41 Spring Street
New Providence, NJ 07974

908.988.1700 PHONE
973.564.6442 FAX

www.trcsolutions.com

February 5, 2016

New Jersey Department of Environmental Protection
Bureau of Case Management
Mail Code 401-05F
P.O. Box 420
Trenton, New Jersey 08625-0420

Attn: Donna Gaffigan, Case Manager

Re: *Soil Remedial Action Report - Investigative Area (IA) 4*
Hoffmann-La Roche Inc.
340 Kingsland Street
Nutley, New Jersey
NJDEP SRP P.I. No. 009949

Dear Ms. Gaffigan:

On behalf of Hoffmann-La Roche Inc. (Roche), TRC Environmental Corporation (TRC) has prepared the attached *Soil Remedial Action Report* (RAR) for Investigative Area 4 (IA-4) at the above-referenced site. This RAR summarizes the soil remedial activities conducted in IA-4 that were proposed in TRC/Roche's November 14, 2014 IA-4 Remedial Action Workplan (RAW), which was approved by the New Jersey Department of Environmental Protection (NJDEP) on February 3, 2015. This report also details the remediation of soils beneath Buildings 36 and 46, which were demolished during September 2014.

If you have any questions or need additional information, please contact me at 908-988-1661 or jpowley@trcsolutions.com.

Very truly yours,

TRC ENVIRONMENTAL CORPORATION

Jeffrey C. Powley, PG, LSRP
Project Director
LSRP No. 584746

cc: Mr. Greg Cierpial, Hoffmann-La Roche Inc.
Mr. Chandra Patel, Hoffmann-La Roche Inc.
Ms. Teresa O'Meara, Hoffmann-La Roche Inc.

Nutley Site Remediation

Project No. S153.29215

TRC Project No. 105009-198233

Soil Remedial Action Report

Investigative Area (IA) 4

NJDEP Required Forms

Prepared for:

Hoffmann-La Roche Inc.
340 Kingsland Street
Nutley, New Jersey 07110-1199

Prepared by:

TRC Environmental Corporation
41 Spring Street
New Providence, NJ 07974

February 5, 2016

New Jersey Department of Environmental Protection
Site Remediation Program

TRADITIONAL OVERSIGHT REPORT CERTIFICATION FORM

Date Stamp
(For Department use only)

SECTION A. SITE NAME AND LOCATION

Site Name: Hoffmann-La Roche Inc. - Investigative Area (IA) 4 - Soils

List All AKAs: Roche

Street Address: 340 Kingsland Street

Municipality: Nutley (Township Borough or City)

County: Essex Zip Code: 07110-1199

Program Interest (PI) Number(s): 009949 Case Tracking Number(s): NJD002191211

SECTION B. REPORT INFORMATION

Report Name: Remedial Action Report - Investigative Area (IA) 4 - Soils

Report Date: 02/05/2016

Federal Traditional Case Type :

☒ **RCRA GPRA 2020** ☐ **CERCLA/NPL** ☐ **USDOD** ☐ **USDOE**

☐ Other (explain):

SECTION C. PERSON RESPONSIBLE FOR CONDUCTING THE REMEDIATION INFORMATION AND CERTIFICATION

Full Legal Name of the Person Responsible for Conducting the Remediation: Hoffmann-La Roche Inc.

Representative First Name: Thomas Representative Last Name Lyon

Title: Vice President, Site Head

Phone Number: (973) 562-2210 Ext: Fax: (973) 562-3977

Mailing Address: 340 Kingsland Street

City/Town: Nutley State: New Jersey Zip Code: 07110

Email Address: tom.lyon@roche.com

This certification shall be signed by the person responsible for conducting the remediation who is submitting this notification in accordance with Administrative Requirements for the Remediation of Contaminated Sites rule at N.J.A.C. 7:26C-1.5(a).

I certify under penalty of law that I have personally examined and am familiar with the information submitted herein, including all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, to the best of my knowledge, I believe that the submitted information is true, accurate and complete. I am aware that there are significant civil penalties for knowingly submitting false, inaccurate or incomplete information and that I am committing a crime of the fourth degree if I make a written false statement which I do not believe to be true. I am also aware that if I knowingly direct or authorize the violation of any statute, I am personally liable for the penalties.

Signature: Date: 2/3/16

Name/Title: Thomas Lyon / Vice President, Site Head

SECTION D. LICENSED SITE REMEDIATION PROFESSIONAL INFORMATION AND STATEMENT

LSRP ID Number: 584746

First Name: Jeffrey Last Name: Powley

Phone Number: (908) 988-1661 Ext: Fax: (908) 464-3712

Mailing Address: 41 Spring Street

City/Town: New Providence State: New Jersey Zip Code: 07974

Email Address: jpowley@trcsolutions.com

This statement shall be signed by the LSRP who is submitting this notification in accordance with SRRA Section 16 d. and Section 30 b.2.

I certify that I am a Licensed Site Remediation Professional authorized pursuant to N.J.S.A. 58:10C to conduct business in New Jersey. As the Licensed Site Remediation Professional of record for this remediation, I:

[SELECT ONE OR BOTH OF THE FOLLOWING AS APPLICABLE]:

☒ *directly oversaw and supervised all of the referenced remediation, and\or*

☒ *personally reviewed and accepted all of the referenced remediation presented herein.*

I believe that the information contained herein, and including all attached documents, is true, accurate and complete.

It is my independent professional judgment and opinion that the remediation conducted at this site, as reflected in this submission to the Department, conforms to, and is consistent with, the remediation requirements in N.J.S.A. 58:10C-14.

My conduct and decisions in this matter were made upon the exercise of reasonable care and diligence, and by applying the knowledge and skill ordinarily exercised by licensed site remediation professionals practicing in good standing, in accordance with N.J.S.A. 58:10C-16, in the State of New Jersey at the time I performed these professional services.

I am aware pursuant to N.J.S.A. 58:10C-17 that for purposely, knowingly or recklessly submitting false statement, representation or certification in any document or information submitted to the board or Department, etc., that there are significant civil, administrative and criminal penalties, including license revocation or suspension, fines and being punished by imprisonment for conviction of a crime of the third degree.

LSRP Signature: Jeffrey C Powley Date: 2-5-2016

LSRP Name/Title: Jeffrey C. Powley, PG, LSRP/Project Director

Company Name: TRC Environmental Corporation

Completed forms should be sent to:

Assigned Case Manager
Bureau of Case Management
Site Remediation Program
NJ Department of Environmental Protection
401-05F
PO Box 420
Trenton, NJ 08625-0420

New Jersey Department of Environmental Protection
Site Remediation Program

REMEDIAL ACTION REPORT FORM

Date Stamp
(For Department use only)

SECTION A. SITE

Site Name: Hoffmann-La Roche Inc. - Investigative Area (IA) 4 - Soils

Program Interest (PI) Number(s): 009949

Case Tracking Number(s) for this submission: NJD002191211

This form must be attached to the Cover/Certification Form

SECTION B. SCOPE OF REMEDIAL ACTION REPORT

1. Does the RAR address:
   This RAR addresses soils in IA-4 only
   - ☐ Area(s) of Concern (AOCs) Only
   - ☒ Entire Site (Based on a completed and submitted Preliminary Assessment/Site Investigation)
2. Total number of contaminated AOCs associated with the case: 22
3. Total number of contaminated AOCs addressed in this submission: 7
4. Are there any outstanding contaminated AOCs associated with the case where the remedial action has NOT been performed? ☐ Yes ☒ No
5. Does this RAR address a discharge/release from a federally regulated UST? ☐ Yes ☒ No

When answering the remaining questions on this form consider only the AOCs addressed in this submission.

SECTION C. GENERAL

1. Does this submission include Remedial Action Permit Application(s) that require Site Remediation Program approval? ☐ Yes ☒ No
2. Was a remediation initiated after May 6, 2010, for new construction / change in the use of the site proposed for the purpose of residential use, use as a licensed child care center or use as a school? ☐ Yes ☒ No
   If "Yes," was an unrestricted use or a presumptive remedy implemented? ☐ Yes ☐ No
3. Was an alternative remedy approved by the NJDEP? ☐ Yes ☒ No
   If "Yes," provide the date of the approval: _____
4. Has the remediation varied from the Technical Rules? ☐ Yes ☒ No
   If "Yes." provide the citation(s) from which the remediation has varied and the page(s) in the attached document where the rationale for the variance is provided.
   N.J.A.C. 7:26E- _____ Page _____
   N.J.A.C. 7:26E- _____ Page _____
   N.J.A.C. 7:26E- _____ Page _____
5. Were the laboratory Reporting Limits below applicable remediation standards/screening levels criteria required for the contaminants of concern for the AOCs addressed in this submission? ☒ Yes ☐ No
6. Have past NJDEP-documented deficiencies been addressed in this submission? ☐ Yes ☐ No ☒ N/A
7. Did the remediation deviate from that proposed in the Remedial Action Workplan? ☒ Yes ☐ No
   If "Yes," specify the section/page(s) in the report where the deviation(s) are discussed:
   IA-4 RAR Section 4.7 Page 26-28
8. Did the remedial action render the property unusable for future redevelopment or for recreational use (N.J.A.C. 7:26C-6.4(b)? ☐ Yes ☒ No

SECTION D. SITE CONDITIONS

1. At any time, was there any radiological contamination detected at the AOCs addressed in this submission? ☐ Yes ☒ No
2. At any time, did any of the AOCs addressed in this submission contain Ordnance and Explosives/ Unexploded Ordnance (OE/UXO)? ☐ Yes ☒ No
3. Did the remedial action involve containment of free product? ☐ Yes ☒ No
4. Has dioxin been detected at levels above NJDEP's interim direct contact soil screening level of 50 ppt dioxin TEQ (TCDD Toxicity Equivalence Quotient) in any AOCs addressed in this submission? ☐ Yes ☒ No
5. Have any of the following contaminants *ever* been detected in sediment above the ecological screening levels at the AOCs addressed in this submission? ☐ Yes ☒ No

   If "Yes," check all that apply:

   ☐ Arsenic ☐ Dioxin ☐ Mercury ☐ PCBs ☐ Pesticides
6. Is remediation complete in all affected media at the AOCs addressed in this submission? ☐ Yes ☒ No
7. Did contaminants from the AOCs addressed in this submission discharge to surface water? ☐ Yes ☒ No
8. Did contaminants from the AOCs addressed in this submission discharge to an Environmentally Sensitive Natural Resource (ESNR)? ☐ Yes ☒ No
9. Are any of the following conditions currently present for the AOCs addressed in this submission? *(check all that apply):*

