at the Site.

8.10 Health and Safety Plan and Field Sampling Plan/Quality Assurance Project Plan

A Field Sampling Plan – Quality Assurance Project Plan ("FSP-QAPP") is available under separate cover (Appendix D). A Health and Safety Plan ("HASP") was also developed for remedial actions that will be performed at the PPG Non-Residential Chromate Chemical Production Waste Sites and is available under separate cover (Appendix E). These two documents describe health and safety protocols and the quality assurance requirements applicable to non-residential CCPW sites for which PPG has responsibility.

The HASP establishes general health and safety protocols to be followed by site personnel during implementation of the RAWP. The HASP describes training, medical surveillance, personnel hygiene practices, hazard exposure monitoring, and monitoring equipment maintenance requirements. It is a dynamic document, which will be updated as needed to address issues that may be encountered during the RA.

The FSP-QAPP establishes the overall quality assurance ("QA") objectives for the RA program and documents sampling and analytical procedures to be used for collecting and analyzing environmental samples. It describes procedures for equipment decontamination, sample handling, sample chain-of-custody protocols, and standard QA procedures for conducting the RA. The FSP-QAPP will be updated as conditions warrant. The FSP-QAPP was prepared to address the requirements presented the ACO.

8.11 Site Restoration

Certified clean fill will be imported from virgin source (i.e., quarry) to backfill the area to within six inches of the original surface grade. The excavation area will be restored to the previous conditions or better. Existing curbing, sidewalks and/or asphalt will be replaced as necessary. Topsoil and grass seed or sod will be installed over clean fill material in existing grass areas to return the Site to original elevations.

Other surface restoration activities include:

- Removal of the construction access and decontamination pad;
- Clearing truck route roadways of temporary construction equipment;
- Cleaning truck route roadways of residual dust or soil;
- Removing temporary signs used for traffic control; and
- Restoring permanent vegetative growth.

8.12 Demolition, Demobilization and Removal of Remedial Structures

This RAWP does not require the installation of remedial structures. Therefore, demolition, demobilization, and removal of structures will not be necessary.

8.13 Treatment and Disposal Methods

Waste characterization sampling will be conducted during the pre-excavation soil boring program. Impacted soils can then be excavated and loaded directly onto trucks and hauled onsite to a permitted solid waste facility. The excavation will not extend below the water table; therefore, there should not be a need for dewatering. However, if dewatering becomes necessary, groundwater will be pumped from the excavation and into holding tanks or tankers for onsite disposal at a permitted facility.

8.14 Remedial Action Cost Estimate

Estimated costs for implementation of this RAWP (in 2012 dollars) range from $89,000-$100,000.

8.15 Remedial Action Schedule

Non-intrusive RA activities such as groundwater sampling can commence shortly after NJDEP approval of the RAWP. Intrusive activities such as soil borings, well abandonment, and excavation, will be conducted in the late fall or winter season when use of the park and pedestrian traffic is minimal. The expected schedule follows N.J.A.C. 7:26E-5.5 and is as follows pending NJDEP approval and permits:

- Groundwater Sampling – October 2012
- MW-01 well decommissioning – November 2012. Wells MW-02 and MW-03 may be decommissioned as well, depending upon groundwater analytical results.
- Soil borings will be advanced for pre-excavation delineation, “post-excavation” confirmation sampling, and in-situ waste characterization. – November 2012
- Excavation and soil remediation – December 2012
- Site restoration – December 2012
- Grass seed or sod for lawn repair – April or May 2013
- Remedial Action Report (“RAR”) will be submitted to NJDEP in July 2013.

This schedule is contingent based on receipt of NJDEP approval, permit approval, weather, conditions encountered in the field, contractor availability, etc. A more detailed schedule will be provided as part of the JCO Master Schedule upon approval by the JCO Administrative Team (Appendix F)

8.16 Draft Deed Notice

A Deed Notice will not be required, as AOC-1 soils will be remediated to levels below the NJ RDC SRS and CrSCC.

