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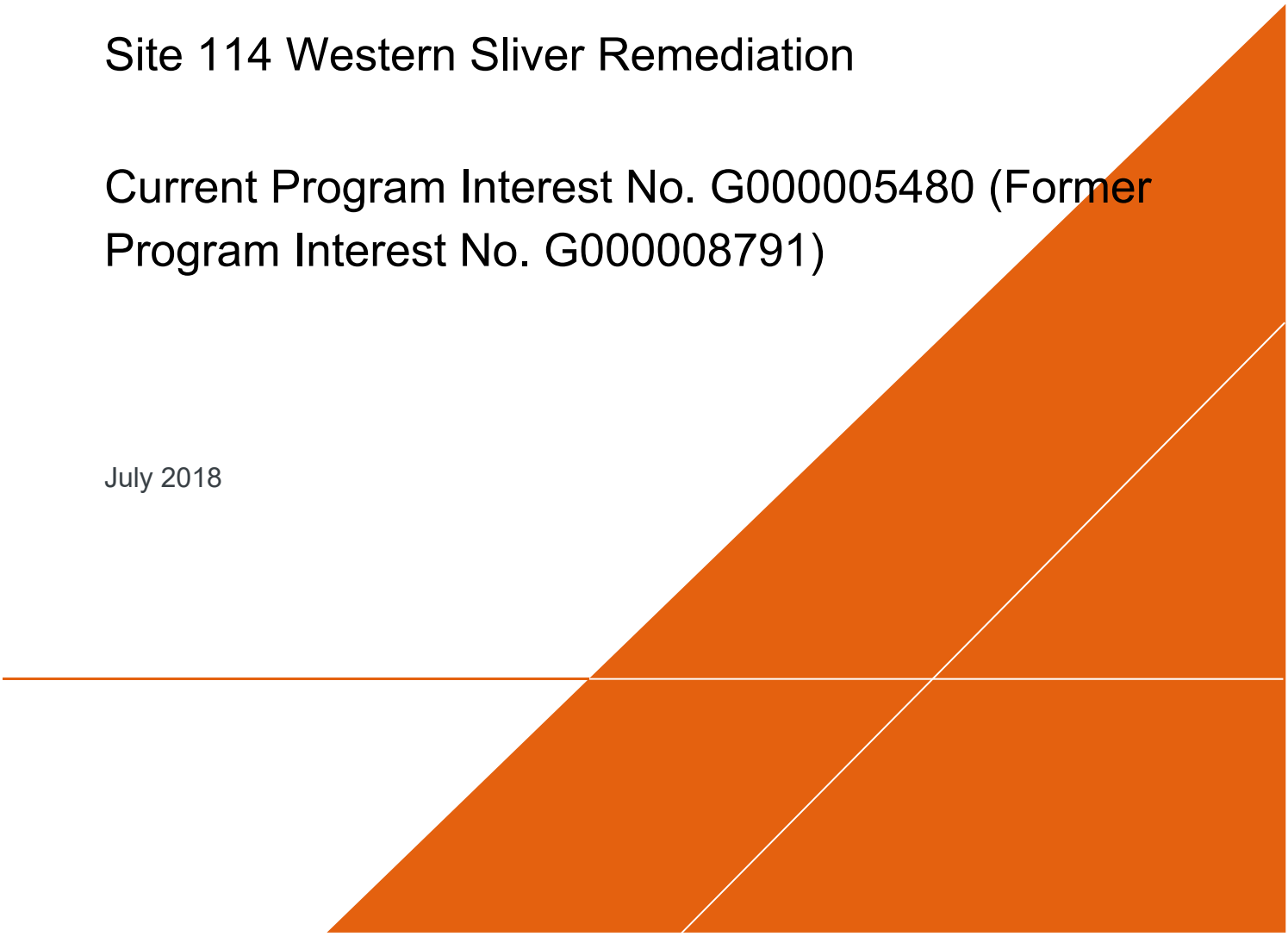
PPG Garfield Avenue Group Sites

REMEDIAL ACTION WORKPLAN ADDENDUM

Site 114 Western Sliver Remediation

Current Program Interest No. G000005480 (Former Program Interest No. G000008791)

July 2018



REMEDIAL ACTION WORKPLAN ADDENDUM

Site 114 Western Sliver Remediation

PPG Garfield Avenue Group Sites
Jersey City, New Jersey

Current Program Interest #G000005480
(Former Program Interest #G000008791)

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Our Ref.:
NP000776

Date:
July 2018

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1 INTRODUCTION

Arcadis U.S., Inc. (Arcadis), on behalf of PPG, is submitting this addendum to the *Draft Remedial Action Work Plan (Soil), Garfield Ave Group* (AECOM 2012) which was conditionally approved by the New Jersey Department of Environmental Protection (NJDEP) for the PPG Garfield Avenue Group Site 114 (hereinafter "Site") on May 14, 2012. The Site is located in Jersey City, New Jersey. The current Site Remediation Program Interest (SRPI) No. is G000005480 (the former SRPI No. was G000008791). SRPI No. G000005480 was created in June 2018, to replace SRPI No. G000008791. A Site location map is presented on Figure 1, and a Site plan showing existing Site features is included on Figure 2.

On September 21, 2017, NJDEP issued a Permit by Rule (PBR) Discharge Authorization to allow for the recovery and treatment of contaminated groundwater, as well as implementation of in-situ remediation of contaminated groundwater at Site 114. An amendment to this PBR was approved by NJDEP on March 29, 2018 to allow for injection of emulsified vegetable oil (EVO) solution to treat soils in a portion of the Site referred to as the "Western Sliver". That PBR Modification Request and NJDEP email approval are included in Appendix A. The injection of EVO solution in the Western Sliver area is designed to reduce residual hexavalent chromium in soil and groundwater to trivalent chromium in this portion of the Site with residual chromium impacted soil.

The Remedial Action Work Plan (RAWP) Addendum has been prepared in accordance with the New Jersey Administrative Code (N.J.A.C.) 7:26E – *Technical Requirements for Site Remediation* (last amended on May 7, 2012), the *In Situ Remediation: Design Considerations and Performance Monitoring Technical Guidance* (NJDEP – October 2017), and *Technical Guidance for Site Investigation of Soil, Remedial Investigation of Soil, and Remedial Action Verification Sampling for Soil* (NJDEP – March 2015). All proposed field activities will be conducted in accordance with the NJDEP's *Field Sampling Procedures Manual* (August 2005).

Information regarding the Site's history, environmental setting, land use, geology and hydrogeology, and historical investigations have been submitted to the NJDEP in the *Draft RAWP (Soil), Garfield Ave Group* (AECOM 2012).

2 SITE-SPECIFIC CONSTITUENT OF CONCERN AND APPLICABLE REMEDIATION STANDARD

The site-specific constituent of concern that will be targeted by the remedial action presented herein is hexavalent chromium. The applicable Soil Cleanup Criterion (SCC) for hexavalent chromium is 20 milligrams per kilogram (mg/kg), which is the non-residential SCC (as listed in the NJDEP's *Chromium Soil Cleanup Criteria* Guidance Document dated September 2008 and revised in April 2010).

3 PROPOSED REMEDIAL ACTION APPROACH

The proposed remedial action will be targeting Western Sliver soils containing residual hexavalent chromium at depths ranging between 13 feet and 20 feet below grade, where hexavalent chromium was detected at levels above the applicable SCC (Figure 2). Specifically, the remedial action will be

performed in a portion of Grids A5B, A6B, A7B, and B7B, as shown on Figure 2. This area encompasses historical boring locations 114-A6B-WS and 114-AB7B-WS which exhibited exceedances of the non-residential SCC for Cr(VI). The exceedance at soil boring location 114-A5B-WS is compliant with the Chromium Policy per the Method to Determine Compliance because this sample is located within undisturbed native deposits (UND), with clean UND above it. Therefore, this exceedance is associated with groundwater, not source material, and serves as a clean boundary condition to the south. The clean boundary to the north of the treatment area is Grid B8B, where soils were previously excavated to 20 feet below grade.

3.1 Description of the Remedial Technology

The remedial technology employs delivery of an organic carbon substrate, EVO, into the impacted soil to stimulate native microorganisms and promote the development of an in-situ reactive zone (IRZ). Within the IRZ, fermentation of the organic carbon substrate promotes development of iron- and sulfate-reducing conditions that are favorable for the reduction of Cr(VI). Under these conditions, Cr(VI) will be reduced to trivalent chromium [Cr(III)] through reactions with multiple biologically-generated reductants, or via direct anaerobic respiration with Cr(VI) serving as the terminal electron acceptor. Specifically, Cr(VI) will be reduced to form less soluble Cr(III)-hydroxide via the following three major reduction mechanisms:

- Direct anaerobic respiration with Cr(VI) serving as the terminal electron acceptor (*e.g.*, enzymatic extracellular reduction and intracellular reduction.
- Reduction by sulfide (hydrogen sulfide [H_2S], hydrosulfide [HS-]) and ferrous iron (Fe[II]). Under reducing conditions, sulfide and ferrous iron will be produced from reduction of naturally occurring sulfate and iron.
- Formation of an iron-Cr hydroxide complex that is less soluble and more stable than pure chromium hydroxide ($Cr[OH]_3$).

The reduction of Cr(VI) to Cr(III) in soil provides two clear benefits from a treatment perspective. First, Cr(III) is less toxic and, therefore, has either higher environmental remediation standard (for residential site-use), or no remediation standard (for non-residential site-use). Second, insoluble Cr(III) phases are resistant to re-oxidation to Cr(VI) phases under soil conditions of the Site. These two factors combine to make Cr(VI) treatment via in-situ anaerobic remediation an attractive remedial technology at the Site.

3.2 Remedial Action Implementation

A network of approximately 22 temporary injection points will be installed by a New Jersey-licensed well driller using a direct push technology (DPT) drilling technique. The DPT injection points will be used to inject dilute EVO solution (approximately 3% by volume). The proposed locations of the injection points are depicted on Figure 2. Utility clearance will be conducted by a private utility locating company, then the injection points will be advanced to a target depth of 20 feet below ground surface (bgs). Following installation, the DPT rod injection screens will be exposed and injection will be initiated.

EVO solution will be mixed to a target concentration of approximately 3% by volume, not to exceed 4% by volume, using either a dosing pump or batch mixing methods. The delivered EVO will be mixed with water from an on-site water source (City water, which is the water source currently used to prepare EVO solution injected in the Phase 1 IRM area). Following mixing, the solution will be pumped through above-ground hoses to a distribution manifold fitted with individual flow totalizers and flow control valves. From the manifold, the solution will be distributed to up to ten injection points simultaneously. Each injection point will have a wellhead fitting with a pressure gauge and pressure relief valve.

Based on a planned five-foot radius of influence, estimated five percent mobile porosity, and eight-foot injection interval, a target volume of approximately 240 gallons will be injected at each location. The volume for each location will be evenly distributed between two vertical injection intervals. Injection will be initiated at approximately 13 to 17 feet bgs. After approximately 120 gallons of solution is injected at this depth interval, the injection rods for that point will be pushed down to 17 to 20 feet bgs and the remaining volume will be injected.

During injection, the injection pressure, cumulative injection volume, and injection flow rate will be routinely monitored. After each injection point reaches its target volume, injection at that location will be stopped and the injection equipment will be decontaminated and moved to a new point until all proposed locations have been injected.

Injections at each location will be continuously monitored to ensure there are no excessive injection pressures (greater than 10 pounds per square inch [psi]) or daylighting of injection solution. If excessive pressure is observed, the injection rate will be adjusted to reduce the pressure. Injection into multiple closely-spaced points will be avoided to prevent daylighting. If daylighting of solution is observed, the injection at the associated location will be paused, surfaced solution will be managed in accordance with the site-specific Spill Prevention and Response Plan (Arcadis 2018), and the source of the daylighting will be repaired. Injection will be resumed at a lower flow rate to minimize the risk of additional daylighting. If the daylighting persists, no further injection will be conducted at that injection point. Following completion of injection at each location, the boring will be abandoned and sealed by gravity pouring bentonite chips pursuant to the requirements in N.J.A.C. 7:9D-2.9 and 2.10, to prevent short-circuiting during remaining injection activity.

In accordance with the NJDEP-approved PBR (September 2017), any malfunctions or non-compliance will be reported to the NJDEP by fax or telephone within 24 hours, and in writing within seven days using the subject line “DGW Permit-by-Rule Compliance Report – COPR”. Written notifications will be submitted to the following address:

New Jersey Department of Environmental Protection
Bureau of Case Assignment and Initial Notice
Mail Code 401-05H
P.O. Box 420
Trenton, NJ 08625-0420
Attention: COPR

As shown in Table 1, It is anticipated that a total injection volume of up to 5,300 gallons of solution including up to 2,200 pounds of as-delivered EVO will be required to complete this scope of work. However, to account for soil matrix heterogeneity and oil retention, a 50% safety factor is used, increasing

the volume to a maximum of approximately 8,000 gallons (and increasing the EVO to be used to 3,300 pounds). The target volume per injection location may be modified based on observations in the field. If at an injection point, it is determined that the target volume cannot be injected, the remaining volume may be redistributed to the remaining injection points or the target concentration for the remaining injection volume may be adjusted.