Groundwater:

- ☒ Contaminated ground water in the overburden aquifer
- ☐ Contaminated ground water in a confined aquifer
- ☒ Contaminated ground water in the bedrock aquifer
- ☐ Contaminated ground water in multiple aquifer units
- ☐ Multiple distinct ground water plumes
- ☐ Contaminated ground water migrating off-site
- ☐ Natural background ground water contamination
- ☐ Contaminated ground water discharging to surface water or Environmentally Sensitive Natural Resource (ESNR)
- ☒ Residual or free product
- ☐ Radionuclides

Soil:

- ☐ On-site discharge(s) impacting soil off-site
- ☐ Chromate Chemical Production Waste/COPR
- ☐ Munitions and explosives of concern
- ☐ Contaminated soil in the saturated zone
- ☐ Historic pesticide impacts to soil
- ☐ Residual or free product
- ☐ Radionuclides
- ☒ Historic Fill
- ☐ Natural background only above Impact to Ground Water Cleanup Criteria
- ☐ Natural background above Direct Contact Remediation Standards
- ☐ Soil contamination in an ESNR

SECTION E. APPLICABLE REMEDIATION STANDARDS

1. Were Default Remediation Standards used for all contaminants? ☒ Yes ☐ No

   If "Yes," check all that apply:

   ☒ Direct Contact
   ☐ Impact to Ground Water Soil Screening Levels
   ☐ Ecological Screening Levels
2. Has compliance averaging been utilized to determine compliance with the Soil Remediation Standards? ☒ Yes ☐ No

   If "Yes," check all that apply:

	Compliance Averaging Method Utilized			
Pathway	Arithmetic Mean	95 Percent UCL	Spatially Weighted Average	75 Percent/ 10X Procedure
☒ Ingestion-Dermal Pathway	☐	☐	☒	☐
☒ Inhalation Pathway	☐	☐	☒	☐
☐ Impact to Ground Water Pathway	☐	☐	☐	☐

3. Has a compliance option been utilized to determine compliance with the Impact to Ground Water Pathway? (If "Yes," check all that apply) ☐ Yes ☒ No

   ☐ Immobile Compounds
   ☐ Data evaluation for metals and semi-volatiles
   ☐ Data evaluation for volatile organics derived from discharges of petroleum mixtures

4. Was an interim standard used for a contaminant where a standard does not exist? ☐ Yes ☒ No

5. Were Alternate Remediation Standards used for the Ingestion/Dermal Pathway? ☐ Yes ☒ No

6. Were Alternate Remediation Standards used for the Inhalation Pathway? ☐ Yes ☒ No

7. Were Site Specific Standards used for the Impact to Ground Water Pathway? ☒ Yes ☐ No
   If "Yes," check all that apply:

   ☐ Soil-Water Partitioning Equation ☒ SPLP ☐ Sesoil ☐ Sesoil/AT123D
   ☐ DAF Modification

8. Were Site Specific Ecological Remediation Goals used? ☐ Yes ☒ No

9. What is the ground water classification for this site as per N.J.A.C. 7:9C? (check all that apply)

   ☐ Class I-A
   ☐ Class I-PL Pinelands Protection Area
   ☐ Class I-PL Pinelands Preservation Area
   ☒ Class II-A
   ☐ Class III-A
   ☐ Class III-B

SECTION F. ALTERNATIVE AND CLEAN FILL USE

1. Was alternative fill used? ☐ Yes ☒ No

2. Was clean fill used? ☒ Yes ☐ No

3. Was material sent off-site for use as alternative and/or clean fill? ☐ Yes ☒ No
   If "Yes," specify the section/page in the RAR where it states the SRP site receiving this alternative and/or clean fill: _____

4. Was material sent off-site for use as alternative and/or clean fill at a non-SRP site? ☐ Yes ☒ No
   If "Yes," specify the section/page in the RAR where it states the non-SRP site receiving this alternative and/or clean fill: _____

5. Was alternative fill used in excess of the amount required for the remedial action? ☐ Yes ☒ No
   If "Yes," was the NJDEP's preapproval obtained pursuant to N.J.A.C. 7:26E-5.2(b)3? ☐ Yes ☐ No

SECTION G. REMEDIAL ACTION REPORT INFORMATION

Soils

1. Did the remedy include a remedial action for soils? ☒ Yes ☐ No
   If "No," skip to **Ground Water**

2. Is a restricted use required? ☒ Yes ☐ No
   If "Yes," indicate the type of restriction being implemented. Deed Notice

3. If applicable, has consent from all involved property owners been obtained (i.e., for institutional or engineering controls)? ☒ Yes ☐ No

4. Was an engineering control required? ☒ Yes ☐ No
   If "Yes," indicate the receptor(s) each engineering control is intended to protect. *(check all that apply)*

   ☒ Human ☐ Ecological ☐ Offsite Impacts

Ground Water

5. Did the remedy include a remedial action for ground water? ☐ Yes ☒ No
   If "No," skip to **Ecological**

6. Is a restricted use required for ground water? ☐ Yes ☐ No

7. Is a revised CEA required? ☐ Yes ☐ No

8. Do any contaminant levels in ground water currently exceed the vapor intrusion ground water trigger? ☐ Yes ☐ No

Ecological

9. Did the remedy include a remedial action for Environmentally Sensitive Natural Resources (ESNRs)? ☐ Yes ☒ No
   If "No," skip to **Indoor Air**

10. Was post-remedial sampling performed to determine whether contaminant levels currently meet ecological screening levels or ecological remediation goals? ☐ Yes ☐ No

11. Did the remedial action require filling of State open waters or wetlands? ☐ Yes ☐ No

12. Have ecological risk-based remediation goals been developed? ☐ Yes ☐ No
    If "Yes," have the ecological risk-based remediation goals been approved by NJDEP? ☐ Yes ☐ No

13. Have Risk Management Decision (RMD) goals been developed? ☐ Yes ☐ No
    If "Yes," have the RMD goals been approved by NJDEP? ☐ Yes ☐ No

Indoor Air

14. Have any vapor intrusion engineering controls/mitigation systems been installed in order to mitigate a vapor condition in a structure? ☐ Yes ☒ No
    If "Yes," check each type of engineering control that was implemented:
    - ☐ Subsurface Depressurization System
    - ☐ Subsurface Ventilation System
    - ☐ Soil Vapor Extraction System
    - ☐ HVAC Positive Pressure
    - ☐ Other (specify): _____

SECTION H. LABORATORY DATA

1. Were all data submitted in the appropriate full and/or reduced formats according to the deliverables defined in N.J.A.C. 7:26E-2? ☒ Yes ☐ No

2. Do all data submitted meet the quality assurance/quality control (QA/QC) requirements incorporated by reference in N.J.A.C. 7:26E-2 for:
   sampling ☒ Yes ☐ No
   analysis ☒ Yes ☐ No

3. How was it determined that the data complied with the QA/QC requirements?
   - ☒ Laboratory non-conformance summary/narrative
   - ☐ Laboratory correspondence
   - ☒ LSRP review
   - ☐ Independent contractor review
   - ☐ Other: _____

4. Has any data been qualified and used? ☐ Yes ☒ No

5. Has any data been rejected and used? ☐ Yes ☒ No

6. Provide the page number for the "Reliability of Data" section of the report: 26

New Jersey Department of Environmental Protection
Site Remediation Program

RECEPTOR EVALUATION (RE) FORM

Date Stamp
(For Department use only)

SECTION A. SITE

Site Name: Hoffmann-La Roche Inc. - Investigative Area 4 (IA-4) - Soils

Program Interest (PI) Number(s): 009949

Case Tracking Number(s) for this submission: NJD002191211

This form must be attached to the Cover/Certification Form
if not submitted through the RIR Online Service

Indicate the type of submission:

☐ Initial RE Submission

☒ Updated RE Submission

Indicate the reason for submission of an updated RE form

☐ Submission of an Immediate Environmental Concern (IEC) source control report;
☐ Submission of a Remedial Investigation Report;
☒ Submission of a Remedial Action Report;

Check if included in updated RE N/A

☐ The known concentration or extent of contamination in any medium has increased;
☐ A new AOC has been identified;
☐ A new receptor is identified;
☐ A new exposure pathway has been identified.

SECTION B. ON SITE AND SURROUNDING PROPERTY USE

1. Identify any sensitive populations/uses that are currently on-site or surrounding property usage within 200 feet of the site boundary (check all that apply):

	On-site	Off-site
None of the following	☒	☒
Residences or residential property	☐	☐
Public or Private Schools grades K-12	☐	☐
Child care centers	☐	☐
Public parks, playgrounds or other recreation areas	☐	☐
Other sensitive population use(s) Explain _____	☐	☐

If any of the above applies, attach a list of addresses, facility names, type of use, and a map depicting each location relative to the site.

2. Current site uses (check all that apply):

☒ Industrial ☐ Residential ☐ Commercial ☐ Agricultural
☐ School or child care ☐ Government ☐ Park or recreational use
☒ Vacant ☐ Other: _____

3. Planned future site uses and off-site use within 200 ft of site boundary (check all that apply):

☐ Industrial ☐ Residential ☒ Commercial ☐ Agricultural
☐ School or child care ☐ Government ☐ Park or recreational use
☐ Vacant ☒ Other: unknown

Provide a map depicting the location of the proposed changes in land use.