8.17 Classification Exception Area

Monitoring wells MW-01, MW-02, and MW-03 were last sampled in 1999 by Kimball Associates. Ni and Tl were reported at concentrations exceeding the GWQS. However, these contaminants are commonly associated with non-indigenous fill material found throughout the Site and are not likely associated with CCPW impacts. None of the CCPW metals were reported above the GWQS in MW-

01, the monitoring well installed in the CCPW-impacted soils within AOC-1. As there is no evidence that the CCPW has impacted groundwater quality, no Classification Exception Area will be established.

8.18 Engineering and Institutional Control Monitoring Plan

CCPW-impacted soils will be removed from the Site and disposed of during the RA and the Site will be restored to pre-excavation conditions. Therefore, no engineering or institutional controls will be necessary.

There are two IRMs currently onsite. One of the IRMs, the Permalon liner and asphalt cap located in AOC-1, will be removed during the RA. The second IRM consisted of rip-rap placed along the shoreline of the Kill Van Kull (Figure 2). This IRM was installed during the mid-1990s based upon analytical data indicating the presence of Cr exceeding the chromium cleanup criteria in effect at that time. Soil borings were advanced along the Kill Van Kull shoreline and sediment samples were collected during the Kimball PSC investigation (2001). CCPW material was not observed in these borings and concentrations of Cr and Cr^{+6} did not exceed the current CrSCC.

Additional rip rap has been placed along the Kill Van Kull shoreline as a shoreline stabilization and erosion control measure. Therefore, the rip-rap originally placed as an IRM will remain in-place for shoreline stabilization and erosion control along the Kill Van Kull. However, it will no longer be considered an IRM. Therefore, IRM inspection and maintenance is not proposed.

8.19 Engineering Design, Construction, Operation, and Maintenance Schedule

No engineered controls will remain in-place. Therefore, no design, construction, operation, or maintenance schedule will be necessary.

8.20 Satisfaction of Permit Requirements

Copies of permits and compliance requirements will be included as appendices to the RAR which will be submitted following the completion of RA field activities.

8.21 Operation, Maintenance, Monitoring and Reporting Requirements

8.21.1 Soil

If unrestricted residential use goals are achieved, no long-term post remedial monitoring will be required. In the event that remedial goals are not met and an engineering control is used, the updated Deed Notice provided in the forthcoming RAR will define the monitoring and certification requirements. However, at this time, it is PPG’s intention to meet the criteria for unrestricted use.

8.21.2 Groundwater

No long-term groundwater monitoring is proposed. Existing well MW-01 is located within AOC-1 and will be decommissioned during the RA. Monitoring wells MW-02 and MW-03 area also proposed for decommissioning, pending results of groundwater sampling.

8.22 Performance Evaluation

As discussed in Section 8.5.1, the three onsite groundwater monitoring wells will be sampled to determine compliance with NJDEP GWQS for CCPW-related metals. In the event analytical results demonstrate compliance, no further monitoring will be performed. However, if groundwater results are not in compliance with the GWQS, a CEA with an appropriate groundwater monitoring schedule will be prepared and will be provided in the RAR.

Compliance with the NJ SRS will be addressed using the analytical data from the pre-excavation soil delineation and characterization borings. The analytical samples collected from these borings will serve as the post-excavation confirmation samples for RA compliance.

Performance and effectiveness of the proposed remedial actions will be demonstrated through the evaluation of analytical data and submittal of the RAR.

8.23 Historic Fill Compliance Statement

Previous remedial investigations performed at the Site have identified non-indigenous urban fill material across the Site. CCPW-impacted fill will be removed and disposed during the RA. The remaining fill material is unrelated to CCPW material and will be the responsibility of the Site owner.

9 References

NJDEP, 2012. *New Jersey Administrative Code Chapter 26E, Technical Requirements for Site Remediation,* N.J.A.C. 7:26E.

AECOM, 2010a, *Field Sampling Plan-Quality Assurance Field Sampling Plan / Quality Assurance Project Plan Non-Residential Chromium Sites, Hudson County, New Jersey,* February 2010.

AECOM, 2010b, *Health & Safety Plan, Environmental Site Investigations, PPG Sites, Jersey City, New Jersey*, September 2010.