Table 1. Proposed Injection Volumes

	Proposed Volume	Maximum Volume
Solution Volume Per Injection Point (gallons)	240	360
Solution Volume Per Injection Interval (gallons)	120	180
EVO Volume Per Injection Point (gallons)	12	18
Total Solution Volume (gallons)	5,300	8,000
Total EVO Mass (pounds)	2,200	3,300

The estimated volume of contaminated soil that is being treated is 150 cubic yards.

4 PROPOSED SOIL MONITORING PLAN

Arcadis anticipates that soil remediation will occur within the first three to nine-month period. Therefore, monitoring associated with this injection will consist of the collection of post-treatment soil samples approximately three months following implementation, with additional confirmation soil samples collected approximately six months after the first sampling event (nine months following implementation).

Samples will be collected from two borings at depth ranges which coincide with historically-observed hexavalent chromium exceedances. The two proposed soil borings will be advanced in close proximity to the two May 2017 soil borings 114-A6B-WS and 114-AB7B-WS, depicted on Figure 2, and samples will be collected at two-foot intervals (similar to the May 2017 sampling intervals). This proposed sampling frequency exceeds the requirements in the NJDEP's *Technical Guidance for Site Investigation of Soil, Remedial Investigation of Soil, and Remedial Action Verification Sampling for Soil*, dated March 2015 (SI/RI/RA Guidance). The SI/RI/RA Guidance recommends collecting one soil sample per 900 square feet of contaminated area biased to the highest contaminant concentration, for each two feet of contaminated depth. The estimated area of the Western Sliver is approximately 570 square feet.

Regarding the analytical parameters, the NJDEP's *In Situ Remediation: Design Considerations and Performance Monitoring Technical Guidance Document*, dated October 2017 (In-situ Guidance), lists the following analytical parameters when EVO is used to remediate soil:

- Contaminants and breakdown products (conditional analysis)
- Fraction organic carbon (conditional analysis)

- Total iron (conditional analysis)
- Ferrous iron (recommended analysis)

Conditional analysis refers to parameters that may or may not be important or useful to include depending on site-specific conditions or the remedial objectives.

Based on the above, the soil samples will be analyzed for total chromium, hexavalent chromium, pH, and Eh. No soil samples will be analyzed for total iron or fraction organic carbon, since these two parameters are "conditional", and will not provide value in assessing the post-injection results. No samples will be analyzed for ferrous iron because there is no added value of this analysis.

The soil samples (including quality assurance and quality control samples) will be submitted to a New Jersey-certified environmental laboratory for analyses.

5 PERMITTING

As indicated under Section 1 of this RAWP Addendum, an amendment to the September 2017 PBR was approved by NJDEP on March 29, 2018 to allow for injection of EVO solution to treat soils in the "Western Sliver". That PBR Modification Request and NJDEP email approval are included in Appendix A.

No other permits are required to implement the remedial action as described in this RAWP Addendum.

6 REPORTING

Following receipt and validation of the post-treatment soil samples, an evaluation and interpretation of the data and conclusions reached will be submitted to NJDEP in a remedial phase report discussing the soil remedial action at the Western Sliver (i.e., Western Sliver Soil Treatment Completion Report). This report will be separate from quarterly Progress Update Reports required per the existing PBR.

7 REMEDIATION GOAL

Per the Canal Crossing Redevelopment Plan, the future use of Site 114 is mixed use (residential and residential/office), while the footprint of the Western Sliver is proposed to fall within the future Garfield Avenue right-of-way (i.e., non-residential).

The scope of work described herein is to remediate Cr(VI) impacts remaining in place in portions of Grids A5B, A6B, A7B, and B7B within the Western Sliver on Site 114, from as-built terminal excavation elevation 1.2 feet NAVD88 (13 feet bgs) to approximate elevation -5.8 feet NAVD88 (20 feet bgs), to achieve compliance with the Chromium Policy. The soil remedial action at these Western Sliver grids consists of the following:

- Soil excavation down to 13 feet bgs (elevation 1.2 feet NAVD88); and
- In-situ reductive remediation of remaining soil impacts down to 20 feet bgs (elevation -5.8 feet NAVD88) to achieve the SCC of 20 mg/kg.

Cr(VI) impacts in soil at concentrations greater than the SCC of 20 mg/kg at a depth greater than 20 feet bgs will not be remediated by the proposed EVO injections. A capillary break that consists of clean stone,

geotextile, dense-grade aggregate, geonet, and a high-density polyethylene liner has been installed to address the groundwater related impacts.

Based on the Memorandum that was prepared by Commissioner Lisa Jackson on February 8, 2007 regarding the chromium moratorium (i.e., the Chromium Policy), the remedial action at the Western Sliver will result in a conditional no-further-action (NFA) determination by NJDEP.

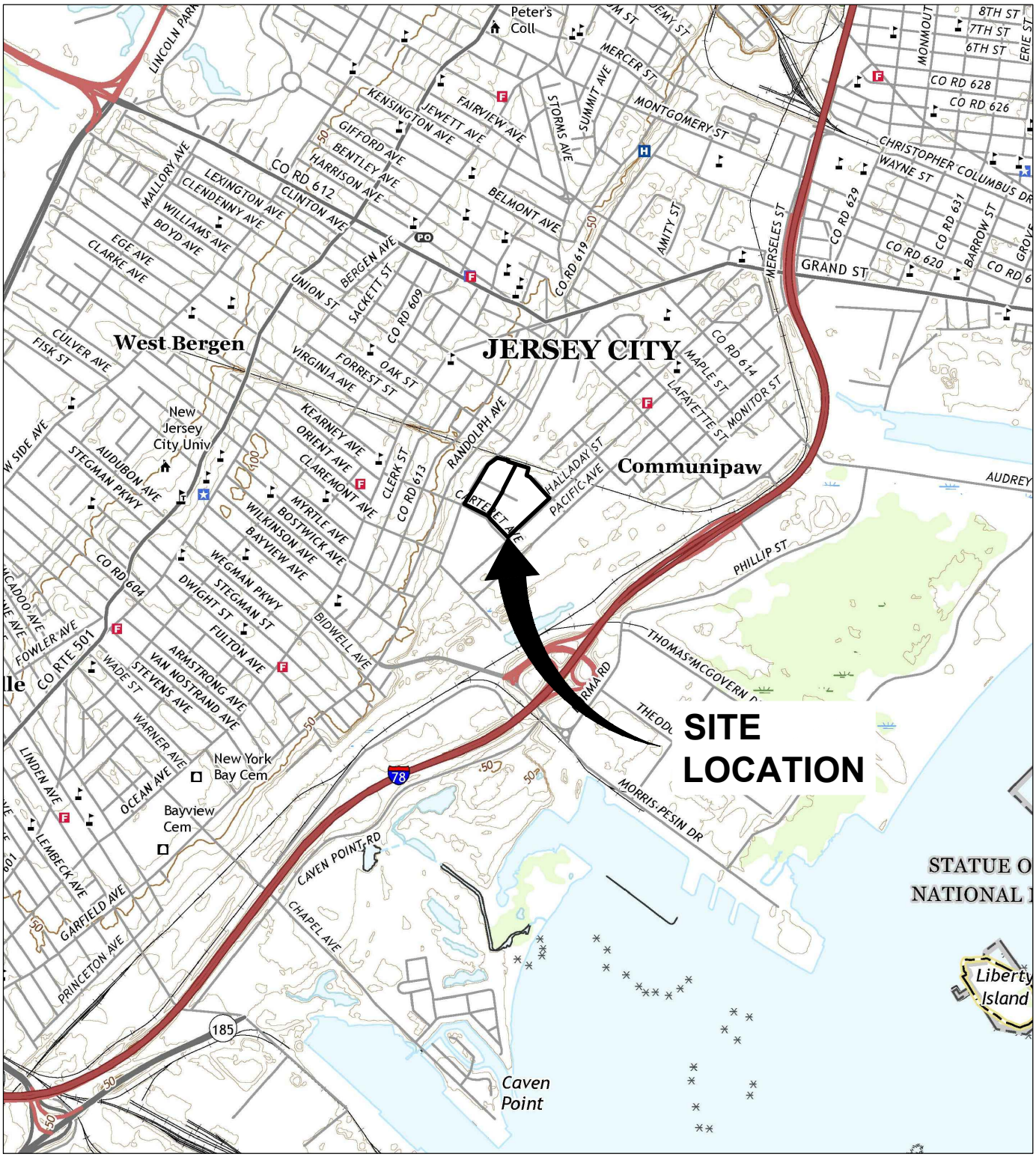
8 SCHEDULE

Injection activities will be initiated within one week of receipt of approval of this RAWP Addendum, pending subcontractor and material availability.

9 QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

Work performed as part of this RAWP Addendum will be conducted in accordance with the *Field Sampling Plan/Quality Assurance Project Plan* (QAPP) *for Non-Residential and Residential Chromium Sites* (AECOM 2010). The QAPP details the standard operating procedures and analytical methods that will be followed to confirm that the quality of all data and data collection activities associated with the implementation of the remedial action are in compliance with the NJDEP requirements.

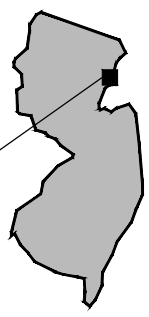
FIGURES



REFERENCE: BASE MAP USGS 7.5. MIN. TOPO. QUAD.: JERSEY CITY, NJ-NY (2016), HUDSON COUNTY, NEW JERSEY

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.



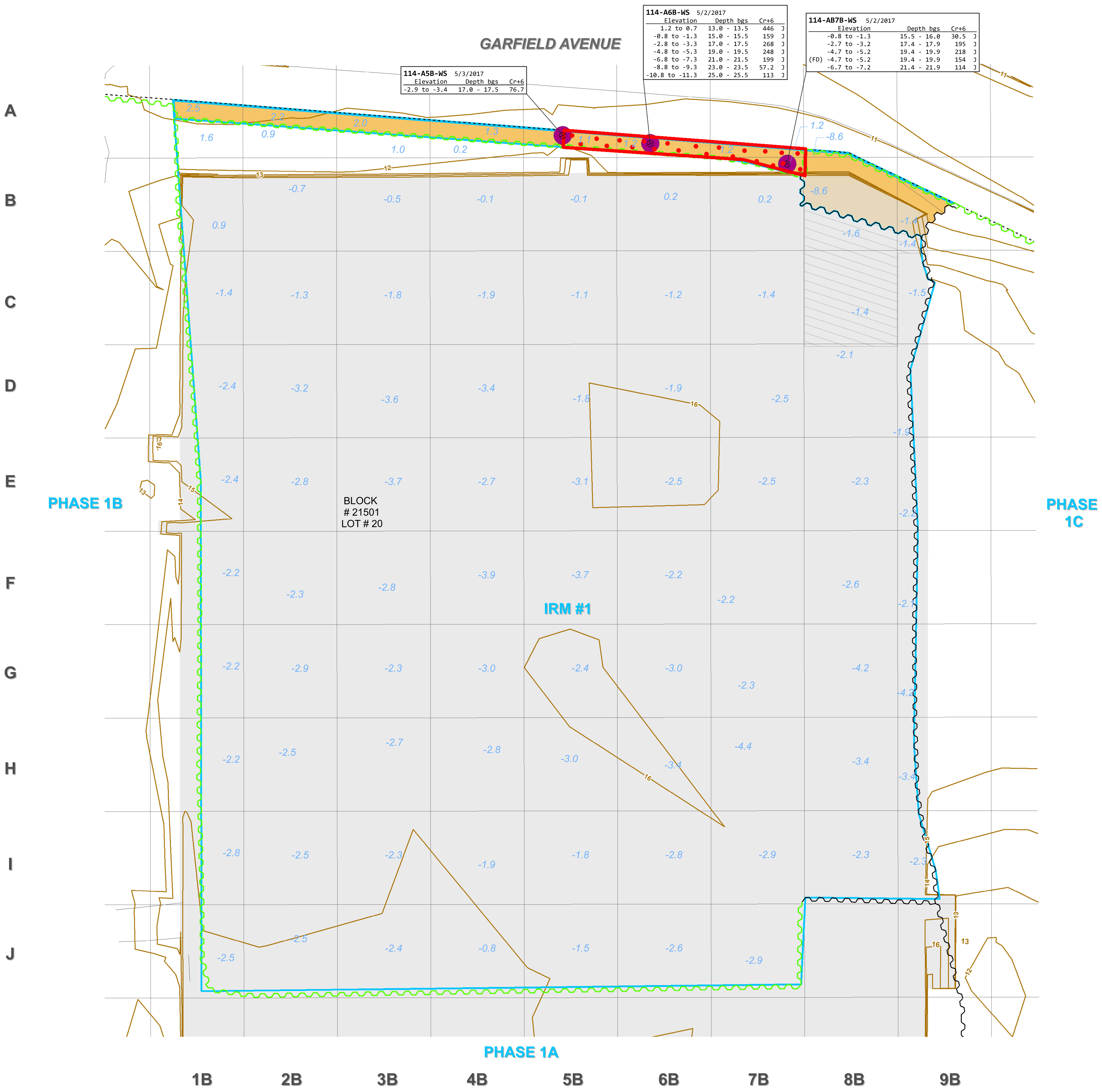
PPG GARFIELD AVENUE GROUP SITE 114
JERSEY CITY, NEW JERSEY

NP000776.0001

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1



ABBREVIATIONS:
bgs - below ground surface
Cr^{+6} - hexavalent chromium
CrSCC - Chromium Soil Cleanup Criterion
FD - field duplicate
ft - feet
IRM - Interim Remedial Measure
mg/kg - milligrams per kilogram
NAVD88 - North American Vertical Datum of 1988