SECTION C. DESCRIPTION OF CONTAMINATION

1. Identify if any of the following exist at the site (check all that apply):
   - ☐ Free product [N.J.A.C. 7:26E-1.8] identified is ☐ LNAPL* or ☐ DNAPL**. Date identified: _____
   - ☒ Residual product [N.J.A.C. 7:26E-1.8] No. 6 fuel oil and motor oil
   - ☐ Other high concentration source materials not identified above (e.g., buried drums, containers, unsecured friable asbestos)

     Explain: _____

   * LNAPL – measured thickness of .01 feet or more

   **DNAPL – See US EPA DNAPL Overview

2. Soil Migration Pathway

   Has soil contamination been delineated to the applicable Direct Contact Soil Remediation Standard? ..... Historic fill extends off-site ..... ☒ Yes ☐ No

   Are all soils either below the applicable Direct Contact Criteria or under an institutional control (i.e. deed notice)? ..... ☒ Yes ☐ No

3. If this evaluation is submitted with a technical document that includes contaminant summary information, proceed to Section D. Otherwise attach a brief summary of all currently available data and information to be included in the site investigation or remedial investigation report. Submitted with IA-4 Soil RAR

SECTION D. GROUND WATER USE

1. Has the requirement for ground water sampling been triggered? ..... ☒ Yes ☐ No ☐ Unknown
   If "No," proceed to Section F. If "Unknown," explain:

   _____

2. Is Ground water contaminated above the Ground Water Remediation Standards [N.J.A.C.7:9C]? ..... ☒ Yes ☐ No ☐ Unknown

   Or ☐ Awaiting laboratory data with the expected due date: _____

   If "Yes," provide the date that the laboratory data was available and confirmed contamination above the Ground Water Remediation Standards. Date: 06/01/1993

   If "Unknown," explain: _____

   If "No," or awaiting laboratory data proceed to Section F.

3. Has ground water contamination been delineated to the applicable Remediation Standard? ..... ☒ Yes ☐ No
4. Has a well search been completed? ..... ☒ Yes ☐ No

   Date of most recent or updated well search: 10/25/2013

   Identify if any of the following conditions exist based on the well search [N.J.A.C.7:26E-1.14(a)] (check all that apply):
   - ☐ Potable wells located within 500 feet from the downgradient edge of the currently known extent of contamination.
   - ☐ Potable well located 250 feet upgradient or 500 feet side gradient of the currently known extent of contamination.
   - ☐ Ground water contamination is located within a Tier 1 wellhead protection area (WHPA).

5. Is a completed Well Search Spreadsheet or historical well search table attached and has an electronic copy of the spreadsheet been submitted to srpgis_wrs@dep.state.nj.us. ..... ☐ Yes ☒ No

   If "No," explain: provided with April 30, 2014 Site-Wide Receptor Evaluation Update - no changes

6. Are any private potable or irrigation wells located within ½ mile of the currently known extent of contamination? ..... ☒ Yes ☐ No

   If "Yes," was a door to door survey completed? ..... ☒ Yes ☐ No

   If survey was not completed explain: _____

7. Has sampling been conducted of ☒ potable well(s) and /or ☐ non-potable use well(s)? ..... ☒ Yes ☐ No

   If "No," provide justification then proceed to Section E.

   _____

8 Has contamination been identified in potable well(s) above Ground Water Remediation Standards that is not suspected to be from the site? (If "Yes," provide justification) ..... ☐ Yes ☒ No

_____

9 Has contamination been identified in potable well(s) that is above the Ground Water Remediation Standards or Federal Drinking Water Standards? ..... ☐ Yes ☒ No

Provide date laboratory data was received: _____

Or ☐ awaiting laboratory data with the expected due date: _____

If "Yes" for potable well contamination **not attributable to background**, follow the IEC Guidance Document at http://www.nj.gov/dep/srp/guidance/index.html#iec for required actions and answer the following:

Has an engineered system response action been completed on all receptors? ..... ☐ Yes ☐ No

Provide a brief narrative description:

Date completed: _____ NJDEP Case Manager: _____

10. Were Non-potable use well(s) sampled and results were above Class II Ground Water Remediation Standards? ..... ☐ Yes ☒ No

Provide date laboratory data was received: _____

Or ☐ awaiting laboratory data with the expected due date: _____

11. Has the ground water use evaluation been completed? ..... ☒ Yes ☐ No

SECTION E. VAPOR INTRUSION (VI)

1. Contaminants present in ground water exceed the Vapor Intrusion Ground Water Screening Levels that trigger a VI evaluation. (see NJDEP Vapor Intrusion Technical Guidance). ... ☒ Yes ☐ No ☐ Unknown

Or ☐ Awaiting laboratory data and the expected due date: _____

Provide the date that the laboratory data was available and confirmed contamination above the Vapor Intrusion Trigger Levels. Date: 10/01/2005

2. Other existing conditions that trigger a VI evaluation. (see NJDEP Vapor Intrusion Technical Guidance)

☐ Wet basement or sump containing free product or ground water containing volatile organics
☐ Methane generating conditions causing oxygen deficient or explosion concern
☒ Other human or safety concern from the VI pathway (i.e. elemental mercury, unsaturated contamination, elevated soil gas or indoor vapor (explain):

See section 6.1.3 of the 4/30/14 Site-Wide Receptor Evaluation Update

If you answered "No," or awaiting laboratory data to Question 1., *and* did not check any boxes in Question 2, proceed to Section F, "Ecological Receptors", otherwise complete the rest of this section.

3. Has ground water contamination been delineated to the applicable Ground Water Vapor Screening Level? ..... ☒ Yes ☐ No

4. Was a site specific screening level, modeling or other alternative approach employed for the VI pathway? ..... ☐ Yes ☒ No

5. Identify and locate on a scaled map any buildings/sensitive populations that exist within the following distances from ground water contamination with concentrations above the Vapor Intrusion Ground Water Screening Levels or specific threats (check all that apply): *

☒ 30 feet of petroleum free product or dissolved petroleum hydrocarbon contamination in ground water
☒ 100 feet of any non-petroleum free product or any non-petroleum dissolved volatile organic ground water contamination
☐ No buildings exist within the specified distances

6. The vapor intrusion pathway is a concern at or adjacent to the site (if "No," attach justification) ..... ☐ Yes ☒ No

* see figures 7 & 8 in the 4/30/14 Site-Wide Receptor Evaluation Update

7. Has soil gas sampling of the building(s) been conducted? ☒ Yes ☐ No ☐ N/A
   If "No," or "N/A," proceed to #12

8. Has indoor air sampling been conducted at the identified building(s)? ☒ Yes ☐ No
   If "No," proceed to #12

9 Has indoor air contamination been identified but not suspected to be from the site?
   (if "Yes," attach justification) ☐ Yes ☒ No

10. Indoor air results were above the NJDEP's Rapid Action Levels. ☐ Yes ☒ No

   Provide the date that the laboratory data was available. Date: 04/03/2013

   Or ☐ Awaiting laboratory data with the expected due date: _____

   If "Yes" to #10 above, follow the IEC Guidance Document at
   http://www.nj.gov/dep/srp/guidance/index.html#iec **for required actions.**

   The IEC engineering system response for control was implemented for all
   identified structures ☐ Yes ☐ No

   Date: _____ NJDEP Case Manager: _____

11. Indoor air sampling was conducted and results were above the NJDEP's Indoor Air Screening
   Levels but at or below the Rapid Action Levels.** - see notes on side and below ☒ Yes ☐ No

   Provide the date that the laboratory data was available. Date: 04/03/2013

   Or ☐ Awaiting laboratory data with the expected due date: _____

   If "Yes" to #11 above, answer the following:

   Has the Vapor Concern (VC) Response Action Form notifying the NJDEP of the exceedances
   been submitted? ☒ Yes ☐ No
   Date: 04/24/2013

   The Utility Tunnel (Building 8) originally was considered a VC, but as described in TRC's 6/16/14 Vapor Concern Response Action Update, TRC determined the conditions in this structure did not meet the description of a VC.

   Has a plan to mitigate and monitor the exposure been submitted? ☐ Yes ☒ No
   Date: _____

   Has the Mitigation Response Action Report been submitted? ☐ Yes ☒ No
   Date: _____

12. Has the vapor intrusion investigation been completed? ☒ Yes ☐ No
   If "No", is the vapor intrusion investigation stepping out as part of the site
   investigation or remedial investigation. (If "No," attach justification) ☐ Yes ☐ No

** Napthalene, a COC for Building 46, was detected in indoor air above the non-residential IASL, however it was not detected in any sub-slab samples for this building and therefore is an incomplete pathway.

SECTION F. ECOLOGICAL RECEPTORS

1. Has an Ecological Evaluation (EE) has been conducted? [N.J.A.C. 7:26E-1.16] ☒ Yes ☐ No
   Date conducted: 01/30/2013

2. Do the results of an EE trigger a remedial investigation of ecological receptors? [N.J.A.C. 7:26E-4.8] ☐ Yes ☒ No

3. Has a remedial investigation of ecological receptors been conducted? ☐ Yes ☒ No
   Date conducted: _____

4. Provide the following information for any surface water body on or within 200 feet of the site:

Surface Water Body Name	Stream Classification	Antidegradation Designation	Trout Production	Trout Maintenance
St. Paul's Brook	FW2/NT	C2	☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐
			☐	☐

5. Does the site contain any features regulated by the Land Use Regulation Program (LURP)? (e.g. wetlands, flood hazard area, tidelands, etc.). ..... ☐ Yes ☒ No

   If "Yes," identify the type(s) of features: _____

6. Have any formal LURP jurisdiction letters or approvals been issued for the site? ..... ☐ Yes ☒ No

   If "Yes," what is the LURP Program Interest (PI) number(s) for the site? _____

7. Have any applications for formal LURP jurisdiction letters or approvals been submitted the NJDEP?..... ☐ Yes ☒ No

   If "Yes," what is the LURP Program Interest (PI) number(s) for the site? _____

8. Is free product or residual product located within 100 feet from an ecological receptor?..... ☐ Yes ☒ No

9. Does available data indicate an impact on Ecological receptor(s), Surface water, or Sediment?..... ☐ Yes ☒ No

   If "Yes,"

   a) Check all that apply:

      ☐ Ecological receptor(s) ☐ Surface water ☐ Sediment

   b) Submit with this evaluation either a technical document that includes contaminant summary information, or a description of the type of contamination, a schedule, and a description of all actions to be taken to mitigate exposure.