Berger (The Louis Berger Group, Inc.), 2001. Final Site Characterization Workplan. Remedial Investigation and Remedial Alternatives Selection Evaluation, Site 174 – D.P. Collins Park. Submitted to NJDEP by The Louis Berger Group, Inc. October.

Berger, 2003. Final Remedial Investigation Report, Hudson County Chromate Orphan Sites Group I: Site 174 – Dennis P. Collins Park. Remedial Investigation and Remedial Alternatives Selection Evaluation. Submitted to NJDEP, October 2003.

City of Bayonne, 2001. *Master Plan Land Use Map,* Division of City Planning, March 9, 2001.

Environmental Data Resources, Inc., November 2009. *Certified Sanborn® Map Report, West 2d Street and Avenue C, Bayonne, New Jersey 07002, Inquiry Number 2975964.2*.

Environmental Data Resources, Inc., November 2009. *EDR Aerial Photo Decade Package, Site 174, 45 Linden Avenue East, Jersey City, New Jersey 07305, Inquiry Number 2643727.35*. November 23, 2009.

Environmental Data Resources, Inc., November 2009. *EDR Historical Topographic Map Report, 145 West 1st Street, Bayonne, New Jersey 07002, Inquiry Number 2643727.22*, November 23, 2009.

Geraghty, J., 1959. *Ground-Water Problems in the New York City Area, New York Academy of Sciences,* Volume 80: 1049-1059.

Herpers, H. and Barksdale, H.C. 1951. *Preliminary Report on the Geology and Groundwater Supply of Newark, New Jersey Area*: New Jersey Division of Water Resources Special Report SR-10, 52p.

Hudson County Chromium Sites Status Report, October 2007.

HydroQual, Inc. (2006). *Newark Bay Study. Final Modeling Work Plan Addendum* prepared under contract to Malcolm Pirnie for US Environmental Protection Agency and US Army Corps of Engineers, September 2006.

Kimball (L. Robert Kimball and Associates, Inc.), 1998a. Background Investigation Report. Final. Site 174 – Dennis P. Collins Park. Prepared for NJDEP Division of Publicly Funded Site Remediation by L. Robert Kimball & Associates, Inc. April.

Kimball, 1998b. Final Site Specific Work Plan and Site Health and Safety Plan, Site 174 – Dennis P. Collins Park. Prepared for NJDEP Division of Publicly Funded Site Remediation by L. Robert Kimball & Associates. April.

Kimball, 2001. Final Preliminary Site Characterization Report with Final Site Characterization Recommendations, Site 174 – Dennis P. Collins Park, Hudson County, New Jersey, Submitted to NJDEP in June 2001.

Lawler, Matusky, & Skelly. (LMS), 1993. Bayonne Park Site Plan, Drawing 24. Prepared for NJDEPE Division of Publicly Funded Site Remediation. Hudson County Chromate Sites Interim Remedial Measures. August 31, 1993.

Lawler, Matusky, & Skelly. (LMS), 1994. Hudson County Chromate Site Interim Remedial Measures Engineering Design, Field Sampling and Testing Results. Prepared for NJDEPE Division of Publicly Funded Site Remediation. Excerpts as provided in Kimball, 1998a.

Leir, R. 2006. *Bayonne toxic site fight goes to court*, Article in The Jersey Journal, October 4, 2006. On line summary accessed April 2011 at http://www.tceblog.com/category/litigationlaw/page/2/).

Lyttle, P.T., and Epstein, J.B., 1987. *Geologic Map of the Newark 1 x 2 Quadrangle, New Jersey, Pennsylvania, and New York* U.S. Geological Survey Miscellaneous Investigations Map 1715, 2 sheets, Scale 1:250,000.

Michalski, A. 1990. *Hydrogeology of the Brunswick (Passaic) Formation and Implications for groundwater Monitoring Practice*. Groundwater Monitoring Review *10:4* 137-143.

. Nationwide Environmental Title Research LLC (NETR), 2011, collection of historic aerial photographs.