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

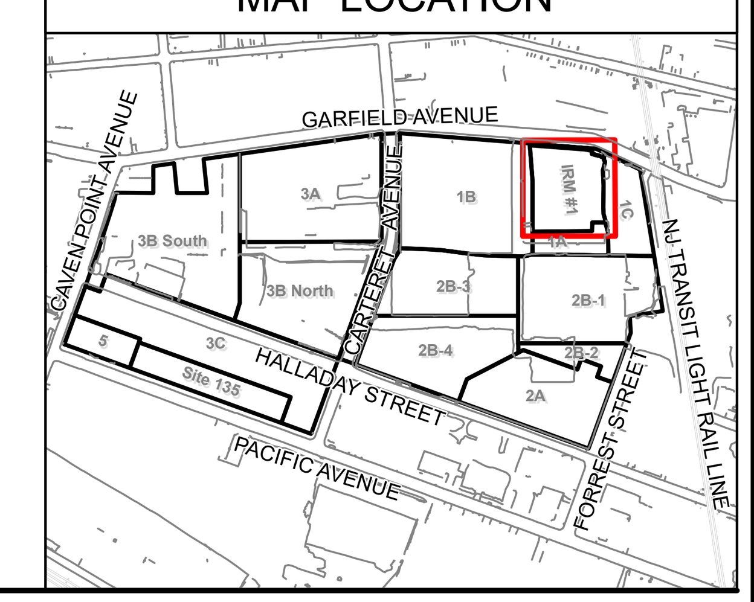
GENERAL NOTES:
G1. The hexavalent chromium data associated with the sample locations shown on this figure are provided in Table 5-1. Data presented in call out boxes on this figure are outliers (i.e., data points that require further explanation). Specific notes on how the New Jersey Department of Environmental Protection's remedial standards are being met and/or how remediation is being achieved/completed for each outlier sample are provided in the Specific Notes in Table 5-1.
G2. "Elevation" refers to the sample elevation based on the pre-remediation surface elevation for samples collected from the pit bottom, and the surface elevation of the sample location when the sample was collected via boring or test pit.
G3. Elevation vertical datum is NAVD88, in U.S. survey ft.
G4. Results are reported in mg/kg.
G5. Source of block/lot information is Jersey City Parcel Data from New Jersey Geographic Information Network (NJGIN), last updated 10/6/2015 (available at: http://data.jerseycitynj.gov/dataset/jersey-city-parcel-polygon).
G6. This figure presents data for locations within the Phase boundary that have samples remaining in place. In addition, locations from outside the Phase boundary and/or removed samples may be shown to demonstrate compliance with the remediation objectives. The Specific Notes on Table 5-1 include discussion of these situations, if necessary.

SPECIFIC NOTES:
S1. Property lines and pre-construction topographical contours are sourced from the "Catch Basin-Receptor Evaluation Survey, PPG Site 114, City of Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated April 19, 2011.
S2. As-built terminal excavation elevations were taken from the "Post Excavation Elevations Plan for ENTACT, L L C; PPG Site IRM1" produced by Maser Consulting P.A., dated 05/23/2017 with revisions.

LEGEND
- PROPOSED INJECTION POINTS
- PROPOSED TREATMENT AREA
- REMAINING SAMPLES NOT ANALYZED FOR Cr^{+6}
- SAMPLING LOCATION (REMAINING SAMPLES)
- RESULTS EXCEED THE MOST STRINGENT STANDARD BUT ARE IN COMPLIANCE WITH THE REMEDIATION OBJECTIVES
- IN PLACE SHEET PILE (AS OF FEBRUARY 2018)
- REMOVED SHEET PILE
- PROPERTY LINE
- PRE-REMEDIATION ELEVATION CONTOUR (1-FOOT INTERVAL IN FT NAVD88)
- PHASE BOUNDARY
- GRID LAYOUT WITH AS-BUILT TERMINAL EXCAVATION ELEVATIONS (FT NAVD88)
- NORTHWEST GRIDS
- FORMER BUILDING SLAB (AVERAGE ELEVATION 16.0 FT NAVD88)
- WESTERN SLIVER

Soil Cleanup Criterion (mg/kg)	
Analyte	**CrSCC**
CHROMIUM (HEXAVALENT)	20

MAP LOCATION



AECOM

PPG
SITE 114
GARFIELD AVENUE GROUP
JERSEY CITY, NEW JERSEY

WESTERN SLIVER SITE PLAN
AND SOIL TREATMENT AREA

DATE: 03/19/2018

FIGURE 2

APPENDIX A

DGW PBR Modification Request and NJDEP Approval

ARCADIS Design & Consultancy for natural and built assets

David VanEck
New Jersey Department of Environmental Protection
Site Remediation Program
Bureau of Groundwater Pollution Abatement
P.O. Box 420, Trenton, NJ 08625

Arcadis U.S., Inc.
10 Friends Lane
Suite 200
Newtown
Pennsylvania 18940
Tel 267 685 1800
Fax 267 685 1801
www.arcadis.com

ENVIRONMENT

Subject:
Discharge to Groundwater Permit-by-Rule Modification Request
PPG Industries Garfield Avenue Group and
Former Halladay Street Gas Works
900 Garfield Avenue; Block: 21501, Lots: 16, 17, 18, 19, and 20
Jersey City, Hudson County, New Jersey
NJ Program Interest Number: G000008791

Date:
March 29, 2018

Contact:
James S. McLaughlin

Phone:
215-815-1030
Email:
James.McLaughlin@arcadis.com

Our ref:
NP000776.0001

Dear Mr. VanEck:

Arcadis U.S., Inc. (Arcadis), on behalf of PPG, is submitting this request for a modification to the Permit-by-Rule (PBR) Discharge Authorization approved by the New Jersey Department of Environmental Protection (NJDEP) for the above-referenced site (hereinafter "Site") on September 21, 2017. A copy of the NJDEP-approved PBR Discharge Authorization is included as Attachment 1.

The PBR Discharge Authorization allows for the recovery and treatment of contaminated groundwater, as well as implementation of in-situ remediation of contaminated groundwater at the Site, as proposed in the June 2017 *Groundwater Interim Remedial Measure (IRM): Phase I Design and PBR Authorization Request* and associated public notice. The authorized discharge allows for injection of organic carbon substrate such as molasses and/or emulsified vegetable oil (EVO) to provide direct treatment of total chromium and hexavalent chromium via anaerobic bioprecipitation. Authorized treatment targets shallow, intermediate, and deep water-bearing zones, with a maximum of 235,000 gallons of EVO solution, including up to 5,000 gallons of as-delivered EVO into the shallow water-bearing zone. On March 19, 2018, NJDEP approved an amendment to the June 2017 PBR which allowed for an increase in EVO dosing strength from 2 percent (%) to a maximum 4% by volume. That email approval is included in Attachment 1.

The proposed modification to the existing DGW PBR is to allow injection of a solution of approximately 3% by volume EVO into shallow groundwater to treat

shallow soils in a portion of the site referred to as the “Western Sliver”, depicted on Figure 1. Dosing will not exceed 4%, per the PBR Discharge Authorization.

Overview

The injection of EVO solution is designed to reduce residual hexavalent chromium in soil and groundwater to trivalent chromium in a portion of the Site along the western Site boundary “Western Sliver”. Under this proposal, a network of approximately 22 temporary injection points will be installed using direct push technology (DPT) drilling technique and used to inject dilute EVO solution (approximately 3% by volume). The proposed locations of the injection points are depicted on Figure 1.

Approach

A network of approximately 22 temporary DPT injection points will be installed by a New Jersey-licensed well driller using a Geoprobe. Utility clearance will be conducted, then the injection points will be advanced to a target depth of 20 feet bgs. Following installation, the DPT rod injection screens will be exposed and injection will be initiated.

EVO solution will be mixed to a target concentration of approximately 3% by volume, not to exceed 4% by volume, using either a dosing pump or batch mixing methods. The delivered EVO will be mixed with water from an on-site water source (City water, which is the water source currently used to prepare EVO solution injected in the Phase 1 IRM area). Following mixing, the solution will be pumped through above-ground hoses to a distribution manifold fitted with individual flow totalizers and flow control valves. From the manifold, the solution will be distributed to up to ten injection points simultaneously. Each injection point will have a wellhead fitting with a pressure gauge and pressure relief valve.

Based on a planned five-foot radius of influence, estimated five percent mobile porosity, and eight-foot injection interval, a target volume of approximately 240 gallons will be injected at each location. The volume for each location will be evenly distributed between two vertical injection intervals. Injection will be initiated at approximately 13 to 17 feet bgs. After approximately 120 gallons of solution is injected at this depth interval, the injection rods for that point will be pushed down to 17 to 20 feet bgs and the remaining volume will be injected.

During injection, the injection pressure, cumulative injection volume, and injection flow rate will be routinely monitored. After each injection point reaches its target volume, injection at that location will be stopped and the injection equipment will be decontaminated and moved to a new point until all proposed locations have been injected.

Injections at each location will be continuously monitored to ensure there are no excessive injection pressures (greater than 10 pounds per square inch [psi]) or daylighting of injection solution. If excessive pressure is observed, the injection rate will be adjusted to reduce the pressure. Injection into multiple closely-spaced points will be avoided to prevent daylighting. If daylighting of solution is observed, the injection at the associated location will be paused, surfaced solution will be managed in accordance with the site-specific Spill Prevention and Response Plan (Arcadis 2018), and the source of the daylighting will be repaired. Injection will be resumed at a lower flow rate to minimize the risk of additional daylighting. If the daylighting persists, no further injection will be conducted at that injection point. Following completion

of injection at each location, the boring will be abandoned and sealed to prevent short-circuiting during remaining injection activity. The site-specific Spill Prevention and Response Plan applicable to all current and future injection activity at Site 114 is included as Attachment 2.

It is anticipated that a total injection volume of up to 5,300 gallons of solution including up to 2,200 pounds of as-delivered EVO will be required to complete this scope of work. However, to account for soil matrix heterogeneity and oil retention, a 50% safety factor is used, increasing the volume to a maximum of approximately 8,000 gallons (and increasing the EVO to be used to 3,300 pounds). The target volume per injection location may be modified based on observations in the field. If at an injection point, it is determined that the target volume cannot be injected, the remaining volume may be redistributed to the remaining injection points or the target concentration for the remaining injection volume may be adjusted.

Permit-by-Rule Modification Request

Arcadis, on behalf of PPG, kindly requests that the NJDEP approve this modification to the existing PBR (Attachment 1) to complete the proposed EVO injection at the area identified in this letter (Western Sliver). Table 1 provides a summary of anticipated injection volumes. The proposed injection locations are shown on Figure 1.

Monitoring Plan

Arcadis anticipates that soil remediation will occur within the first three to nine-month period. Therefore, monitoring associated with this injection will consist of the collection of post-treatment soil samples approximately three months following implementation, with additional confirmation soil samples collected approximately six months after the first sampling event (nine months following implementation).

Samples will be collected from two borings at depth ranges which coincide with historically-observed hexavalent chromium exceedances. The two proposed soil borings will be advanced in close proximity to the two May 2017 soil borings 114-A6B-WS and 114-AB7B-WS, depicted on Figure 1, and samples will be collected at two-foot intervals (similar to the May 2017 sampling intervals). This proposed sampling frequency exceeds the requirements in the NJDEP's *Technical Guidance for Site Investigation of Soil, Remedial Investigation of Soil, and Remedial Action Verification Sampling for Soil*, dated March 2015 (SI/RI/RA Guidance). The SI/RI/RA Guidance recommends collecting one soil sample per 900 square feet of contaminated area biased to the highest contaminant concentration, for each two feet of contaminated depth. The estimated area of the Western Sliver is approximately 570 square feet.

Regarding the analytical parameters, the NJDEP's *In Situ Remediation: Design Considerations and Performance Monitoring Technical Guidance Document*, dated October 2017 (In-situ Guidance), lists the following analytical parameters when EVO is used to remediate soil:

- Contaminants and breakdown products (conditional analysis)
- Fraction organic carbon (conditional analysis)
- Total iron (conditional analysis)
- Ferrous iron (recommended analysis)

Conditional analysis refers to parameters that may or may not be important or useful to include depending on site-specific conditions or the remedial objectives.

Based on the above, the soil samples will be analyzed for total chromium, hexavalent chromium, pH, Eh, and ferrous iron, although analyzing the soil samples for ferrous iron is not expected to have an added

value. No soil samples will be analyzed for total iron or fraction organic carbon, since these two parameters are “conditional”, and will not provide value in assessing the post-injection results.

The soil samples (including quality assurance and quality control samples) will be submitted to a New Jersey-certified environmental laboratory for analyses.

Reporting

Following receipt and validation of the post-treatment soil samples, an evaluation and interpretation of the data and conclusions reached will be submitted to NJDEP in a remedial phase report discussing the soil remedial action at the Western Sliver (i.e., Western Sliver Soil Treatment Completion Report). This report will be separate from quarterly Progress Update Reports required per the existing PBR.

Schedule

Injection activities will be initiated within 30 days of receipt of approval of this PBR modification request, pending subcontractor and material availability.

If you have any questions or require additional information, please contact the undersigned.