Completed forms should be sent to the municipal clerk, designate health department, and:

Bureau of Case Assignment & Initial Notice
Site Remediation Program
NJ Department of Environmental Protection
401-05H
PO Box 420
Trenton, NJ 08625-0420

Nutley Site Remediation

Project No. S153.29215

TRC Project No. 105009-198233

Soil Remedial Action Report

Investigative Area IA-4

NJDEP PI ID #009949

Revision: 1

Date: February 5, 2016

Prepared By:		**Date**
TRC Technical:	Marty Ward, Project Manager	1/6/16

Reviewed by:		**Date**
TRC QA Reviewer:	Elizabeth Denly, QA and CS Manager	2/4/16
TRC LSRP:	Jeffrey Powley, PG, LSRP	1/6/16
TRC Management:	Dawn Pompeo, Vice President	1/11/16

TRC Environmental Corporation
41 Spring Street
New Providence, NJ 07974

Approved By:	**Signature**	**Date**
Roche Technical: T. O'Meara	*Approved via electronic correspondence*	1/20/16

Hoffmann-La Roche Inc.
340 Kingsland Street
Nutley, New Jersey 07110-1199

Soil Remedial Action Report
Investigative Area IA-4

Revision: 1

Date: February 5, 2016

TABLE OF CONTENTS

List of Figures

List of Tables

List of Appendices

List of Attachments

NJDEP PI NO. 009949

SOIL REMEDIAL ACTION REPORT – INVESTIGATIVE AREA 4 (IA-4)
HOFFMANN-LA ROCHE INCORPORATED
340 KINGSLAND STREET
BLOCK 80.02, LOT 1, 3 AND 4
NUTLEY, ESSEX COUNTY, NEW JERSEY

1.0 INTRODUCTION

On behalf of Hoffmann-La Roche Inc., (Roche), TRC Environmental Corporation (TRC) has prepared this *Soil Remedial Action Report – Investigative Area 4 (IA-4)* (RAR) to summarize the soil remedial actions (RA) completed for soils in IA-4, located in the central/northeastern portion of the Roche Nutley facility located at 340 Kingsland Street, Essex County, New Jersey (Figures 1 and 2). A map showing the location of IA-4 within the Roche facility is provided on a United States Geologic Survey (USGS) 7.5 minute quadrangle in Figure 1 (Site Location Map).

The Roche facility is subject to the New Jersey Department of Environmental Protection (NJDEP) Site Remediation Reform Act (SRRA) and is also an Environmental Protection Agency (EPA) Government Performance and Results Act (GPRA) Resource Conservation and Recovery Act (RCRA) corrective action facility. Under the EPA/NJDEP Coordination Agreement, the Roche facility was determined to be a "NJDEP lead" site. Therefore, investigation and remediation was conducted under the NJDEP's *Technical Requirements for Site Remediation* (TRSR) (N.J.A.C. 7:26E). To address facilities such as Roche, N.J.A.C. 7:26E-5.1(f) specifically acknowledges this dual authority and allows for selection of remedies pursuant to either the NJDEP or EPA administrative processes.

This soil RAR was prepared in accordance with the requirements outlined in the TRSR and associated NJDEP technical guidance documents. The purpose of the RAR is to document the performance of the remedial actions proposed in Roche/TRC's November 14, 2014 *Remedial Action Workplan* – Investigative Area IA-4 (RAW). The November 2014 IA-4 RAW was approved by the NJDEP in a letter dated February 3, 2015 (Appendix A).

Although Roche is subject to NJDEP Traditional Oversight, remediation work including field activities and reporting has been conducted under the oversight of, and/or reviewed by a New Jersey Licensed Site Remediation Professional (LSRP). In addition, the regulatory compliance approach for the Roche site was set out in the Remediation Road Map Document (the Road Map) submitted by Roche to the NJDEP in September 2012. The Road Map was approved by the NJDEP on October 11, 2012. A Road Map Amendment, which included additional public notification activities was submitted to the NJDEP in March 2013 and received NJDEP approval in August 2013. Roche submitted an Enhanced Notification and Public Outreach Plan to both NJDEP and EPA in April 2013, which met both NJDEP and EPA requirements for public notification and

outreach provisions. Roche complied with the public notification and outreach provisions by placing advertisements in the local papers on November 20, 2014 and December 18, 2014. Copies of the public notification advertisements is included as Appendix B.

In accordance with the Road Map, TRC submitted a *No Further Action (NFA) Summary Report for AOCs in Investigative Area (IA)-4* (a.k.a. "NFA Summary Report") to the NJDEP on May 8, 2013. The NFA Summary Report provided a summary of previously submitted information and noted the prior NJDEP NFA approvals of nine Areas of Concern (AOCs). In addition, NFA was proposed for AOC 40 in the November 11, 2013 *No Further Action (NFA) Summary Report for AOCs in Investigative Area (IA)-1*. The NJDEP approved the IA-1 and IA-4 NFA Summary Reports on January 17, 2014 and January 24, 2014, respectively.

The remedial investigation (RI) activities were performed in accordance with the Road Map, the January 2013 *IA-4 Remedial Investigation Work Plan* (RIWP), the NJDEP TRSR and applicable NJDEP guidance. The RI activities performed at IA-4 from February 2013 through January 2014 consisted of a geophysical survey, the completion of soil borings, temporary and permanent monitoring well installations and associated sampling. Site-specific information and investigation data generated for IA-4 prior to February 2013 are included in the March 2014 RIR.

After the submission of the March 2014 RIR, a supplemental investigation was conducted to further evaluate the use of the Synthetic Precipitation Leaching Procedure (SPLP) analyses to calculate IA-4 specific Impact to Ground Water Soil Remediation Standards (IGWSRS) and soil samples were also collected to confirm past, low level soil analytical results. As a result, the locations of some volatile organic compounds (VOC) and dieldrin exceedances no longer required remediation, since re-sampling at the original locations did not reproduce any exceedances of applicable remediation standards. At the remaining locations, the concentrations of benzene, carbon disulfide, methylene chloride, tetrachloroethene (PCE), toluene, and trichloroethene (TCE) had concentrations exceeding the IGWSRS and these locations were remediated as proposed in the November 2014 RAW. Additionally, in order to gather additional information for remedy selection, Roche conducted soil pre-design investigations (PDI) subsequent to the completion of the IA-4 RI. These PDI sampling activities occurred from March through August 2014 and the results of these additional soil investigations were presented in the IA-4 RAW. A summary of the applicable remediation standards can be found on Table 1.

This soil RAR does not address remediation of residual petroleum hydrocarbons that may remain in the fractured bedrock (non-soils) in IA-4 at AOC 105. The investigations of fractured bedrock and groundwater following the soil remedial action completed at AOC 105 are briefly summarized in this report. The groundwater investigation is ongoing and a groundwater report will be submitted to the NJDEP in the future.

During preparation of the March 2014 RIR, TRC was informed that Roche intended to demolish Buildings 36 and 46 and the portion of Building 50 located in IA-4. Roche requested TRC to perform pre-demolition soil sampling prior to building abatement activities and demolition. The

primary objective of the pre-demolition soil sampling within the footprints of Buildings 36, 46 and 50 was to characterize underlying historic fill material (HFM) prior to building abatement and demolition activities. When applicable, the soil sample locations were biased towards features inside these buildings such as floor drains, sumps, trenches, sub-grade piping, etc. If there were no features of this nature, then a representative number of soil samples were collected for characterization purposes.

Prior NJDEP approvals and important correspondence associated with IA-4 include:

- 1998 NJDEP Approval of Preliminary Assessment/RCRA Facility Assessment (Site-Wide PA/RFA) Report (AOCs 51, 52, 68, 69, 90, 91, 113, and 114);
- 2012 NJDEP Approval of the November 2006 *Site Investigation Report (SIR), Investigative Area 8 (AOCs 67, 106, 116 and 117)*;
- 2012 NJDEP Approval of the Remediation Road Map Document ("the Road Map");
- 2013 NJDEP Approval of the *Quality Assurance Project Plan (QAPP)*;
- 2013 NJDEP Approval – Soil Only Remedial Investigation;
- 2013 NJDEP Comments on the IA-4 NFA Summary Report;
- 2014 NJDEP Comments on the IA-4 Remedial Investigation Work Plan (RIWP)
- 2014 NJDEP Approval of the IA-1 NFA Summary Report (AOC 40 only);
- 2014 NJDEP Approval of the IA-4 NFA Summary Report (Appendix A);
- 2014 NJDEP Approval of Site-Wide EE-SW RIR;
- 2014 NJDEP Approval of Alternate Soil Remediation Standard for Vanadium (Appendix A);
- 2014 NJDEP Conditional Approval of the IA-4 RIR (Appendix A);
- 2014 NJDEP Clarification and Guidance Regarding HFM; and
- 2015 NJDEP Approval of the IA-4 Soil RAW.

Supporting technical information referenced within this RAR can be found within previous reports including the IA-4 RIR dated March 20, 2014 and the IA-4 RAW dated November 14, 2014.

<u>This document is organized into the following seven sections:</u>

- Section 1.0 Introduction;
- Section 2.0 Site Information;
- Section 3.0 Areas of Concern Summary;
- Section 4.0 Technical Overview;
- Section 5.0 Summary of Remedial Activities;

- Section 6.0 Conclusion and Recommendations; and
- Section 7.0 References.

As discussed in this report, the impacted soils were excavated for off-site disposal at a properly licensed and approved facility, followed by placement of clean backfill and restoration of the excavation areas.

Based on the results of the investigation and remediation conducted in IA-4, no further action regarding soils is warranted for IA-4. As noted in this report, engineering and institutional controls will be established in IA-4 for soils at AOC 8a and AOC 105 and a Soil Remedial Action Permit (RAP) application will be submitted to the NJDEP following the completion of site-wide soil remediation. Following NJDEP approval of the RAR and the deed notice/Soil RAP application, a Response Action Outcome (RAO) letter for soils for IA-4 will be issued by the IA-4 LSRP.

2.0 SITE INFORMATION

2.1 Site Description

IA-4 consists of approximately 7.05 acres of land historically used by Roche for manufacturing, and research and development and administrative purposes. IA-4 is bounded to the north by the Jersey City Water Company right-of-way, and beyond this right-of-way, IA-12; to the east by IA-3; to the south by IA-2 and IA-9; and to the west by IA-1. Historically, the IA-4 portion of the Roche facility included boiler operations (Building 39), maintenance and repair operations (Building 36), pharmaceutical research and development and manufacturing (Buildings 42, 44 and 45), incineration operations (Building 43), engineering services (Building 46), employee locker rooms and training facilities (Building 50), electrical transformers (Building 53) and water supply pump house operations (Building 61). Buildings 36, 42, 43, 44, 45, 46, and 50 have been demolished; Buildings 39, 53 and 61 remain.

IA-4 includes 21 AOCs consisting of former hazardous waste drum storage areas, a waste oil drum storage area, electrical transformers, former chemical above ground storage tanks (ASTs), existing/former petroleum product underground storage tanks (USTs), former building footprints, former incinerators, tank storage areas, a raw materials storage area, a drum storage area, dumpster storage areas, subsurface process/storm water/chemical transfer piping, steam condensate return system, and a railroad spur tank car loading/unloading area. IA-4 also includes portions of AOC 67 (the subgrade process sewer system), AOC 106 (the chemical transfer network) and AOC 116 (the eastern storm sewer system), previously designated as part of Investigative Area 8 (IA-8).