New Jersey Department of Environmental Protection (NJDEP), 2009a. *New Jersey Administrative Code Chapter 26D, Remediation Standards,* N.J.A.C. 7:26D.

NJDEP, 2009b. *New Jersey Administrative Code Chapter 26E, Technical Requirements for Site Remediation,* N.J.A.C. 7:26E.

NJDEP, 2009c. *New Jersey Administrative Code Chapter 9B, Surface Water Quality Standards,* N.J.A.C. 7:9B.

NJDEP, 2009d. *New Jersey Administrative Code Chapter 9C, Groundwater Quality Standards,* N.J.A.C. 7:9C.

NJDEP, 2009e. *New Jersey Administrative Code Chapter 26C, Administrative Requirements for the Remediation of Contaminated Sites,* N.J.A.C. 7:26C.

NJDEP, 2008. *Guidance Document for the Development of Site-Specific Impact to Groundwater Soil Remediation Standards Using the Soil-Water Partition Equation,* revised December 2008.

NJDEP, September 2008. *Chromium Soil Cleanup Criteria*.

NJDEP, 2007a. *NJDEP Commissioner Jackson's February 8, 2007 Memorandum Regarding Chromium Moratorium.*

NJDEP, 2007b. *New Jersey Administrative Code Chapter 7:9D, Well Construction and Maintenance; Sealing of Abandoned Wells.* N.J.A.C. 7:9D.

NJDEP, 2006. New Jersey Integrated Water Quality Monitoring and Assessment Report 2006, Trenton, New Jersey. December.

NJDEP, August 2005. *Field Sampling Procedures Manual*.

NJDEP, 1999. *Bedrock Geology for New Jersey*, NJDEP, Office of Geographic Information Systems (OGIS), Trenton, New Jersey, 1999.

NJDEP, 1992b. Data for Soil Sample 21156 (June 18, 1992 sample)

NJDEP, 1992a. Letter from Ronald T. Corcory, Assistant Director, Responsible Party Cleanup Element, to Richard A. Rutkowski, Mayor, City of Bayonne. Re: Addition of Dennis P. Collins Park to known chromate site list as Site 174. July 13, 1992.

NJDEP, 1992c. Data for soil Samples 21192 – 21196 (July 15, 1992 samples). Reported August 1992.

NJDEP, 1986. Wetlands of Hudson County, New Jersey, NJDEP, Trenton, New Jersey.

New Jersey GIS, 2007. *2002 Land Use/Landcover of New Jersey Web Map Service,* Trenton, New Jersey, 2007.

New Jersey Office of Information Technology (NJOIT), 2009. *New Jersey 2007-2008 High Resolution Orthophotography*, NJOIT, Office of Geographic Information Systems, Trenton, New Jersey, 2007.

T&M Associates, 2009. *Jersey City Master Plan Circulation Element,* Amended July 14, 2009.

USGS, 1967. *Jersey City-NJ-NY Jersey City Topographic Quadrangle*, 7.5 Minute Series, Photo revised 1981.

USGS, 1898, *Staten Island-New Jersey Topographic Quadrangle*, 15 Minute Series.

10 Certification

Pursuant to N.J.A.C. 7:26C-1.5(a), a completed and signed NJDEP Remedial Action Workplan Form is included as Appendix L.

Tables

Figures

Appendices

Appendix A

Sanborn Maps

Appendix B

Historic Aerial Photos

Appendix C

Selected Information from Previous Investigations

Appendix D

Field Sampling Plan – Quality Assurance Project Plan

The project FSP-QAPP is under a separate cover and is available on request.

Appendix E

Health and Safety Plan

The project HASP is under a separate cover and is available on request.

Appendix F

Project Schedule

The Project Schedule will be developed upon selection of a Contractor and award of the Remedial Action work.

Appendix G

Utility Maps

Appendix H

Air Monitoring Plan

Appendix I

AECOM 2012 Investigation Boring Logs and Data Validation Report

Appendix J

AECOM 2012 Investigation Lab Data Report

Appendix K

AECOM 2012 Investigation EDD

Appendix L

NJDEP Remedial Action Workplan Form