Sincerely,

Arcadis U.S., Inc.

James Mclaughlin
Project Manager

Copies:
Tom Cozzi, NJDEP
David Doyle, NJDEP
Prabal Amin, Weston
Richard Feinberg, PPG
Jody Overmyer, PPG
Matt Schnobrich, Arcadis

Enclosures:
Tables

1 Injection Volume Summary

Figures

1 Injection Locations

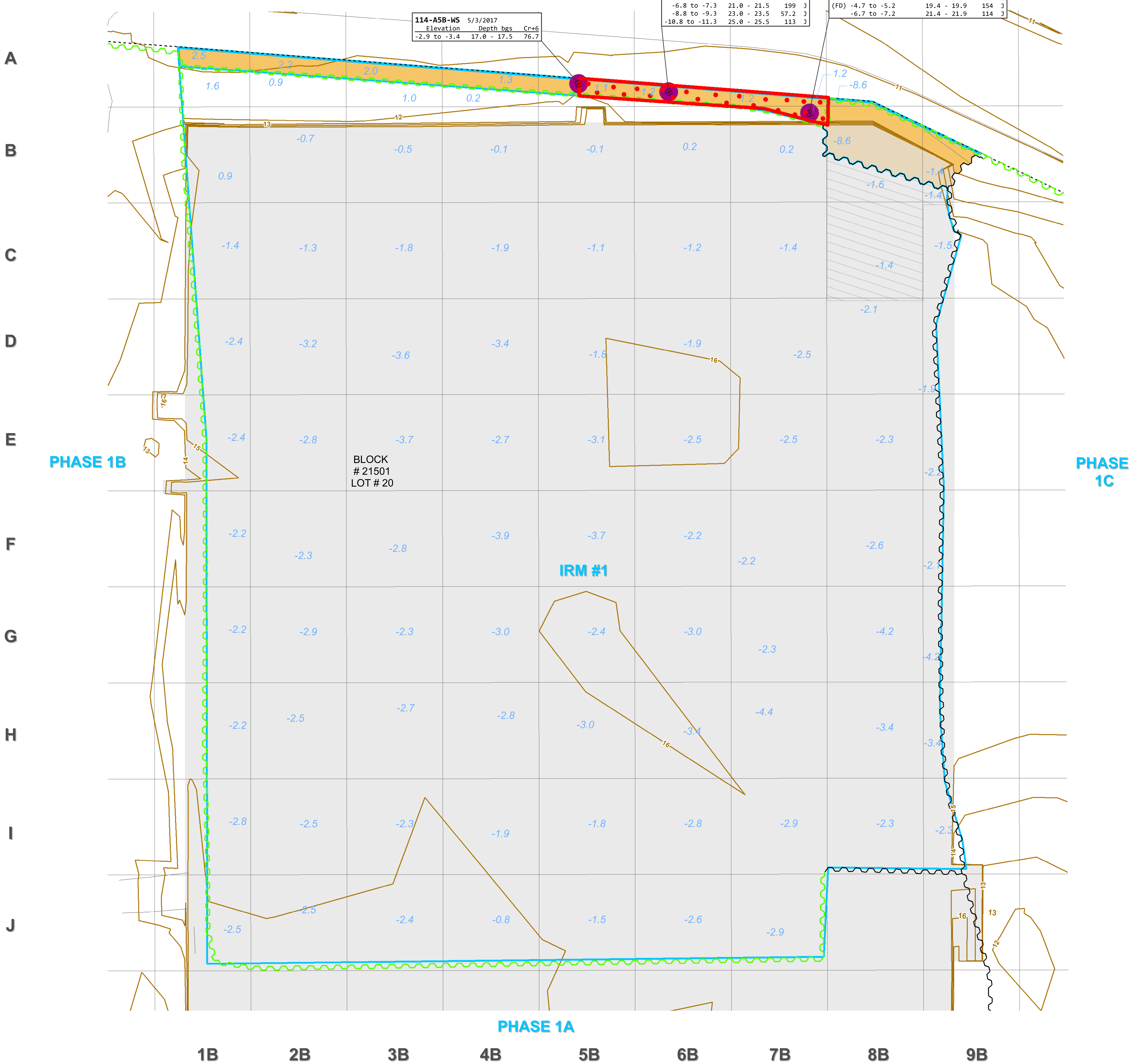
Attachments

1 Permit-by-Rule Authorization Approval
2 Spill Prevention and Response Plan

Table 1
Proposed Injection Volumes
Permit-by-Rule Modification Request
Garfield Avenue Group Sites
Jersey City, New Jersey

ARCADIS Design & Consultancy for natural and built assets

	Proposed Volume	Maximum Volume
Solution Volume Per Injection Point (gallons)	240	360
Solution Volume Per Injection Interval (gallons)	120	180
EVO Volume Per Injection Point (gallons)	12	18
Total Solution Volume (gallons)	5,300	8,000
Total EVO Mass (pounds)	2,200	3,300



114-A5B-WS 5/3/2017

Elevation	Depth bgs	Cr+6
-2.9 to -3.4	17.0 - 17.5	76.7

114-A6B-WS 5/2/2017

Elevation	Depth bgs	Cr+6	
1.2 to 0.7	13.0 - 13.5	446	J
-0.8 to -1.3	15.0 - 15.5	159	J
-2.8 to -3.3	17.0 - 17.5	268	J
-4.8 to -5.3	19.0 - 19.5	248	J
-6.8 to -7.3	21.0 - 21.5	199	J
-8.8 to -9.3	23.0 - 23.5	57.2	J
-10.8 to -11.3	25.0 - 25.5	113	J

114-AB7B-WS 5/2/2017

	Elevation	Depth bgs	Cr+6	
	-0.8 to -1.3	15.5 - 16.0	30.5	J
	-2.7 to -3.2	17.4 - 17.9	195	J
	-4.7 to -5.2	19.4 - 19.9	218	J
(FD)	-4.7 to -5.2	19.4 - 19.9	154	J
	-6.7 to -7.2	21.4 - 21.9	114	J

ABBREVIATIONS:

bgs - below ground surface

Cr^{+6} - hexavalent chromium

CrSCC - Chromium Soil Cleanup Criterion

FD - field duplicate

ft - feet

IRM - Interim Remedial Measure

mg/kg - milligrams per kilogram

NAVD88 - North American Vertical Datum of 1988

QUALIFIERS:

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

GENERAL NOTES:

G1. The hexavalent chromium data associated with the sample locations shown on this figure are provided in Table 5-1. Data presented in call out boxes on this figure are outliers (i.e., data points that require further explanation). Specific notes on how the New Jersey Department of Environmental Protection's remedial standards are being met and/or how remediation is being achieved/completed for each outlier sample are provided in the Specific Notes in Table 5-1.

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

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

G4. Results are reported in mg/kg.

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

G6. This figure presents data for locations within the Phase boundary that have samples remaining in place. In addition, locations from outside the Phase boundary and/or removed samples may be shown to demonstrate compliance with the remediation objectives. The Specific Notes on Table 5-1 include discussion of these situations, if necessary.

SPECIFIC NOTES:

S1. Property lines and pre-construction topographical contours are sourced from the "Catch Basin-Receptor Evaluation Survey, PPG Site 114, City of Jersey City, Hudson County, New Jersey" prepared by Borbas Surveying and Mapping, LLC, dated April 19, 2011.

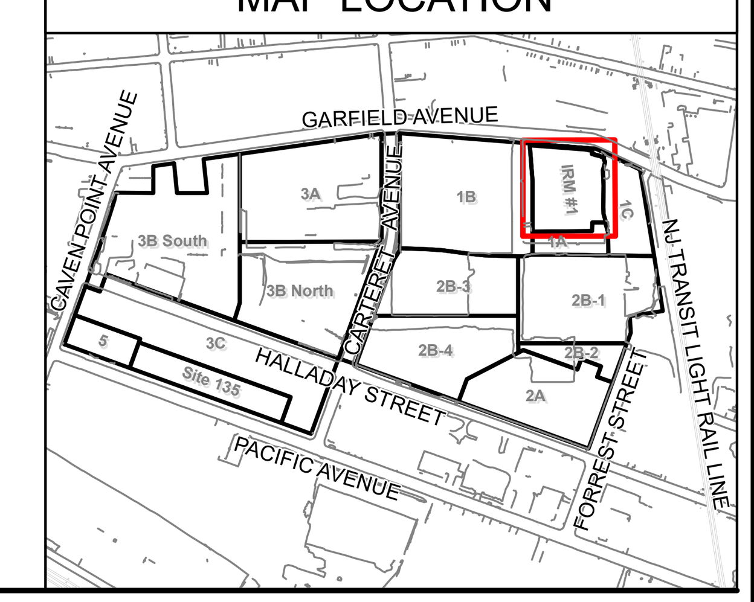
S2. As-built terminal excavation elevations were taken from the "Post Excavation Elevations Plan for ENTACT, L L C; PPG Site IRM1" produced by Maser Consulting P.A., dated 05/23/2017 with revisions.

LEGEND

- PROPOSED INJECTION POINTS
- PROPOSED TREATMENT AREA
- REMAINING SAMPLES NOT ANALYZED FOR Cr^{+6}
- SAMPLING LOCATION (REMAINING SAMPLES)
- RESULTS EXCEED THE MOST STRINGENT STANDARD BUT ARE IN COMPLIANCE WITH THE REMEDIATION OBJECTIVES
- IN PLACE SHEET PILE (AS OF FEBRUARY 2018)
- REMOVED SHEET PILE
- PROPERTY LINE
- PRE-REMEDIATION ELEVATION CONTOUR (1-FOOT INTERVAL IN FT NAVD88)
- PHASE BOUNDARY
- GRID LAYOUT WITH AS-BUILT TERMINAL EXCAVATION ELEVATIONS (FT NAVD88)
- NORTHWEST GRIDS
- FORMER BUILDING SLAB (AVERAGE ELEVATION 16.0 FT NAVD88)
- WESTERN SLIVER

Soil Cleanup Criterion (mg/kg)	
Analyte	**CrSCC**
CHROMIUM (HEXAVALENT)	20

MAP LOCATION



0 20 40 Feet

AECOM

PPG
SITE 114
GARFIELD AVENUE GROUP
JERSEY CITY, NEW JERSEY

IRM #1
SAMPLE MAP FOR Cr^{+6} COMPARED
TO CHROMIUM SOIL CLEANUP CRITERION

DATE: 03/19/2018

FIGURE 5-1

ATTACHMENT 1

Permit-by-Rule Authorization Approval

State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Site Remediation and Waste Management Program
Mail Code: 401-06
P.O. Box 420
Trenton, NJ 08625-0420

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

21 September 2017

Mark Terril, Corporate Director Environmental Affairs
PPG Industries, Inc.
One PPG Place
Pittsburgh, PA 15222

Re: Discharge Approval and Monitoring Requirements Associated with
Permit-By-Rule Discharge Authorization for PPG Industries (COPR)
Garfield Avenue Group and Former Halladay Street Gas Works
900 Garfield Avenue; Block: 21501, Lots: 16,17,18, 19, and 20
NJ Program Interest Numbers: G000008791
Jersey City, Hudson County

Dear Mr. Terril:

This New Jersey Pollutant Discharge Elimination System/Discharge to Ground Water (NJPDES/DGW) authorization is hereby issued under the authority of the New Jersey Water Pollution Control Act, N.J.S.A. 58:10A-1 et seq. and the implementing regulations, N.J.A.C. 7:14A-1 et seq. N.J.A.C. 7:14A-7.5 authorizes the discharge described below which will allow the recovery and treatment of contaminated ground water, as well as implementation of in-situ remediation of contaminated ground water at the above referenced site.

Pursuant to N.J.A.C. 7:14A-22.4(b)5, a Treatment Works Approval is not required for discharges to ground water authorized pursuant to N.J.A.C. 7:14A-7.5 or 8.5 and a licensed operator is not required pursuant to N.J.A.C. 7:10A-1.10(c)1. The discharge shall be conducted as proposed in the June 2017 *Groundwater Interim Remedial Measure (IRM): Phase I Design and Permit-By-Rule (PBR) Authorization Request*, received on 30 June 2017 and clarified and revised as described in meeting minutes circulated on 11 September 2017, and the email correspondence of 14 September 2017. This document and supporting clarification information was submitted by James McLaughlin, Matthew Schnobrich, and John Horst of Arcadis U.S. Inc., on behalf of PPG Industries.

A public notice describing this discharge was published in The Jersey Journal on 29 July 2017 which initiated a 30-day public comment period. In addition, a copy of the public notice has been sent to the Municipal Clerk and designated local health official for Jersey City and Hudson County. The Department did not receive any comments on the DGW proposal.

Pursuant to N.J.A.C. 7:14A-2.7 the maximum approved discharge duration is five (5) years from the date of this letter, regardless of the date when the discharge first occurs. The Department shall be notified of the date when the discharge begins as instructed in section IV of this letter. Only the discharge described in Section I below is authorized. The discharge shall be conducted in conformance with the above mentioned DGW proposal and shall comply with the requirements of Sections II, III, and IV, farther below.