2.2 Topography and Site Surroundings

Topographic relief across the site is relatively gentle, with site elevations ranging from approximately 90 to 166 feet above mean sea level (ft. msl). The majority of the site is located between topographic highs to the east and west, within the site boundaries. The site is generally flat, and slopes gently to the south and southwest.

The surface grade in IA-4 is generally flat, with an area of slightly higher relief extending from the northwest towards the southeast. The surface grade locally slopes towards the northeast near Building 39; the remainder of IA-4 generally slopes south to southeast. The elevation of IA-4 ranges from 140.50 ft. msl in the northwestern corner, near Building 50 to 119.77 ft. msl at the southeastern corner of IA-4. Grades existing since the development of this portion of the Roche Site in the 1940s have been altered. The western quarter of IA-4 was cut (the area of former Building 44) and the remainder filled to level the area for building, road, and parking lot construction.

The nearest surface water body, St. Paul's Brook (a Third River tributary), is located 845 feet northwest of the northwestern corner of IA-4. The brook flows from northwest to southeast. Surface water runoff from IA-4 is directed to the Roche site storm sewer system via a series of

interconnected catch basins and storm drains that eventually lead to Roche's Environmental Control Facility (ECF). All process, sanitary and storm waters are discharged to Passaic Valley Sewerage Commission (PVSC). Only during extreme weather events (hurricanes, nor'easter's, etc.) did storm water discharge to St. Paul's Brook, which ultimately discharges to the Passaic River (via the Third River) located approximately 7,900 feet to the east of IA-4. No wetlands are located on or adjacent to IA-4.

2.3 Geology and Hydrogeology

Based on numerous subsurface soil borings completed throughout IA-4, soils are primarily comprised of red-brown silt and sand, typical for the Roche site. The average thickness of this deposit in IA-4 is approximately four feet, ranging from 1.5 to 14 feet. HFM identified in IA-4 is comprised of varying amounts of reworked native soils including glacial till, fluvial deposits and weathered bedrock, including red-brown clay, silt, sand, pebbles and cobbles; artificial fill including yellow, tan, brown and black sands, and some black and blue-gray gravel; bedding sand, concrete and asphalt debris and some glass, ash, coal, wood fragments, brick, black granular gravel, trace grey to green clay, and debris. The HFM is present over much of the IA-4 area ranging in thickness from approximately 0.33 feet in the central and northwestern portions of IA-4, to 17 feet along the 15-inch process waste line near former Building 43. The average thickness of HFM in IA-4 is over 4 feet.

Underlying the fill is a weathered bedrock zone that is present throughout much of the site in the upper portion of the bedrock. In IA-4, the average thickness of weathered bedrock underlying the fill material and soil is approximately 5 feet, ranging from 0.5 to 6 feet. The average depth to competent bedrock in IA-4 is 7.5 feet below grade, ranging from 4 to 20 feet below grade. The overburden material is thickest in the north-central and northeastern part of IA-4.

Regionally, the groundwater in the glacial till, where present, occurs under water table conditions, and groundwater flow follows surface water drainage patterns. Groundwater in the upper weathered portions of the bedrock also occurs under water table conditions and follows surface water drainage patterns. Ultimate regional groundwater drainage is easterly toward the Passaic River. Groundwater flow in the Passaic Formation occurs mainly along joints, fractures and bedding plane partings. The groundwater flow direction in the bedrock is influenced by the extent and orientation of fracturing and bedding. Fracture sets are found to have various orientations including those that are parallel, transverse, and oblique to the strike.

2.4 Receptor Evaluation

The TRSR requires completion of a receptor evaluation (RE) which includes four components, Land Use, Groundwater, Vapor Intrusion, and Ecological. Updates to the RE are required with certain remedial phase reports (e.g., with the RAR). Roche submitted an updated Site-wide RE for the entire Roche Nutley facility on April 30, 2014, which included IA-4. The following sections include updated RE information applicable to IA-4.

2.4.1 Receptor Evaluation – Land Use

IA-4 is located in a predominately commercial and industrial area of Clifton, New Jersey. There are no residences, schools, child care centers, parks, playgrounds, or other sensitive population use properties within 200 feet of the IA-4 portion of the property. A list of the properties within 200 feet of IA-4 and a map with their locations is provided as Attachment 1.

2.4.2 Receptor Evaluation – Groundwater

Due to the presence of groundwater impacts at the Roche site, including IA-4, a well search is required pursuant to N.J.A.C. 7:26E-1.14. An initial well search was completed in 2001 and was updated in 2009 and 2013. All available NJDEP, county and local records were requested to identify all wells located within one-half mile of the site and all irrigation, industrial wells and wells with water allocation permits located within one mile of the site.

In addition, in accordance with NJDEP requirements, a 1/2-mile radius well record search and a 1-mile radius search of high-capacity wells was conducted using the NJDEP Bureau of Water Allocation (BWA) well record database to identify potentially active wells in the area surrounding the Site. No permitted potable groundwater supplies are located within one mile of IA-4 or within the delineated extent of groundwater contamination. One potentially potable well located down gradient of the delineated extent of groundwater contamination was sampled; VOC concentrations were well below the groundwater quality standards (GWQS).

2.4.3 Receptor Evaluation – Vapor Intrusion

Shallow groundwater with concentrations above the NJDEP January 2013 Vapor Intrusion Ground Water Screening Levels (GWSLs) is present beneath IA-4. Based on a site-wide evaluation, five buildings, Buildings 8 (utility tunnel), 36, 39, 46 and 61 within IA-4 were subject to investigation of the VI pathway pursuant to N.J.A.C. 7:26E-1.15 and the NJDEP's *Vapor Intrusion Technical Guidance* dated March 2013 (VITG).

Indoor air samples were collected from the utility tunnel on March 21 and October 31, 2013, and February 22, 2014, but sub-slab samples were not collected due to the depth of the tunnel relative to the depth to groundwater. As detailed in the Roche/TRC June 16, 2014 *Vapor Concern Response Action Update – Onsite Utility Tunnel* report, with the exception of chloroform, PCE, TCE, benzene, vinyl chloride, and bromodichloromethane, no VOCs were detected in indoor air samples at concentrations above the residential or non-residential indoor air screening levels (IASLs). The concentrations detected in air samples from the utility tunnel did not constitute a vapor concern condition and further investigation and mitigation in the utility tunnel was not required.

A VI investigation was completed in March 2013 for Building 36, resulting in no indoor air samples exceeding residential or non-residential IASLs. Chloroform exceeded the residential and

non-residential sub-slab soil gas screening levels (SGSLs), but was not found in indoor air at levels exceeding the IASLs; therefore, this VI pathway is incomplete. TCE was found to exceed the residential SGSL, but was below the non-residential SGSL and was not found in indoor air above the residential or non-residential IASLs. The VI pathway for TCE is therefore incomplete. Building 36 was demolished in July 2014 and no longer represents a potential VI receptor.

The VI investigation of Building 39 took place in March 2013 and resulted in an exceedance of chloroform in a sub-slab soil gas sample above the residential and non-residential SGSLs. Chloroform was not detected in indoor air above residential or non-residential IASLs and therefore the VI pathway is incomplete. No further investigation of Building 39 is necessary.

Indoor air and sub-slab soil gas were sampled in Building 46 in March and November 2013. Naphthalene was the only VOC detected in indoor air above the residential and non-residential IASLs. This compound was not detected above the residential or non-residential SGSLs in any sub-slab soil gas samples and the VI pathway for naphthalene is therefore incomplete. Chloroform and 1,1-dichloroethane (1,1-DCA) were detected in sub-slab soil gas samples exceeding the residential and non-residential SGSLs. Benzene was detected in two sub-slab soil gas samples exceeding the residential SGSL but not exceeding the non-residential SGSL. In indoor air benzene, chloroform and 1,1-DCA were not detected above the residential or non-residential IASLs, and therefore the VI pathways for these compounds are incomplete. Building 46 was demolished in September 2014 and no longer represents a potential VI receptor.

An indoor air sample and an ambient air sample were collected from Building 61 in March 2014. All concentrations of VOCs were below the residential and non-residential IASLs as detailed in the *Indoor Air Sampling Results: On-Site Buildings 52, 59A, 61 & 103* letter, which was included in the May 30, 2014 results submission to the NJDEP. Due to the existence of utilities beneath and in the immediate vicinity of the building, no sub-slab soil gas samples were collected.

Details of the site-wide VI investigation, including that of Buildings 8, 36, 39 and 46 were included in the April 30, 2014 *Site-Wide Receptor Evaluation Update*. Shallow groundwater results are being compared to the GWSLs as new samples are collected. In the event that the new data indicate that additional investigation/monitoring is necessary for Buildings 8, 39 or 61, the NJDEP will be notified and appropriate actions will be taken in accordance with the VITG.

2.4.4 Receptor Evaluation – Ecological

In accordance with the TRSR, an Ecological Evaluation was completed as part of the RE for IA-4, as described in the RIR and RAW.

The area surrounding IA-4 is fully developed and consists entirely of industrial properties to the north, east, south and west. The Roche Site is located in an urbanized and industrial area within Clifton and Nutley, New Jersey. Approximately 90% of the Roche campus is covered by impervious surfaces such as paved parking areas, buildings and interior roads.

A site inspection was completed on Monday, January 14, 2013 by Jeffrey C. Powley, TRC LSRP, and no environmentally sensitive natural resources (ESNRs) were observed on or adjacent to IA-4. Review of the NJDEP GIS information indicated that no ESNRs are present on or adjacent to IA-4. According to the New Jersey Natural Heritage Program threatened and endangered species database search information, no threatened or endangered species or habitat are located on or near IA-4.

There are no ESNRs on, adjacent to, or within the influence of IA-4, therefore, no further ecological evaluation is warranted for IA-4.

2.5 Pertinent Site Documents

Document	Date
PA/RCRA Facility Assessment Report	May 1998
Remediation Road Map for the Roche Facility	September 2012
Quality Assurance Project Plan prepared by TRC	November 20, 2012
IA-4 -Remedial Investigation Workplan	January 30, 2013
Response to NJDEP Final Comments on IA-4 RIWP	February 6, 2013
No Further Action (NFA) Summary Report for AOCs in IA-4	May 8, 2013
No Further Action (NFA) Summary Report for AOCs in IA-1	November 11, 2013
NJDEP Final Comments on IA-4 RIWP	January 6, 2014
IA-4 Remedial Investigation Report	March 20, 2014
NJDEP Comments on IA-4 RIR	August 26, 2014
IA-4 Remedial Action Workplan	November 14, 2014
NJDEP IA-4 RAW Approval Letter	February 3, 2015

2.6 Regulatory Timeframes

Pursuant to the SRRA [N.J.A.C. 58:10C-27a(3)], any discharge discovered before May 7, 1999 must have a complete and submitted RIR by May 7, 2014. Roche submitted the IA-4 RIR on March 20, 2014. In addition, soil remedial actions at the site subject to the statutory timeframe must be completed by May 7, 2019. This timeframe includes completing the soil remedial action as described in the November 2014 Soil RAW, submitting the soil RAR and issuing an RAO. Because the Roche facility is under NJDEP Traditional Oversight, the Department must approve the IA-4 Soil RAR before an RAO can be issued

3.0 AREA OF CONCERN SUMMARY

This section provides a brief summary of previous investigations conducted in IA-4 between February 2013 and August 2014. Details and results were presented in the March 2014 RIR (TRC 2014a) and the November 2014 RAW (TRC 2014c).

Based on information presented in the March 2014 IA-4 Soil RIR and the November 2014 Soil RAW, HFM is present throughout IA-4. The HFM in IA-4 extends beyond the limits of IA-4, indicating that the historic fill is a regional issue and not specific to IA-4. This is supported by observations of fill material along the boundaries of IA-4 coupled with interpretation of historical Sanborn maps and aerial photographs. The historic fill present in IA-4 contains contaminants typically associated with historic fill such as polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs) and metals at concentrations above the Residential Direct Contact soil Remediation Standard (RDCSRS) and/or the Non-Residential Direct Contact Soil Remediation Standards (NRDCSRS). Analytical results with RDCSRS/NRDCSRS exceedances can be found on Figure 3.

Twenty-one (21) AOCs were identified within IA-4. NFA determinations have been approved by NJDEP for 15 AOCs (8b, 38, 39, 40, 41, 51, 52, 68, 69, 90, 91, 113, 114, 128, and 137). The AOCs for which NFA determinations have been confirmed are documented in the May 8, 2013 IA-4 NFA Summary Report (approved on January 24, 2014), the October 29, 2013 IA-1 NFA Summary Report (approved on January 17, 2014), the March 20, 2014 IA-4 RIR (approved on August 26, 2014), and the November 14, 2014 IA-4 RAW (approved on February 3, 2015). Figure 2 provides the location of all IA-4 AOCs.

In addition, the portions of AOCs associated with IA-8 (AOCs 67, 106 and 116) that were investigated during the IA-4 RI were discussed in the IA-4 RAW.

Based on the results of the IA-4 RI, the results of the supplemental soil sampling investigations, and NJDEP's August 26, 2014 conditional approval of the March 2014 RIR, NFA was proposed and approved by the NJDEP in the IA-4 RAW for the following AOCs:

- AOC 38 – Former Building 44 West Dumpster Storage Area;
- AOC 39 – Former Building 44 West Drum Storage Area;
- AOC 41 – Former Building 45 North Raw Materials Storage Area;
- AOC 128 – Railroad Spurs (and Former Coal Loading and Unloading Area); and
- AOC 137 - Former Tank Storage Area North of Building 36.

The following AOCs were evaluated during the IA-4 RI, IA-4 PDI, and pre-demolition soil sampling investigation and are discussed below.

- AOC 8a – Former Building 39 No. 6 Fuel Oil USTs;
- AOC 9 – Building 43 No. 2 Fuel Oil UST;

- AOC 92 – Former Building 44 East ASTs;
- AOC 105 – Building 61 Pump House and Piping (No. 6 Fuel Oil Release Area);
- AOC 142 – Building 44 Footprint;
- AOC 143 – Building 45 Footprint;
- Portions of AOCs associated with IA-8 (AOCs 67, 106 and 116);
- Former Buildings 36, 46 and 50 Footprints; and
- Groundwater.

3.1 AOC 8a – Former Building 39 No. 6 Fuel Oil USTs

AOC 8a consists of six former petroleum USTs that were removed from exterior areas north and west of Building 39 during 1992. The USTs were used to supply fuel to the boilers located inside adjacent Building 39. A review of historical records indicates releases from several tanks were documented during closure activities and contaminated soil was present in the excavation. On May 6, 1991, the NJDEP Bureau of Underground Storage Tanks (BUST) approved the closure of the AOC 8a USTs (Closure No. C-91-0195), including the collection of 70 soil samples and the installation of two ground water monitoring wells. After the closure of the AOC 8a USTS, five replacement USTs were installed in generally the same location. These large capacity petroleum fuel USTs are currently in operation by Roche. The five existing USTs currently located in this area are designated as AOC 8b, which received a No Further Action determination from NJDEP.

Groundwater samples collected in the past from wells MW-39-1, MW-39-2, MW-39-2A, west and south of AOC 8a did not detect any petroleum-related COCs. Possible petroleum-related semi-volatile organic compounds (SVOCs) detected in January 2004 in IA-8 Area G temporary wells G-240 (benzo(a)anthracene and benzo(a)pyrene) and G-244 (2-methylnaphthalene and n-nitrosodiphenylamine) could not be confirmed or reproduced in nearby permanent wells (MW-127, MW-178, and MW-179) in May/June 2013. No petroleum-related COCs were detected in any groundwater samples collected from the wells at AOC 8a during the RI.

A soil remedial investigation could not be conducted to evaluate current subsurface conditions at AOC 8a because the AOC 8b USTs would have to be closed/removed to access the areas beneath and adjacent to the existing USTs. Based on an evaluation of the available UST closure documentation provided by Roche and NJDEP files, it is evident that soil contaminated with PAHs above the most stringent NJDEP Soil Remediation Standards (SRS) remains in the subsurface at three of the former UST locations. Additionally, an evaluation of the sample results documenting the quality of the existing material used for backfilling the former UST excavation areas indicates that a PAH compound (benzo(a)pyrene) is present at a concentration above the most stringent SRS. The areas of contaminated soil are inaccessible for further evaluation and/or removal actions. The PAH-contaminated soil that remains will be addressed with engineering and institutional controls. A site-wide draft deed notice, including AOC 8a, will be provided in a future submission to the NJDEP.

3.2 AOC 9 – Building 43 No. 2 Fuel Oil UST

AOC 9 (Figure 2) consists of a former 1,500-gallon UST that stored No. 2 fuel oil between 1945 and 1977. This tank was reportedly located adjacent to the south side of former Building 43. The UST was emptied and inactivated in September 1977. Soil samples collected around the UST showed no evidence of impact. An AST containing a mixture of fuel oil and other constituents was subsequently used to fuel the incinerator between September 1977 and May 1978. By 1986, both tanks (UST and AST) had been removed. A site investigation (SI) conducted at this AOC indicated that soil and possibly groundwater had been impacted by the past operations of the UST and AST. During the investigations at AOC 9, visual evidence of stained soils was observed at and below the water table in the overburden. As a result, further remediation was warranted.

A review of historical sample analytical data showed SVOCs and metals are present in AOC 9 soil, at concentrations above the NJDEP SRS and Default Impact to Ground Water Soil Screening Levels (DIGWSSLs), including exceedances of PAHs, arsenic, beryllium, dieldrin, and mercury. The January 2013 IA-4 RIWP proposed further contaminant delineation, including the analyses of soil samples for extractable petroleum hydrocarbons (EPH) (Category 1), petroleum hydrocarbon fingerprinting, and SPLP analyses to calculate IA-4 specific IGWSRS.

As a result of the completion of the RI, there were no exceedances of the NJDEP's Category 1 EPH residential human health soil cleanup criteria (5,100 ppm). The hydrocarbon fingerprinting analyses indicated petroleum was likely attributable to diesel/No. 2 fuel oil, consistent with the former contents of the 1,500-gallon UST (AOC 9). The other COCs detected in the soils are associated with HFM in the area of former Building 43 and AOC 9. The remediation of HFM in IA-4 is discussed below. The horizontal and vertical extent of the COCs detected above remediation standards was delineated.

A groundwater investigation at AOC 9 was proposed; temporary well points were completed and a groundwater sample was collected from AOC 9 well MW-127. No light non-aqueous phase liquid (LNAPL) or sheen was measured or observed in the temporary wells. Recent well gauging and groundwater sample results from well MW-127 indicates no sheen or LNAPL is present and there were no exceedances of the NJDEP GWQS. Therefore, there is no actionable impact to soil and/or groundwater from the past operation of the former No. 2 fuel oil UST. However, the RI and RAW concluded that the petroleum-stained subsurface soils, while not actionable under applicable regulations, may pose a potential nuisance for future land owners. As a result, the excavation of petroleum-stained soils to bedrock was recommended in the IA-4 RAW.

After the IA-4 RAW was approved by NJDEP, an excavation access issue arose in July 2015 when preparing for the two proposed excavations between Building 39 and former Building 43 (RA-23 and RA-24). The proposed excavations were very deep (15 ft and 17.5 ft) and located very close to two Public Service Electric and Gas (PSE&G) gas utility lines (a 20-inch cast iron transmission line and an 8-inch high pressure line). PSE&G inspected the areas and provided requirements and restrictions for working in close proximity to the gas lines, including the installation of steel

sheeting for any excavation within the zone of influence. However, the installation of steel sheeting would cause vibration issues and vibration monitoring would be required. At the 17.5 ft excavation, the high pressure gas line is located within the excavation limits.

Given the proximity of these lines, the fragility of the cast iron pipe and the risk of damage, the removal of residual petroleum-stained soils was determined to be impracticable. Furthermore, the lack of LNAPL or petroleum sheen on groundwater in the wells, no actionable soil contamination, and no dissolved groundwater contamination did not warrant the excavation of these soils. Finally, it is unlikely that the future owner of the site would develop the land within the PSEG natural gas line easement. This information was presented to and approved by the NJDEP case management team on July 19, 2015. NFA is recommended for AOC 9 at this time. Details are discussed further in Section 6.2 of the IA-4 RAW.