I. DISCHARGE DESCRIPTION

The authorized discharge includes organic carbon substrate (e.g., molasses and/or emulsified vegetable oil [EVO]) which will be mixed with treated groundwater recovered from the site. Groundwater will be recovered from the northern portion of Site 114, from an area containing the highest total chromium (Cr) and hexavalent chromium (Cr[VI]) concentrations, and will also be recovered from areas in southern Site 114 to enhance the organic carbon recirculation program. Groundwater will be treated using an on-site water treatment plant to provide direct treatment of Cr and Cr(VI). Treatment of the recovered water will also make it suitable for re-injection with organic carbon substrate.

The treated water will be amended with substrates to provide a degradable source of organic carbon within the subsurface to support an in situ anaerobic bioprecipitation (ISAB) approach. Both dilute organic carbon and treated water will be reinjected in the southern portion of Site 114, where concentrations of Cr are lower and more amenable to rapid bioremediation. The organic carbon will stimulate several primary mechanisms that: (1) promote the in-situ reduction of Cr(VI) to trivalent Cr (Cr[III]); and (2) support the development of an environment that enables the precipitation and fixation of Cr within the aquifer matrix.

The combination of groundwater extraction from the northern area of Site 114 and portions of southern Site 114 with reinjection in southern Site 114 will help maintain the hydraulic balance inside the sheet pile enclosure around Site 114 and may also support flushing of Cr mass toward the extraction wells to speed up the reduction of Cr concentrations in the groundwater.

The IRM Phase I operation is anticipated to start in fourth quarter of 2017 and last for a duration of up to approximately 12 months, followed by a post-operational monitoring of 2 years. However, this will be evaluated as the program proceeds, and modifications may be requested.

It is expected that the average organic carbon dosing over the course of the 12-month Phase I program is 0.5% by volume. Based on the projected total recirculation volume of 21 million gallons of groundwater, the organic carbon demands for Phase I will be no more than 105,000 gallons of substrate (either molasses, EVO, or a combination of both). The actual dosing strength of these organic carbon substrates, the dosing durations per day (or per week), and the timing of molasses and EVO use will be determined based on monitoring observations.

Reagent flexibility is considered a key consideration for maximizing overall treatment during the IRM Program. While the carbon substrates above will serve as the primary reagents for use, other reagents are being included in this PBR to allow flexibility in the event that unique areas of the site are better suited to their application. Both FerroBlack®-H (a water based suspension of 7 to 8% by weight ferrous sulfide and 1 to 2% by weight sodium hydrosulfide) and CaS_x (calcium

polysulfide) were used to achieve treatment during prior pilot test activities, and these reagents are retained for potential consideration during Phase I. CaS_x could be delivered via the recirculation network as a soluble reagent for ISCR in select areas of Site 114 in lieu of, prior to, or following use of carbon substrate. In addition to these two reagents, ferrous sulfate heptahydrate ($FeSO_4$ x 7 H_2O) may also be used as a supplement to the carbon substrate source to provide additional iron and sulfide to further enhance Cr abiotic reduction mechanisms.

The planned IRM design consists of 35 injection and 7 extraction well positions. Each position is assumed to entail discrete screened intervals in both the intermediate and deep water-bearing units, resulting in 70 total injection wells and 14 extraction wells. However, up to 100 total injection wells and 25 total extraction wells may be installed if needed. Using hollow stem auger (HSA) drilling techniques (or similar equivalent drilling technologies), intermediate water-bearing zone wells will be constructed with 4-inch stainless steel, 10-slot, 20-foot screens at approximate depths between 20 to 40 feet below ground surface (bgs). Deep water-bearing zone wells will be constructed with 4-inch stainless steel, 10-slot, 20-foot screens between 45 to 65 feet bgs. Actual length of screen and screen size will be based on pre-design testing and field observations.

While a combined total injection and extraction rate of 17 gpm is expected to achieve organic carbon distribution within the southern area of Site 114 during the first 6-month period, extraction rates may be increased to maximize the total quantity of groundwater extracted and injected within system capabilities (40 gpm) and up to permit specifications. Over the first 6 months of operation, the Phase I design entails initiation of injection activities within the southern end of Site 114, followed by gradual northward shifts in operating wells during three, 8-week cycles. Injection wells may temporarily or permanently be converted to extraction wells to enhance hydraulic control, mass removal, and/or overcome aquifer heterogeneities. Following this first 6-month period, additional cycles are anticipated through the end of the planned 12-month operational period to replenish organic carbon substrates and address residual Cr concentrations.

In addition to the intermediate and deep groundwater treatment, a shallow water-bearing zone polishing treatment for Cr-impacted groundwater will be implemented in the vicinity of the current water treatment plant and pilot testing areas located in the north-western portion of the site. The shallow treatment will be completed as part of one injection event using temporary injection points. Injection points will be placed throughout an area estimated to be approximately 20,000 square feet (ft^2). Within this area, an estimated 70 total injection points will be installed on 20-foot on-center spacing. Using direct-push drilling methods, the injection points will be constructed using 1-inch PVC casing materials and a 10-foot 0.020-slot injection screen. The screen interval will be placed at depths between 5 to 15 feet bgs or with a terminal depth consistent with the observed top of the meadow mat. The selected carbon substrate for shallow water-bearing zone treatment is EVO. A total volume of up to 235,000 gallons of 2% EVO solution and up to approximately 5,000 gallons of as-delivered EVO material will be injected within the target shallow treatment area. During injection, multiple injection points/piezometers will be manifolded together for simultaneous injection.

The treatment of groundwater used for reinjection will be sufficient to achieve either 95% reduction of influent levels (e.g., primarily for Cr and Cr[VI]) or concentrations below the

applicable Ground Water Quality Standard (GWQS) values (e.g., for Cr, Cr[VI], and other compounds with historical detections) in the effluent of the water treatment plant, whichever is less stringent. A temporary permit-related ground water Classification Exception Area (CEA) is hereby established to allow the discharge of water containing Cr, Cr(VI), metals, volatile organic compounds (VOCs), and semi-volatile organic compounds (SVOCs) which may not be treated to levels below the GWQS by the water treatment plant prior to re-injection. The compounds other than Cr and Cr(VI) that were historically detected above the respective GWQS in the shallow, intermediate, and deep water-bearing zones are listed in the table below. Groundwater generated from the shallow water-bearing zone during soil excavation dewatering will be combined with groundwater extracted from the intermediate and deep water-bearing zones and treated with the water treatment plant. The permit-equivalent CEA comprises the entirety of the project area (Block 21501, Lots 16 through 20), and extends to a depth of 100 feet below ground surface.

METALs	VOCs	SVOCs
ALUMINUM	1,1-DICHLOROETHYLENE	1,2,4-TRICHLOROBENZENE
ANTIMONY	1,1,2-TRICHLOROETHANE	2,4-DIMETHYLPHENOL
ARSENIC	1,2-DICHLOROETHANE	2-METHYLNAPHTHALENE
BARIUM	1,2,4-TRICHLOROBENZENE	2-METHYLPHENOL
BERYLLIUM	BENZENE	3+4-METHYLPHENOL
CADMIUM	CHLOROBENZENE	ACENAPHTHENE
COBALT	CIS-1,2-DICHLOROETHENE	BENZO(A)ANTHRACENE
COPPER	DICHLOROMETHANE	BENZO(A)PYRENE
IRON	ETHYLBENZENE	BENZO(B)FLUORANTHENE
LEAD	METHYL-TERT-BUTYL ETHER	BENZO(K)FLUORANTHENE
MANGANESE	STYRENE (MONOMER)	BIS(2-ETHYLHEXYL)PHTHALATE
MERCURY	TETRACHLOROETHENE	CHRYSENE
NICKEL	TOLUENE	DIBENZO(A,H)ANTHRACENE
SELENIUM	TRICHLOROETHENE	FLUORENE
SILVER	VINYL CHLORIDE	HEXACHLOROBENZENE
SODIUM	XYLENES	INDENO(1,2,3-CD)PYRENE
THALLIUM		NAPHTHALENE
VANADIUM		NITROBENZENE
ZINC		N-NITROSO-DI-N-PROPYLAMINE
		N-NITROSODIPHENYLAMINE
		PENTACHLOROPHENOL
		PHENANTHRENE
		PHENOL

II. SYSTEM OPERATION AND MONITORING

The area of discharge shall be monitored for evidence of malfunction. Said evidence shall include, but is not limited to: injection solution observation at land surface, wet areas, ponding, odors, and elevated photoionization detector (PID) readings in the nearby work area or building. If encountered, appropriate controls and system modification will be implemented.

The discharge shall not cause any of the following negative impacts: adverse impact on the behavior of free product or the plume; adverse impacts to a water supply well or have a long term adverse impact on ground water quality; create an unpermitted discharge to any surface water of the State or violation of Surface Water Quality Standards; create a persistent standing, ponded or surface-flowing fluid condition; or cause adverse vapor intrusion to occur.

Pursuant to N.J.A.C. 7:14A-6.2(a)5 and 11, if free product in ground water, vapors or odors in any building, or any malfunction resulting in a potential impact to a receptor are detected and are a result of the discharge authorized by this approval, the discharger will immediately: (1) cease the discharge or make necessary adjustments to the discharge rate or system operation; and (2) repair or mitigate any negative impacts.

After completion of the discharge, the property returned to its previous condition, or as agreed to with property owner if the permittee is not the property owner. All UIC-Class V injection wells shall be properly abandoned in accordance with N.J.A.C. 7:14A-8.16(d)1 as applicable. The permittee will comply with any applicable provisions of the Additional Conditions Applicable to Class I, II, III and V UIC Permits of the NJPDES regulations, N.J.A.C. 7:14A-8.9, et seq. when UIC-Class V injection well units (i.e., the injection points) are used.

III. GROUND WATER MONITORING REQUIREMENTS

The Permittee shall perform the following ground water sampling as was specified in the DGW proposal (including all addendums and modifications) for the purpose of complying with this Discharge to Ground Water Permit-By-Rule authorization.

Baseline Sampling, before injection:

Prior to the startup of Phase I operations, but following the installation of the remediation well network and new monitoring well locations, samples will be collected for baseline analysis to establish the starting conditions for IRM treatment performance review. In accordance with Table 1, baseline samples will be collected for TAL metals (total and dissolved); Cr(VI) (total and dissolved); key geochemical parameters (sulfate/sulfide and methane); total organic carbon (TOC), field parameters (pH, specific conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP), turbidity, and temperature); and depth to groundwater.

Baseline samples will be collected using the low-flow sampling method. Purge water generated during sampling will be temporarily stored and then transferred to the groundwater treatment system. Prior to the start of purging, depth to water will be gauged at each well location. Following purging, field parameter measurements will be recorded. Samples collected for dissolved metal analyses will be filtered using 0.45 micrometer (μm) filters in the field.

Operational and Treatment Monitoring, during the injections:

The operational monitoring program will be used to assess ongoing remedial system performance in support of guiding potential modifications to injection and extraction flow rates, recirculation well balancing, carbon dosing and timing, and to pre-emptively guide potential biofouling management and well redevelopment.

Operational monitoring will be performed at variable frequencies (weekly, biweekly, or monthly), as necessary, over the course of operation pursuant to Table 1. Measurements may be periodically performed more frequently than specified in Table

1 to support potential troubleshooting activities over the course of operation. Given the adaptive nature of the recirculation program and the sequencing of different groupings of injection and extraction wells during operation, it is anticipated that the operational sampling frequency of existing monitoring wells will be adapted over time. As an example, monitoring wells located within the southernmost area of Site 114 are most relevant for operational monitoring during the first step of recirculation activities. Following this initial 8-week period and the transition to more northerly injection wells, the frequency and parameter list of the initial monitoring locations may be reduced to maintain remedial efficiency, as applicable, subject to NJDEP approval. For the operational monitoring, analytical data and field parameter measurements for extracted and treated groundwater will be collected at operating extraction wells from sampling ports located at the wellheads or at the influent to the water treatment system.

Overall Phase I remedial performance will be documented via ongoing treatment monitoring during the 12-month IRM program. Sampling parameters will be collected to verify organic carbon distribution, assess the development of reduced geochemical groundwater conditions within the subsurface, and confirm corresponding declines in total Cr and Cr(VI). Evaluation of these parameters will confirm development of the subsurface reactive zone and will be used to guide carbon substrate dosing strength and frequency. This will enable treatment optimization and confirmation prior to transitioning the operating recirculation wells to subsequent steps. A summary of the analytical and field parameter measurements for treatment sampling is provided in Table 1.

Similar to the operational monitoring specifications, treatment monitoring parameters will be collected at specified frequency based on the relevance of a given parameter to operation and optimization activities. TOC and field parameter sampling is proposed most frequently (biweekly to monthly) to effectively gauge propagation of both carbon substrate and geochemical influence within the subsurface. Total Cr and Cr(VI) and select geochemical parameters (ferrous [dissolved] iron, dissolved manganese, sulfate) will be collected monthly to enable the collection of at least one to two samples between recirculation well steps. Methane sampling is also proposed, albeit less frequently, to confirm the overall extent of reduced groundwater conditions. Similar to the sampling frequency considerations presented for the operational monitoring program, select well locations or parameters may be collected more frequently for system optimization purposes, as applicable.

Treatment monitoring samples will be collected using the low-flow sampling method. Purge water generated during sampling will be temporarily stored and then transferred to the groundwater treatment system. Prior to the start of purging, depth to water will be gauged at each well location. Following purging, field parameter measurements will be recorded. Samples collected for dissolved metal analyses will be filtered using 0.45 μm filters in the field.

Post Treatment Sampling, after completion of injections:

> Following the 12-month Phase I operational program, post-treatment monitoring will be used to document overall Cr treatment performance, confirm the residual reactive zone reduction capacity (via residual TOC and reduced geochemistry species), and develop an appropriate data set to demonstrate ongoing natural attenuation of any residual total Cr and Cr(VI). Post-treatment sampling will be performed in accordance with Table 1.
>
> Treatment monitoring samples will be collected using the low-flow sampling method. Purge water generated during sampling will be temporarily stored and then transferred to the groundwater treatment system – or containerized and disposed of off-site, as appropriate. Prior to the start of purging, depth to water will be gauged at each well location. Following purging, field parameter measurements will be recorded. Samples collected for dissolved metal analyses will be filtered using 0.45 µm filters in the field.
>
> Post-treatment sampling activities will be performed on a quarterly basis over a total duration of two years.

Pursuant to the Tech Regs, the Permittee shall measure ground water elevations at all sampled wells upon each sampling event and shall construct ground water flow maps with the water elevation data to document the direction of ground water flow. Any product observed, including sheen, shall be documented and the NJDEP shall be notified. If measurable product is observed, injections shall be suspended until all of the recoverable product is removed from the treatment area.

All sampling shall be performed as proposed and consistent with the methods specified in the most current edition of the Department's Field Sampling Procedures Manual. All samples shall be analyzed by a New Jersey Certified Laboratory certified for the methods being used to analyze groundwater samples. Analytical method MDLs shall be less than or equal to the ground water quality standards (N.J.A.C. 7:9C-1.7). Parameters determined in the field (pH, specific conductance, dissolved oxygen, temperature) are to be measured by a certified contractor or laboratory.

Comparison to the VI screening levels is necessary in order to monitor whether or not the discharge activities have the potential to cause VI issues within any nearby structures by means of adversely impacting the behavior of the ground-water contaminants (e.g., unexpected contaminant movement). If there are any exceedances of the VI screening levels caused by the authorized discharge, a VI evaluation shall be conducted of any potentially impacted structures.

Compliance with N.J.A.C. 7:26E-5.7(b) requires that the Permittee satisfy the post-injection ground water monitoring requirements that are set forth in this letter before applying for any Remedial Action Permit for Ground Water. If a Remedial Action Permit application is submitted before the required ground water sampling has been completed, the application will be denied.

Additionally, contingency compliance ground water sampling is required if ground water sampling results indicate that GWQS have been contravened because of the authorized discharge (e.g., the GWQS for sulfate is exceeded as a result of calcium polysulfide injection, or the GWQS for iron is

exceeded as a result of FerroBlack®-H injection), or that ground water quality has not returned to baseline conditions (when baseline concentrations are greater than GWQS) in the expected timeframe. Ground water sampling must continue until it can be demonstrated that the GWQS have been met or until the ground water quality has returned to baseline conditions. To demonstrate either of these conditions, a minimum of two consecutive ground water sampling events spaced far enough apart to account for seasonal fluctuations, must be conducted.

Furthermore, if the Permittee is planning to apply for a Ground Water Remedial Action Permit for Natural Attenuation in the future, and exceedances of the GWQS that are due to the discharge remain, those exceedances must be treated similarly to any other site related contaminants (i.e., a sufficient number of samples is required and a decreasing concentration trend must be evident) consistent with the Department's Remedial Action Permits for Ground Water Guidance.

IV. REPORTING REQUIREMENTS AND INFORMATION SUBMITTALS

Details of the supplemental pre-design testing, well and system installation, system operation, and performance monitoring results associated with the IRM Phase I program will be documented as part of a quarterly technical status reports submitted to the NJDEP. These quarterly status reports will include succinct, high-level summaries of activities performed, data collected, adaptive steps taken to modify or optimize Phase I treatment, and an overview of activities planned for the subsequent quarter.

Succinct performance summary results will be submitted as part of quarterly status reports. All information, including a complete summary of the work performed under the PBR, a complete set of the data collected, a summary of data trends, an evaluation and interpretation of the data, and conclusions reached (as well as the QA/QC package specified at N.J.A.C. 7:26E-2.1(a)15) shall be submitted as part of the completion report following cessation active operation. All information shall be submitted to:

NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF CASE ASSIGNMENT & INITIAL NOTICE
MAILCODE 401-05H
P.O. BOX 420
TRENTON, NJ 08625-0420
ATTN: COPR

Consistent with N.J.A.C. 7:14A-2.11(a) and 6.2(a)14, within 90 days after initiation of the discharge, notify the Department of the "start date" of the discharge. To report this date, send an email to Tom.Cozzi@dep.nj.gov stating the start date of the discharge.

Consistent with N.J.A.C. 7:14A-2.11(a) and 6.2(a)14, any malfunctions or non-compliance should be reported by fax or telephone within 24 hours to Tom Cozzi of the Site Remediation Program at (609) 984-2905, and in writing within 7 days to the above address using the subject line "DGW Permit-by-Rule Compliance Report - COPR." Written submissions must include the facility name

and PI Number. Failure to report this information is a violation of N.J.A.C. 7:14A and the permit-by-rule.

If you have any questions or concerns, please contact Tom Cozzi of the Site Remediation Program at (609) 984-2905.

Sincerely,

Thomas Cozzi, Assistant Director
NJDEP Site Remediation Program, Office of the Assistant Commissioner

Attachment

c: John Horst, Arcadis U.S. Inc.
Rolando R. Lavarro, Jersey City Redevelopment Agency
Carrie Nawrocki, Health Officer, Hudson Regional Health Commission
Stacey Flanagan, Director, Department of Health and Human Services
Robert Byrne, Jersey City Clerk

Table 1:
IRM Phase I Groundwater Monitoring Program, PPG Garfield Avenue Group Sites, Jersey City, New Jersey

Monitoring Program	Monitoring Well Network	Monitoring Parameters	Monitoring Frequency
Baseline Monitoring	New extraction, injection, monitoring wells and existing monitoring wells	1. **Field Parameters**: DTW, pH, conductivity, DO, ORP, turbidity, and temperature 2. **Lab Analytical**: Total/dissolved TAL metals, total/dissolved Cr(VI), TOC, sulfate/sulfide, and methane	Prior to operation start
Operational Monitoring	New extraction and monitoring wells, existing shallow, intermediate and deep monitoring wells, and system sampling port (influent and effluent)	1. **Field Parameters**: DTW	Weekly - Biweekly
		2. **System Parameters** - Injection / extraction well flow rates	Weekly
		- Wellhead pressures	Weekly
		- Water treatment system monitoring	Weekly - Monthly (as appropriate)
Treatment Monitoring	New extraction and monitoring wells, and existing intermediate and deep monitoring wells	1. **Field Parameters**: DTW, pH, conductivity, DO, ORP, turbidity, and temperature	Biweekly - Monthly
		2. Lab Analytical: - Total/dissolved Cr and Cr(VI)	Monthly
		- TOC	Biweekly - Monthly
		- Supplemental geochemical parameters (sulfate, ferrous [dissolved] iron, dissolved manganese)	Monthly
		- Methane	Monthly-Quarterly
Post-Treatment Monitoring	New monitoring wells and existing shallow, intermediate and deep monitoring wells	1. **Field Parameters**: DTW, pH, conductivity, DO, ORP, turbidity, and temperature 2. **Lab Analytical**: Total/dissolved TAL metals, total/dissolved Cr and Cr(VI), VOCs, SVOCs, TOC, sulfate/sulfide, dissolved iron, dissolved manganese, and methane.	Quarterly following system shutdown for up to 2 years

Notes:

1. The monitoring locations, parameters, and frequencies provided in this table serve as a general guidance for IRM-related monitoring activities and may be adjusted or changed based on IRM Phase I performance, injection and extraction areas in operation, and observed monitoring results.
2. Dissolved metal samples are to be field filtered prior to sample collection.

Cr - chromium
Cr(VI) - hexavalent chromium
DO - dissolved oxygen
DTW - depth-to-water
IRM - Interim Remedial Measures
ORP - oxidation-reduction potential
PBR - Permit-by-Rule
SVOCs - semi-volatile organic compounds
TAL - target analyte list
TOC - total organic carbon
VOCs - volatile organic compounds

McLaughlin Jr., James (ARCADIS)

From: VanEck, David <David.VanEck@dep.nj.gov>
Sent: Monday, March 19, 2018 1:26 PM
To: McLaughlin Jr., James (ARCADIS)
Cc: Prabal.Amin@WestonSolutions.com; Ralph.Costa@WestonSolutions.com; Doyle, David; Feinberg, Richard [C]; Overmyer, Jody; Schnobrich, Matthew
Subject: RE: PPG Garfield Avenue Group Sites- GW IRM: Phase 1 Design & PBR Request Inquiry

Hello Jim,

The NJDEP approves the proposed modification to the subject Permit-By-Rule with this email. The proposal calls for an increase the emulsified vegetable oil [EVO] dosing strength, as needed, from 2% to a maximum of 4%.
I will memorialize the approval by entering this email into NJEMS.

David
…
David Van Eck, Supervising Geologist
NJ Dept. of Environmental Protection, Site Remediation Program
Bureau of Ground Water Pollution Abatement
P.O. Box 420, Mail Code 401-05V, Trenton, New Jersey 08625-0420
Phone: 609-633-2427 Fax: 609-633-1454
David.VanEck@dep.nj.gov

From: McLaughlin Jr., James (ARCADIS) [mailto:James.S.McLaughlin@arcadis.com]
Sent: Friday, March 16, 2018 2:15 PM
To: VanEck, David <David.VanEck@dep.nj.gov>
Cc: Prabal.Amin@WestonSolutions.com; Ralph.Costa@WestonSolutions.com; Doyle, David <David.Doyle@dep.nj.gov>; Feinberg, Richard [C] <feinberg@ppg.com>; Overmyer, Jody <overmyer@ppg.com>; Schnobrich, Matthew <Matthew.Schnobrich@arcadis.com>
Subject: PPG Garfield Avenue Group Sites- GW IRM: Phase 1 Design & PBR Request Inquiry

Hello David,

I am writing in regard to the attached PPG Garfield Avenue Group Site 114 PBR which governs ongoing shallow EVO injection at the site. Arcadis would like to request the ability to increase the EVO dosing strength, as needed, from **2%** as described in the PBR, to a maximum of **4%**. Maximum total volume of solution and as-delivered EVO during current IRM activities will remain unchanged. For reference, the attached PBR Approval letter dated September 21, 2017 states:

> *"…total volume of up to 235,000 gallons of 2% EVO solution and up to approximately 5,000 gallons of as-delivered EVO material will be injected within the target shallow treatment area."*

If this reagent strength increase is approved for current shallow IRM injections, Arcadis will utilize up to 4% for future proposed EVO injections onsite such as in the Western Sliver area, for which a revised PBR Request is forthcoming for your approval.

Regards,
Jim McLaughlin

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Professional Geologist / TN, 5651 | Certified Safety Professional / BCSP, 25117

ATTACHMENT 2

Spill Prevention and Response Plan

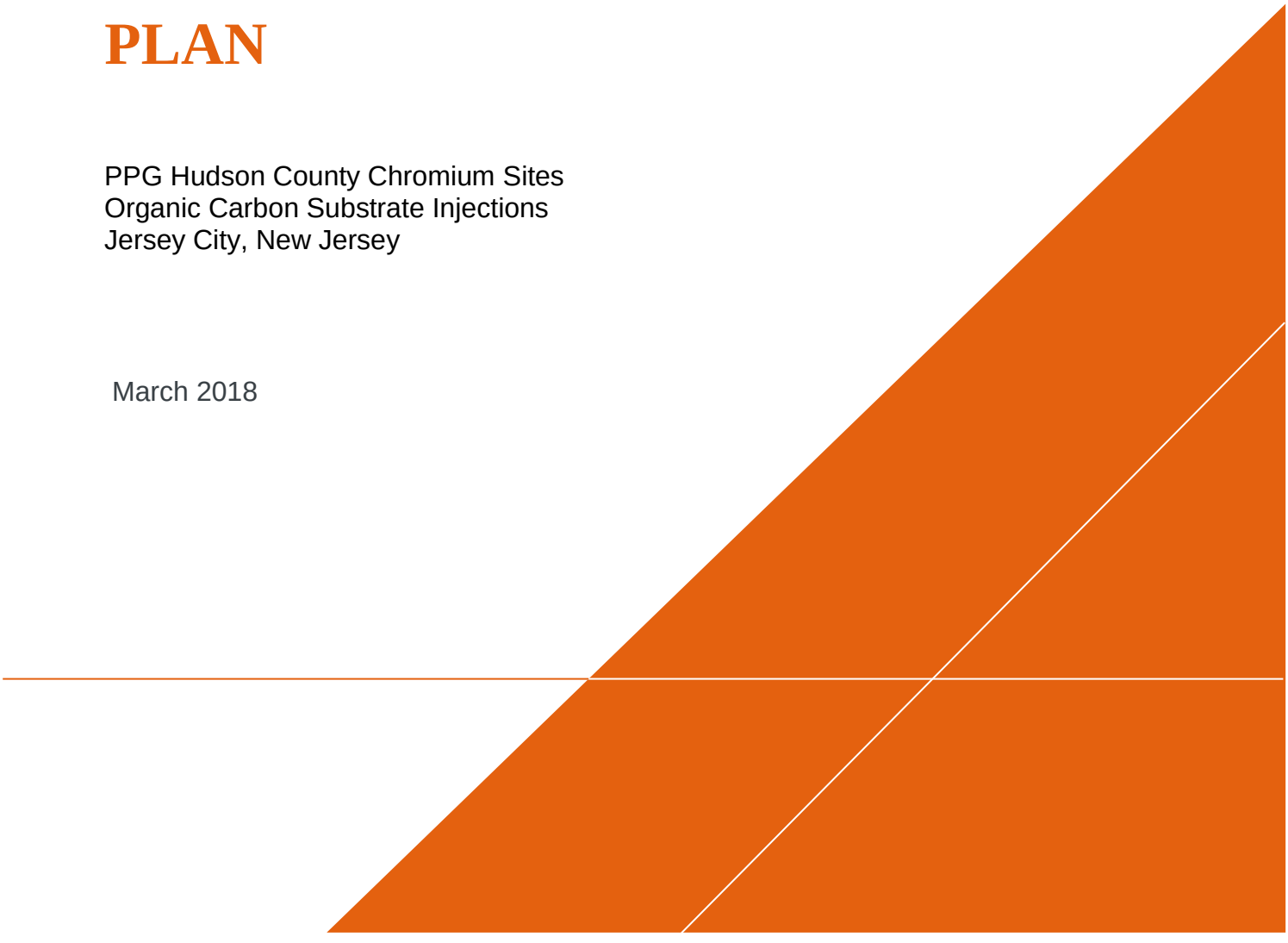
ARCADIS Design & Consultancy for natural and built assets