3.3 AOC 92 – Former Building 44 East ASTs

AOC 92 consists of 12 former ASTs removed from an AST farm located east of former Building 44 sometime between 1993 and 1999. No investigation had been performed at this AOC prior to the IA-4 RI.

Twenty one (21) borings were completed at the former AST locations in AOC 92. Based on an evaluation of the soil sampling results, PAHs and methylene chloride were the only COCs detected above the NJDEP SRS and IA-4 specific IGWSRS. Methylene chloride was detected in five soil samples above the DIGWSSL. Several of these locations were evaluated as part of the SPLP supplemental soil investigation. Based on the results of this investigation, the methylene chloride was delineated to the IGWSRS using single-point compliance. Remedial actions as proposed in the November 2014 RAW have been completed and are summarized in Section 5 of this RAR, and NFA is recommended.

3.4 AOC 105 – Building 61 Pump House and Piping (No. 6 Fuel Oil Release Area)

AOC 105 consists of the area around the Building 61 Pump House and appurtenant piping in the northern portion of the Site. The building is used to pump fire suppression water in the northern portion of IA-4 at the Roche Site. The No. 6 fuel oil supply line from the former 640,000 gallon No. 6 fuel oil AST in IA-1 lies beneath a portion of Building 50, all of Building 61 and extends east to Building 39.

Past Investigation and Remediation at AOC 105

An unknown quantity of No. 6 fuel oil was discovered in a storm water catch basin on December 18, 1989 and determined to be the result of a leak in an underground fuel oil supply line near the pump house (between Building 50 and Building 61). The oil release from the supply line migrated into the subsurface area beneath and around Building 61 and the east side of Building 50. Fuel oil-impacted material was excavated and the underground piping was removed in this area, where

accessible. Additionally, the underground fuel oil supply line that ruptured was replaced with an aboveground fuel oil supply line.

In February 1990, a series of soil borings were completed by ERM-Northeast of Shelton, Connecticut (ERM) to assess the effectiveness of the remedial actions performed at AOC 105. Each soil boring was continuously advanced to the top of bedrock. Elevated photoionization detector (PID) readings, odors and/or oil were noted at several borings. Soil sample results indicated total petroleum hydrocarbons (TPH) were present and three separate soil excavations were reportedly performed around Building 61; however, only two excavations are depicted in ERM's report. The report notes that oil was present under Building 61 and within the underlying fractured bedrock. Post-excavation soil samples were collected to document conditions (442 to 2,080 ppm TPH). Contaminated soils were left in place under Building 61, due to structural stability considerations. The extent of oil observed in the fractured bedrock by ERM was not fully investigated in 1990.

One groundwater monitoring well was reportedly installed in the fractured bedrock (MW-20) as part of these activities to assess groundwater conditions near the area of the release. However, well MW-20 is located over 140 feet south of the soil excavations. At the time well MW-20 was installed and sampled in April 1990, groundwater samples contained elevated concentrations of petroleum hydrocarbons and VOCs. Subsequent groundwater samples from well MW-20 contained elevated concentrations of VOCs (e.g., benzene, PCE, and chloroform) above the NJDEP GWQS. Quarterly groundwater sampling at well MW-20 between 1995 and 2010 continued to show several VOCs above the GWQS; however, a declining trend in concentrations over time was evident during this period. From November 1995 through the most recent sampling event, only benzene, methylene chloride and vinyl chloride were detected above the NJDEP's GWQS. Free product or LNAPL was also detected and measured in well MW-20 in April, June and July 2000. LNAPL has not been detected in this well since July 2000. The type of LNAPL in the well was not identified, but it was likely related to AOC 105.

In 2003 and 2004, temporary wells were installed by TRC at and adjacent to the AOC 105 area as part of the IA-8 SI at Area G in the fill material along the storm water and process sewer lines adjacent to the north side of Building 46. Groundwater samples collected from these temporary wells exhibited concentrations of benzene and SVOCs above the GWQS. Several Area G SI borings completed between AOC 105 and Building 46 exhibited black staining, oily sheens and elevated PID readings; temporary wells were installed, but no free product or LNAPL was measured in these wells at the time they were installed and sampled.

Based on this information, it appeared that the fill material within the trench excavated into the bedrock for the buried storm water and process sewer lines acted as a conduit for contaminant, and possibly, free product migration. Since this work pre-dates the promulgation of the NJDEP's TRSR and no NFA was issued, the past work was evaluated in comparison to current NJDEP

requirements and remediation standards and additional remedial investigation of soil and groundwater was proposed.

Summary of Recent PDI at AOC 105

Additional soil remedial investigation was conducted by TRC in May 2013 to confirm the effectiveness of the past investigation and remediation discussed above. The evaluation of the EPH sample data indicated that none of the soil samples exhibited concentrations of EPH in excess of the calculated residential sample specific human health values. Based on an evaluation of the other AOC 105 soil sampling results, PAHs and benzene were the only COCs detected above the NJDEP's SRS; however, only the PAHs exhibited contaminant concentrations in excess of RDCSRS and NRDCSRS. Benzene was only detected once at a concentration greater than the DIGWSSL.

Additional groundwater remedial investigation was also conducted by TRC at AOC 105. During the March 2013 RI, temporary well points were installed and screened across the water table (TRC 2014a, Figures 3, 16 and Appendix G) to determine if measurable LNAPL (> 0.01 feet thick) was present. No free product or LNAPL was detected. A monitoring well (MW-183) was installed near the Area G borings/temporary wells north of Building 46 to confirm prior temporary well sample results from the IA-8 SI and to assess current shallow bedrock ground water quality. COCs expected to be associated with AOC 105 were not detected at concentrations above the NJDEP's GWQS.

Based on the groundwater sample analytical results obtained during the RI, the impact to groundwater from the No. 6 fuel oil release, if it exists, may be limited to shallow groundwater in AOC 105, but no deeper than 16 ft bgs. The potential for impact to groundwater from the AOC 105 oil release is currently under investigation. The results of this investigation will be provided in a future report to NJDEP.

In October 2014, during the demolition of Building 50, a portion of the buried No. 6 fuel oil product supply line was uncovered during the excavation of the eastern subgrade concrete building footing structure. The excavation was located between former Building 50 and existing Building 61, where past soil excavation activities occurred in 1990. Groundwater was encountered at 5.5 to 6.0 ft bgs in the excavation. Oil-stained soils were observed above and below the water table and there was a petroleum sheen on the groundwater surface after the soils were disturbed by the excavation equipment. A portion of the fuel oil product supply line was missing between the two buildings, but it was observed to be present beneath Building 61. No odors were noted. Two soil samples were collected for EPH (Category 2: No. 6 Fuel Oil) analyses. Soil sample B50-PIPE-1-5.5 was collected at the terminus of the buried pipe, where staining was observed in the soil. Soil sample B50-PIPE-2-6.0 was collected at the northern edge of the excavation wall, where a steep incline in topography was present. The analytical results indicated that the concentration of EPH in sample B50-PIPE-1-5.5 (15,452 ppm) exceeded the composition-specific EPH residential soil remediation criterion (RSRC) for No. 6 fuel oil calculated by TRC for this location (9,700 ppm).

The results also indicated the EPH concentration in soil sample B50-PIPE-2-6.0 was below the residential criterion; therefore, the extent of impacted soil was delineated towards the north. The soil samples collected at pre-demolition boring B50IN-7 inside the footprint of former B50 (Figure 4) at 1.0 ft bgs and at bedrock refusal (3.0 ft bgs) had EPH concentrations of 26 and 20 ppm, respectively; therefore, the extent of impacted soil was delineated to the west.

The IA-4 RIR concluded that the residual product from the No. 6 fuel oil release was retained within the fill material at and below the water table in the process sewer piping trench south of AOC 105 and behind Building 46 and required remedial action.

AOC 105 – Soil Remedial Action (Remedial Action Area RA-22)

The soil remedial action at AOC 105 also known as Remedial Action Area 22 (or "RA-22") (shown on Figure 5) occurred from June 2015 to October 2015. The removal of petroleum-impacted soil, weathered bedrock and ground water was conducted concurrently with the removal and replacement of the process sewer, storm sewer, potable water, and fire water pipes and associated manholes at RA-22 in AOC 105. This effort was completed based on a combination of visual observations of petroleum product in fill material/soil, weathered bedrock and groundwater in conjunction with test pit excavations and soil sampling. The extent of the excavations was based on a combination of test pit investigations beyond the originally proposed boundary of RA-22, field instrumentation methods (ultraviolet light) and post-excavation soil sample results. Soil and rock core logs are provided in Appendix C. A soil sample summary table is provided in Table 2. The AOC 105 soil sample results obtained during the remedial action at RA-22 are summarized in Tables 3-1 and 3-2, and Figure 4. EPH Soil Remediation Criterion Calculators are presented as Attachment 2.

During the RA-22 excavation activities, petroleum product and groundwater flowed into the excavation from bedrock fractures in the northern and southern sidewalls, buried piping bedding materials, and from the storm water and process sewer pipes themselves. The product and groundwater within the excavation were managed by pumping into a vac-truck and using oil sorbent booms, pillows and sheets. The locations of the various buried utilities and pipelines in this area provided migration pathways for the petroleum away from the former supply line.

Overall, the area of excavation was expanded further south and north than originally proposed in the IA-4 RAW. The competent bedrock encountered at 13 to 15 feet below grade precluded vertical excavation beyond these depths.

Observations indicated oil had migrated along the former buried fuel oil supply line from former Building 50, beneath Building 61 and to the existing tank field at Building 39 (AOC 8a) (Figure 6). The pipeline was located very close to the boundary of IA-4 and IA-12 and the Jersey City Water Supply Right of Way. Petroleum-impacted soil related to the location of the former pipeline was observed at the northeastern corner of the excavation. This impact corresponded with the depth of the former oil supply piping. On August 18, 2015, three grab soil samples were collected

from about three feet below grade and 0.5 feet below the apparent base of the piping (IA4-RA22-EPH-WC-1 through IA4-RA22-EPH-WC-3) for Category 2 EPH analyses. The concentrations of EPH ranged from 9,161 to 12,607 ppm, above the EPH RSRC. On September 8, 2015, three vertical delineation soil borings were completed at boring locations IA4-105-RA22-WC-1V through IA4-105-RA22-WC-3V. Soil samples were collected at the bedrock interface. EPH at IA4-105-RA22-WC-3V still exceeded the RSRC. The EPH concentrations at the other two borings were below the RSRC.