PPG

SPILL PREVENTION AND RESPONSE PLAN

PPG Hudson County Chromium Sites
Organic Carbon Substrate Injections
Jersey City, New Jersey

March 2018



SPILL PREVENTION AND RESPONSE PLAN

Prepared for:
PPG
Hudson County Chromium Sites
Jersey City, New Jersey

Matt Schnobrich, PE
Technical Lead

James McLaughlin, PG, CSP
Project Manager

Prepared by:
Arcadis U.S., Inc.
10 Friends Lane
Newtown
Pennsylvania 18940
Tel 267 685 1800

Our Ref.:
NP000776.0001

Date:
March 2018

CONTENTS

1 INTRODUCTION

Arcadis U.S., Inc. (Arcadis) prepared this Spill Prevention and Response Plan (SPRP) for the PPG Hudson County Chrome Sites located in Jersey City, New Jersey (the site). To remediate elevated hexavalent chromium Cr(VI) in groundwater and soil, Arcadis is performing subsurface injections of degradable sources of organic carbon. The organic carbon will stimulate the in situ biological reduction of Cr(VI) to trivalent Cr (Cr[III]) and subsequent precipitation and fixation of Cr within the aquifer matrix as part of an in situ anaerobic bioprecipitation (ISAB) approach.

During injection activities, discharge of concentrated or dilute organic carbon materials may occur under several potential scenarios. These include via inadvertent release during mixing activities, around an injection well annulus following seal failure, or via preferential pathways in the subsurface that allow solution daylighting in areas away from injection well locations. For the purposes of the SPRP, all of these conditions are referred to as spills. This document provides a summary of: the key points of contact; the roles of existing team members; training requirements; the methodology for handling, storing and observing chemical delivery; and spill prevention and response planning steps.

The following objectives should be met with the correct planning and implementation of this plan:

1. Protection of human life, health, and safety
2. Protection of the environment through containment
3. Protection of worksite aesthetics as perceived by the public, PPG, and Arcadis
4. Mitigation of damage through cessation of the cause of the incident (stopping leaks)
5. Protection of property from damage via cleanup and spill response

2 SPILL PREVENTION AND RESPONSE COORDINATION

2.1 Project Team Contact List

Project Team	Contact Name and Phone Number
Project Manager (PM)	James McLaughlin (M) 215-815-1030
Site Supervisor	Joe Fedele/Tamru Taye (M) 315-391-0628
Site Safety Officer (SSO) / Spill Prevention and Response Coordinator (SPRC)	Grey Coppi//Tamru Taye (M) 908-917-6948/765-462-9217
Client Contact	Rich Feinberg, PPG (M) 732-233-4552
Jersey City Police Dept South District	(210) 547-5456

2.2 Roles and Responsibilities

Project Manager (PM)

The PM will support the field team members on task planning and safe implementation with respect to chemical handling and storage. The PM will be responsible for the completion of the responsibilities of the roles listed below. The PM will be responsible for notifications to the client and/or governing agencies if a spill were to occur.

Site Supervisor

The Site Supervisor will communicate the daily operations associated with chemical handling or storage, including a review of each field member's job tasks and responsibilities for the day. The Site Supervisor will update the PM on a regular basis on site status, current storage quantities, and anticipated handling of chemicals.

Site Safety Officer (SSO)

The SSO ensures the appropriate level of controls and procedures are being implemented to prevent and when a necessary respond to a spill. The SSO's responsibilities include confirming that the proper personal protective equipment (PPE) is being used, confirming that the secondary containment is adequate and inspected regularly, and confirming that personnel know how to prevent and/or respond to a possible spill of the chemicals being handled on site.

Spill Prevention and Response Coordinator (SPRC)

If an incident occurs, the SPRC will assess and monitor the situation throughout an incident to ensure that personnel are not endangered, spilled materials are contained and collected, and that spilled materials are disposed of according to state and federal regulations.

Client

The client will be notified on a regular basis regarding site and project status at the discretion of the PM.

Local Police Department

The police department receives notification, via AECOM on behalf of PPG, of chemical storage activities in the event they are called to respond either by Arcadis staff in accordance with this plan and/or for an unrelated incident in the vicinity of chemical storage areas.

2.3 Training

Minimum training for field staff will include the Hazardous Waste Operations and Emergency Response (HAZWOPER) 40-hour Occupational Safety and Health Administration (OSHA) training, and 8-hour Department of Transportation / International Air Transport Association Hazardous Materials Shipping and Transportation Training, and Material of Trade Training. The operators and employees will take 8-hour HAZWOPER OSHA refresher training annually.

During daily tailgate safety meetings, near misses, spills, and other safety issues will be discussed to assure an adequate understanding of the SPRP requirements. Also, tailgate safety meetings will be held prior to deliveries.

Visitors must sign in daily and be given a brief description of the SPRP requirements by the SSO or the SPRC. Visitors will then be required to sign out when they leave the site.

3 CHEMICAL MANAGEMENT

3.1 Chemical Reagent Inventory

Chemical[1] Name	Maximum Storage Quantity	Storage Method/Location (see Figure 1)
Emulsified Vegetable Oil for shallow-zone injections	Q1-Q2 2018 Up to 13,151 lbs	Stored in 262.5-gallon totes inside two locked conex boxes at 70 Carteret Ave (Site 114)
Molasses and/or EVO for intermediate and deep-zone injections	Q2-Q4 2018 Up to 105,000 gallons	Stored in secondary containment by MIU at 70 Carteret Ave (Site 114)

[1] Safety data sheet (SDS), Site-specific Health and Safety Plan (HASP), and EVO Shallow Injections

3.2 Chemical Reagent Handling Guidelines

Reagents stored or prepared will be in small batches as per the daily need. Before introducing the chemical reagents in to the injection mixing system, a clean water leak test will be performed. Additionally, a clean water leak test will be performed when any part of the injection and mixing system is added, removed, or replaced. Prior to modification of injection and mixing system, a clean water rinse will be required for equipment contacting the chemical solution. The rinsed water will be injected into the injection wells. The injection equipment and mixing tanks will need a thorough clean water rinse after the injection is complete prior to demobilization.

Additional general handling and storage requirements:

- Wear personnel protective equipment (PPE) and wash spillage from clothing.
- Keep material away from light and heat.
- Keep the storage area cool and dry.
- Avoid physical damage to containers.
- Do not repack or return unused portions to original containers. Withdraw only sufficient amounts for immediate use.
- Do not smoke, eat, or drink when handling the chemical.

The job safety analysis and PPE requirements for chemical handling, mixing, and injection are included in the site-specific HASP. A copy of the SDS for Emulsified Vegetable Oil (EVO) and molasses are also included in the site-specific HASP. Injection area and chemical specific handing methodology is discussed in the sections below.

EVO solution will be received in 262.5-gallon totes and stored in two locking conex boxes. A lift gate and pallet jack or a forklift will be used by the carrier or site staff to unload and place the chemicals in the conex boxes at the proposed locations. Totes will be placed on a polyethylene sheet inside the conex box.

During the injection activities, Emulsified vegetable oil and clean water will be mixed to achieve the target injection dosing within mixing totes or a 500-gallon tank. The mixing vessels will be placed on pallets inside a 500-gallon spill guard.

3.3 Storage Area and Containment Measures

Molasses and EVO will be delivered in batches to reduce the volume of staged materials onsite. EVO utilized in shallow-zone injections will be secured in conex boxes to protect the chemical from tampering and possible disruption. The conex box will be kept locked when Arcadis staff is not on site. The chemicals will be taken out of the conex boxes or transferred to the mixing locations when mixing is required. The mixing location will be attended continuously during the injection process.

4 SPILL PREVENTION

The conex boxes used for chemical storage will be placed on a level, compacted surface. Chemical mixing will be conducted inside a spill guard, also placed on a level, compacted surface. The injection staff will complete required training detailed in Section 2.3 and appropriate PPE will be provided to the field staff

The injection will be performed under gravity or low-pressure conditions. Polyvinyl Chloride (PVC) fittings will be used to leak proof the connection between well and well head fittings. The connection will be checked for leakage with water before starting chemical injection. In addition, sorbent pads will be placed around the well cap or casing to contain a spill, if needed.

4.1 Reagent Handling Tasks

Reagent handling tasks include:

- Receiving and placing chemicals
- Transferring chemical to the mixing tanks
- Mixing solution
- Injecting dilute reagent solution into the injection wells
- Disposing of empty containers

The procedures to perform the listed tasks are presented in Section 5.

4.2 Spill Prevention Monitoring

Early leak detection is critical to eliminating spills, preventing the discharge of larger volumes of reagent, and determining the appropriate mitigation steps. The SSO will establish the following monitoring program to prevent chemical spill:

- While injections are underway, perform daily monitoring observations at the start of the day, at completion of daily activities, and on a regular basis over the course of each day. These inspections will include:
    - Visual observation of each well in operation to evaluate wellhead connections, fitting integrity, and wellhead annulus integrity
    - Visual inspection of mixing system and conveyance infrastructure to identify potential leaks or equipment connection deficiencies
    - Visual observation of the injection area and the surrounding vicinity for pooling reagent or stormwater accumulation

Proactive steps taken to respond to spills or reagent surfacing include:

- No injections will occur in areas of ponded surface water.
- No injections will occur within one day of forecasted rain events.
- Berms will be constructed, as necessary, to prevent runoff outside of the treatment area or offsite.
- In consideration of previously identified spills and reagent daylighting, the following proactive steps have been identified:
    - The recommended shallow-zone injection flow rate will be reduced to approximately 0.5 gpm to minimize injection pressure and the rate of fluid delivery into the subsurface.
    - Injection well groupings will be staggered such that injection is performed into spatially distant wells instead of grouped well clusters. At the first sign of surfacing, this approach allows for the injection lead to definitively pinpoint the well contributing to the surfacing and remove it from the injection program.
    - Well-specific target injection volumes will be assessed, and quantity of solution decreased as needed in areas prone to daylighting.

If a spill is observed during active injection, the following steps will be implemented:

- Immediately upon observation of daylighting, delivery into the contributing well (or other adjacent injection wells) will cease. Spill pads will be deployed and used to adsorb and eliminate accumulating

reagents. Based on site conditions and the location of spill, a small hole will be dug into the land surface where the spill is identified, and a sump will be placed and utilized to remove EVO before surfacing spreads.

- The identified injection well responsible for spill observation will be evaluated to determine if additional injection can be achieved without spill observation or whether it should be removed from the injection program.

- Additional berms will be constructed, as necessary, to enhance existing controls and prevent runoff outside of the treatment area or offsite.

5 SPILL RESPONSE PROCEDURES

This section provides the response procedures for a minor or major spill of reagent solution on site or off site during injection activities. Every effort will be taken to prevent leakage. In case of a spill, the first step is to contain or collect the spill inside the spill guard or totes/tanks. Sorbent pads can be used to contain the spill. Spill response personal must wear appropriate PPE before responding to a spill. Spill response procedures are provided below.

Emulsified Vegetable Oil/Molasses

- Turn off Injection activities immediately and contain spill
- Clean up as needed. Pump into containers and use absorbent pads where necessary
- Soak up remaining liquid with sorbent materials.
- Placed used sorbents into a waste bags to dispose of on site as a non-hazardous waste.

For a major spill, the Emergency Response Contractor will assist with the spill cleanup activities.

Emulsified vegetable oil will be received and stored in 262.5 gallon totes. If the totes are damaged resulting in a release during handling and transportation, the emulsified vegetable solution should be collected using a diaphragm pump. If spill occurs within secondary containment area, the collected emulsified vegetable oil can be recycled and reused. If the spill occurs outside the secondary containment area, the collected emulsified vegetable solution will be contained in a tank/tote for future management.

5.1 Spill Response Notification Procedures

The SPRC will, after proper assessment of the situation, order whatever action is appropriate to protect human life and site aesthetics. Secondary to preservation of lives, the SPRC will attempt to stop the release of chemicals that pose a hazard to health, safety, or the environment.

The SPRC will assess and monitor the situation throughout the incident to ensure that personnel are not endangered, spilled materials are contained and collected, and that spilled materials are disposed of according to state and federal regulations.

The spills, leaks, or discharges of chemicals to the environment will be handled based on the following sequence.

i. The First Responder or other employees will stop the flow of material from the container or tank and disable nearby electrical equipment, if possible.

ii. The First Responder or the SSO will notify SPRC and other employees in the area and contain the spill to prevent its spread if possible.

iii. SPRC will estimate the magnitude of the spill and he/she will coordinate clean-up efforts.

iv. Minor spill: If a release to the environment is below 50 gallons or manageable by the employees.

v. Major spill: If a release to the environment is greater than 50 gallons or not manageable by the employees.

vi. If SPRC identifies that the spill is a major spill than he/she will notify the SSO and project manager.

vii. The SSO and project manager will then notify PPG.

viii. If the spill extends offsite, PPG will determine if notification to the Local Police Department is warranted. The Emergency Response Contractor will be notified and will assist with the spill cleanup activities.

ix. If the spill extends offsite, SPRC or designated personnel will block or redirect traffic from the spill area.

x. SPRC will oversee containment and cleanup operations.

xi. SPRC will evaluate if the spilled material is reusable or must be contained and disposed.

xii. Waste will be labeled, stored, and disposed of according to applicable local, state, and federal regulations.

xiii. In the event of a release of extracted, untreated, chromium-impacted groundwater, the project manager will notify PPG, then New Jersey Department of Environmental Protection (NJDEP). If deemed a release, within 30 days of the spill, the PM will file a written report to the New Jersey Bureau of Release Prevention, NJDEP, P.O. Box 420, Mail Code 22-03D, Trenton, New Jersey 08625-0420, Attention: Discharge Confirmation Report. The report will include the cause of the release, how the release was discovered, and the response measures taken or a schedule for completion of corrective measures. Additional information is available on http://www.nj.gov/dep/warndep.htm

6 WASTE MANAGEMENT

Non-usable waste material will be treated or disposed of in compliance with local, state, and federal regulations.

Arcadis U.S., Inc.

10 Friends Lane

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Tel 267 685 1800

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McLaughlin Jr., James (ARCADIS)

From: VanEck, David <David.VanEck@dep.nj.gov>
Sent: Thursday, March 29, 2018 2:06 PM
To: McLaughlin Jr., James (ARCADIS); Schnobrich, Matthew; Feinberg, Richard [C]; Overmyer, Jody; 'terril@ppg.com'; Cozzi, Tom
Cc: Jray@mdmc-law.com; ncolson@mdmc-law.com; BDoshi@jcnj.org; Benjamin Delisle; 'psorge@jmsorge.com' (psorge@jmsorge.com) (psorge@jmsorge.com); rtschmit@hampshireco.com; Amin, Prabal (Prabal.Amin@WestonSolutions.com); Costa, Ralph (Ralph.Costa@WestonSolutions.com); Amend-Babcock, Laura (Laura.Amend-Babcock@WestonSolutions.com); Doyle, David; Rabah, Majda; RRiccio@mdmc-law.com; dspader@erfs.com; 'Dorothy.Laguzza@leclairryan.com'; Horst, John
Subject: FW: PPG- Site 114- PBR Modification Request- Western Sliver
Attachments: 2018-03-29-PPG Site 114 Western Sliver- DGW PBR Modification Request_F.PDF

The NJDEP approves the proposed modification to the Permit-By-Rule dated 21 September 2018 with this email. The subject proposal calls for injection of emulsified vegetable oil (EVO) solution into shallow groundwater to treat shallow soils in a portion of Site 114 referred to as the "Western Sliver". Details of the proposal is provided in the attached document "2018-03-29-PPG Site 114 Western Sliver- DGW PBR Modification Request_F.pdf".

I will memorialize the approval by entering the 2018-03-29 proposal, and this email, into NJEMS.

…
David Van Eck, Supervising Geologist
NJ Dept. of Environmental Protection, Site Remediation Program
Bureau of Ground Water Pollution Abatement
P.O. Box 420, Mail Code 401-05V, Trenton, New Jersey 08625-0420
Phone: 609-633-2427 Fax: 609-633-1454
David.VanEck@dep.nj.gov

From: McLaughlin Jr., James (ARCADIS) [mailto:James.S.McLaughlin@arcadis.com]
Sent: Thursday, March 29, 2018 10:14 AM
To: VanEck, David <David.VanEck@dep.nj.gov>
Cc: Rabah, Majda <Majda.Rabah@arcadis.com>; Schnobrich, Matthew <Matthew.Schnobrich@arcadis.com>
Subject: RE: PPG- Site 114- PBR Modification Request- Western Sliver

David,

Use of 3% dosing for this specific injection at the Western Sliver was intentional. The 3/19/18 approved PBR modification allowed for increased EVO dosing up to 4% for injections sitewide. The 4% was a maximum needed for a portion of the IRM #1-area injections, where delivery of the target solution volume within 5' of ground surface is a challenge. Our target EVO solution concentration for the short-duration Western Sliver injection is 3%, and anticipated EVO volumes as specified in Table 1 were calculated accordingly. To avoid confusion for this submittal, I propose revision of all mention of 3% dosing to state "*approximately 3%, with a maximum dosing concentration of 4%*".

If you find that acceptable, the attached revised PBR Modification Request Package includes rewording of the three mentions of the 3% as stated above.

Many thanks,
Jim McLaughlin

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Professional Geologist / TN, 5651 | Certified Safety Professional / BCSP, 25117

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ARCADIS

Be green, leave it on the screen.

From: VanEck, David <David.VanEck@dep.nj.gov>
Sent: Thursday, March 29, 2018 8:19 AM
To: McLaughlin Jr., James (ARCADIS) <James.S.McLaughlin@arcadis.com>
Subject: RE: PPG- Site 114- PBR Modification Request- Western Sliver

Jim,

After reviewing the proposal with Weston, I have one question and one comment.

On page 1, the PBR modification request for the Western Sliver references the 3/19/18 approved PBR modification increasing the EVO dosing from 2% to 4%. However, the remainder of the document still reads 3%. Is this intentional? Or should the text reflect a dosage of 4%?

We agree that analysis for ferrous iron would not provide useful information, so we will not be requiring ferrous iron analysis for soil samples.

David

…
David Van Eck, Supervising Geologist
NJ Dept. of Environmental Protection, Site Remediation Program
Bureau of Ground Water Pollution Abatement
P.O. Box 420, Mail Code 401-05V, Trenton, New Jersey 08625-0420
Phone: 609-633-2427 Fax: 609-633-1454
David.VanEck@dep.nj.gov

From: McLaughlin Jr., James (ARCADIS) [mailto:James.S.McLaughlin@arcadis.com]
Sent: Monday, March 26, 2018 8:22 PM
To: VanEck, David <David.VanEck@dep.nj.gov>
Cc: Jray@mdmc-law.com; ncolson@mdmc-law.com; RRiccio@mdmc-law.com; Cozzi, Tom <Tom.Cozzi@dep.nj.gov>; Doyle, David <David.Doyle@dep.nj.gov>; Amend-Babcock, Laura <Laura.Amend-Babcock@WestonSolutions.com>; Costa, Ralph <Ralph.Costa@WestonSolutions.com>; BDoshi@jcnj.org; dspader@erfs.com; delisleB@jcnj.org; rtschmit@hampshireco.com; Psorge@jmsorge.com; Feinberg, Richard [C] <feinberg@ppg.com>; Overmyer, Jody <overmyer@ppg.com>; Terril, Mark <terril@ppg.com>; Dorothy.Laguzza@leclairryan.com; Horst, John <John.Horst@arcadis.com>; Schnobrich, Matthew <Matthew.Schnobrich@arcadis.com>; Amin, Prabal <Prabal.Amin@WestonSolutions.com>; Rabah, Majda <Majda.Rabah@arcadis.com>
Subject: RE: PPG- Site 114- PBR Modification Request- Western Sliver

Hello David,

On behalf of PPG, Arcadis has prepared the attached request to modify the NJDEP-approved PBR Discharge Authorization for Garfield Ave Group Site 114 in Jersey City, Hudson County, New Jersey. The proposed modification to the existing DGW PBR is to allow for injection of EVO solution to treat shallow soils in a portion of Site 114 referred to as the “Western Sliver”. This request has been revised per the comments received below by Weston.

Regards,
Jim McLaughlin

James S. McLaughlin, PG, CSP | Certified Project Manager/Group Leader 3 | James.McLaughlin@Arcadis-us.com
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From: Amin, Prabal <Prabal.Amin@WestonSolutions.com>
Sent: Tuesday, March 13, 2018 3:47 PM
To: McLaughlin Jr., James (ARCADIS) <James.S.McLaughlin@arcadis.com>; VanEck, David <David.VanEck@dep.nj.gov>
Cc: Jray@mdmc-law.com; ncolson@mdmc-law.com; RRiccio@mdmc-law.com; Tom.Cozzi@dep.nj.gov; David.Doyle@dep.nj.gov; Amend-Babcock, Laura <Laura.Amend-Babcock@WestonSolutions.com>; Costa, Ralph <Ralph.Costa@WestonSolutions.com>; BDoshi@jcnj.org; dspader@erfs.com; delisleB@jcnj.org; rtschmit@hampshireco.com; Psorge@jmsorge.com; Feinberg, Richard [C] <feinberg@ppg.com>; Overmyer, Jody <overmyer@ppg.com>; Terril, Mark <terril@ppg.com>; Dorothy.Laguzza@leclairryan.com; Horst, John <John.Horst@arcadis.com>; Schnobrich, Matthew <Matthew.Schnobrich@arcadis.com>
Subject: RE: PPG- Site 114- PBR Modification Request- Western Sliver

On behalf of the NJDEP, Weston is providing the following preliminary comments on the PBR modification request for the Western Sliver. These comments were also relayed verbally by Weston to Arcadis on a conference call held on 3/5/18. The PBR modification request should be revised to address these comments and resubmitted for final review by NJDEP/Weston.

1. Page 1, last paragraph: The text states the EVO solutions will be 3% by volume. The original PBR approval was for a 2% EVO solution (see page 3 of the 9/21/17 approval letter). Please specify the increase from 2% to 3% in this PBR modification request.

2. Page 2, Approach, 2nd paragraph, 2nd sentence: The text specifies *"[t]he delivered EVO will be mixed with water from an on-site source."* Please specify the available options (e.g. WWTP effluent, City water, etc.).

3. Page 2, Approach, 5th paragraph: The text mentions *"a site-specific Spill Response Plan."* Please provide clarification on when and where the Spill Response Plan would be available.

4. Page 2, Approach, last paragraph, 2nd sentence: To be consistent with Table 1, the text should more clearly state the PBR modification request is for a maximum injection of 9,000 gallons of EVO solution.

5. Page 3, Monitoring Plan, 2nd sentence: The description of post-treatment soil sampling needs more clarity. Note that no pilot study work was performed to demonstrate the effectiveness of the EVO technology for the in-situ treatment of soils at the site. Therefore, more post-treatment monitoring specifics should be provided to demonstrate the efficacy of the EVO delivery system and treatment of impacted soils. The appropriate NJDEP guidance documents on in-situ remediation should be consulted to identify the appropriate number, locations and target depth intervals of post-treatment soil samples. Samples should be biased towards previously known locations with elevated hexavalent chromium concentrations.

6. Page 3, Reporting: The text should specify that the Western Sliver soil treatment completion report will be submitted separate from any of the quarterly groundwater IRM status reports.

Thank you.

Prabal N. Amin, P.E., LSRP

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From: McLaughlin Jr., James (ARCADIS) [mailto:James.S.McLaughlin@arcadis.com]
Sent: Wednesday, February 28, 2018 4:50 PM
To: VanEck, David <David.VanEck@dep.nj.gov>
Cc: Jray@mdmc-law.com; ncolson@mdmc-law.com; RRiccio@mdmc-law.com; Tom.Cozzi@dep.nj.gov; David.Doyle@dep.nj.gov; Amin, Prabal <Prabal.Amin@WestonSolutions.com>; Amend-Babcock, Laura <Laura.Amend-Babcock@WestonSolutions.com>; Costa, Ralph <Ralph.Costa@WestonSolutions.com>; BDoshi@jcnj.org; dspader@erfs.com; delisleB@jcnj.org; rtschmit@hampshireco.com; Psorge@jmsorge.com; Feinberg, Richard [C] <feinberg@ppg.com>; Overmyer, Jody <overmyer@ppg.com>; Terril, Mark <terril@ppg.com>; Dorothy.Laguzza@leclairryan.com; Horst, John <John.Horst@arcadis.com>; Schnobrich, Matthew <Matthew.Schnobrich@arcadis.com>
Subject: PPG- Site 114- PBR Modification Request- Western Sliver

Hello David,

On behalf of PPG, Arcadis has prepared the attached request to modify the PBR Discharge Authorization approved by NJDEP for Garfield Ave Group Site 114 in Jersey City, Hudson County, New Jersey. The proposed modification to the existing DGW PBR is to allow for injection of EVO solution into shallow groundwater to treat shallow soils in a portion of Site 114 referred to as the “Western Sliver”.

Regards,
Jim McLaughlin

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