The eastern extent of the petroleum-impacted soil and weathered bedrock was delineated by the completion of soil boring IA4-105-RA22-D1 located east of the excavation towards the Building 39 tank farm area on September 9, 2015. Three soil samples were collected for EPH Category 2 analyses to provide horizontal and vertical delineation at 3.0, 6.0 and 17.5 (top of bedrock) ft, bgs. The concentration of EPH at soil sample IA4-105-RA22-D1-6.0 exceeded the RSRC. EPH detected at 3.0 and 17.5 ft, bgs was below the RSRC.

Contaminated soil and residual petroleum product in the fractured rock remains at the northern boundary of IA-4 (where overhead steam and electrical utilities are present) adjacent to the southern boundary of the Jersey City Water Supply Right of Way Given the proximity to the Jersey City Water Supply Right of Way no further excavation/lateral soil sample investigation to the north could be conducted. Petroleum is also still present in the soil and fractured bedrock beneath Building 61, which is not accessible for removal. The northern extent of petroleum impact was delineated by the completion of a series of soil borings/soil samples and rock cores in IA-12 along the north side of the Jersey City Water Supply Right of Way (Figure 4), as described below.

On September 8, 2015, TRC completed four delineation soil borings north of IA-4 and the Jersey City Water Supply Right of Way in IA-12 (designated: IA4-105-R22-D2 through D5). Two soil samples were collected for EPH Category 2 analyses from each boring for horizontal and vertical delineation of the soil exceedances in IA-4. The EPH laboratory results indicate no exceedances of the EPH RSRC. On September through October 2015, TRC also completed four rock core borings north of the IA-4 RA-22 excavation and the Jersey City Water Supply Right of Way in IA-12 to delineate petroleum product in the rock fractures (designated IA4-105-RC1 though RC4). Visual observations, PID field-screening and ultraviolent light screening were used to identify fractures that could contain petroleum. The depth of the rock cores was based on the deepest elevation of the bottom of the excavation in IA-4 RA-22. The rock cores extended 10 feet below that elevation. Based on this investigation, no petroleum product was observed in the rock cores and no actionable EPH was detected in the soil samples. These borings and rock core locations serve to define the northern extent of the petroleum impact in the soil and fractured rock at AOC 105, RA-22.

Due to accessibility issues (Building 61 structure and associated appurtenances, overhead piping, the Jersey City Water Supply Pipeline easement, etc.), the residual petroleum in soils and fractured bedrock above and below the water table that cannot be excavated or otherwise removed, will be

addressed with institutional and engineering controls. The soil remedial action at AOC 105 will be complete upon the filing of a deed notice and approval of a soil remedial action permit.

3.5 AOC 142 – Building 44 Footprint

AOC 142 consists of the former Building 44 footprint where subsurface piping formerly conveyed sanitary and process waste water from production areas to the process sewer system. Building 44 was constructed in 1947 and used for pharmaceutical manufacturing (aminazole, isoxamine, ipronidazole, marplan, midazolam, etc.). Based on a review of historical engineering drawings, numerous floor drains and chemical transfer pipe trenches existed beneath the footprint of the former building. A series of process sewers, chemical transfer piping trenches and manholes/pits surround former Building 44, primarily on the west, north and south sides of the building. Additionally, a series of below ground storm water catch basins and manholes exist around the building. These buried piping systems were not addressed during the IA-8 SI; therefore, an RI was proposed. AOC 142 also included an investigation of former exterior AST locations (AOCs 90 and 91) following the same workplan that was previously proposed for AOC 92 – Building 44 East ASTs. A series of soil borings were also proposed within the footprint of Building 44. Historically, no releases have been documented at this AOC; however, it is known that Roche utilized subsurface glass piping for some service connections at the facility.

The primary soil contaminants detected in AOC 142 were PAHs and PCBs. There were also sporadic, isolated VOC, pesticide and metals exceedances of the DIGWSSLs. An IA-4 specific IGWSRS was calculated for the pesticide dieldrin; none of the dieldrin soil sample results exceed the calculated IGWSRS.

Some of the locations of these VOC soil exceedances were evaluated by the supplemental SPLP soil investigation. Based on the results of this investigation, VOC exceedances were delineated to the IGWSRS using single-point compliance. Remedial actions based on compliance averaging and single point compliance, as proposed in the November 2014 RAW, have been completed and are summarized in Section 5 of this RAR, and NFA is recommended.

3.6 AOC 143 – Building 45 Footprint

AOC 143 consists of a portion of the eastern half of the former Building 45 footprint where subsurface piping formerly conveyed process waste water from production areas to the process sewer system. Additionally, a former trench drain was located between former Buildings 45 and 44. No assessment of this drain had been performed in the past. The drain no longer exists and could not be inspected. Given the production and chemical handling/storage operations that historically occurred at the buildings, TRC added one boring adjacent to the trench drain. No releases have been documented at this AOC; however, it is known that Roche utilized glass piping for some service connections at the facility.

Based on an evaluation of the AOC 143 soil sampling results, PAHs, lead, mercury, and methylene chloride were the only COCs detected above the NJDEP's SRS and/or IA-4 specific IGWSRS. Based on the results of this investigation, the methylene chloride exceedances were delineated to the IGWSRS using single-point compliance. Remedial actions based on compliance averaging and single point compliance, as proposed in the November 2014 RAW, have been completed and are summarized in Section 5 of this RAR, and NFA is recommended.

3.7 Portions of AOCs associated with IA-8 (AOCs 67, 106 and 116)

IA-8 consists of the following: the subgrade process sewer system (AOC 67), the chemical transfer network (AOC 106) and the eastern storm sewer system (AOC 116). Between 2001 and 2005, SI activities were conducted in IA-8. Evaluation of the SI soil and groundwater sample analytical results identified several locations where concentrations of VOCs, SVOCs, and metals exceeded soil remediation standards and DIGWSSLs. There were no exceedances found in Area H in IA-4. Groundwater sample analytical results in IA-8 Area G indicated concentrations of VOCs and SVOCs in excess of NJDEP GWQS. The soil RI in IA-4 addressed the IA-8 sample locations where impacted soils were previously detected.

IA-8 Sub-Area G. A large portion of Area G is located within the northern and eastern portions of IA-4. The remainder of Area G is located in adjacent IA-3 to the east. Much of the subgrade Area G piping along the eastern and northern boundary of IA-4 was within the saturated zone at the time of the SI.

Several Area G borings completed between AOC 105 and Building 46 exhibited black staining, oily sheens, and elevated PID readings, and temporary wells were installed, but free product or LNAPL was not measured in these wells at the time they were installed and sampled. Since this condition was identified in IA-4 Area G sample locations in the past, temporary well points were installed in 2013 at some locations where soils once again exhibited black staining, oily sheens and elevated PID readings to determine if measurable LNAPL (> 0.01 feet thick) was present on the water table. No free product or LNAPL was detected.

The fill material within the storm sewer and process sewer pipe trench excavated into the bedrock for these buried pipes acted as a conduit for the migration of contaminants, and possibly, free product. Based on an evaluation of the results of the 2003, 2004 and 2013 subsurface investigations, an area of residual product is present (see March 2014 RIR, Figure 16).

To further evaluate the potential impact to groundwater from this residual product, a permanent groundwater monitoring well (MW-183) was installed near the Area G borings/temporary wells north of Building 46 to confirm prior temporary groundwater monitoring well sample results from the IA-8 SI and to assess current shallow bedrock groundwater quality. Except for aluminum, iron, manganese, and sodium, no COCs were detected at concentrations greater than the NJDEP's GWQS.

Based on the soil RI at Area G, SVOCs and mercury were the most frequently detected COCs, with PAHs present at concentrations above the RDCSRS and NRDCSRS. PAHs and metals are common HFM contaminants and the areas where the exceedances were detected exhibited fill material in the subsurface. In the areas near AOC 105 (north of Building 46) and AOC 9 (near former Building 43), the occurrence of the PAHs could be related to historic releases of petroleum products from buried pipelines and USTs or to HFM; it is unclear. No other specific source or discharge related to these contaminants has been identifiedMethylene chloride, 2-methylnaphthalene and benzene were detected at several isolated locations at concentrations greater than the DIGWSSL, but less than the RDCSRS. Several locations were re-sampled as part of the supplemental SPLP re-evaluation soil investigation. Based on spatially weighted and single-point compliance calculations presented in the November 2014 RAW, remedial action (i.e., excavation) was completed in Area G in IA-4. A summary of the remedial actions is included in Section 5 of this RAR, and NFA is recommended.

3.8 Demolition of Buildings 36, 46 and 50

Pre-demolition soil investigations were conducted at Buildings 36, 46 and 50 in IA-4. The soil investigation was conducted in accordance with the NJDEP's TRSR and applicable guidance documents. At all borings except those adjacent to floor drains, representative soil samples were collected from the shallow fill material (0 to 2 feet below surface) and from the deeper fill material (below 2 feet). At borings adjacent to floor drains, soil samples were collected from the 6-inch depth interval below the floor drain/piping inverts. In addition, if contaminated soils were observed or detected during drilling based on staining and/or high PID readings, soil samples were collected from the 6-inch depth interval representing the "worst-case" contamination, the 6-inch depth interval above the water table (if encountered), and the 6-inch depth interval above bedrock.

As a result of the pre-demolition soil investigations conducted at Buildings 36, 46 and 50, underlying HFM conditions were characterized prior to building abatement and demolition activities. Areas of soil contamination beneath Building 36 were removed in May 2014. The soil requiring remediation beneath Building 46 was remediated during excavation activities at AOC 105 in August 2015. No actionable areas of soil contamination were found beneath Building 50 in IA-4. Remediation of the soils beneath these former buildings was achieved using single point compliance and comparing soil sample analytical data to the most stringent soil remediation standards and soil excavation. The results of these analyses were presented in the November 2014 IA-4 RAW.

All soil samples collected by TRC were sent to Roche's contracted laboratory for analyses of the following parameters:

- EPHs;
- Target Compound List/Target Analyte List plus 30 TICs as determined by a forward library search (TCL/TAL+30), which includes:
    - TCL VOCs;

    - TCL SVOCs;
    - PCBs;
    - Pesticides;
    - TAL Metals;
    - Cyanide;
- Hexavalent Chromium (Cr+6); and
- pH.

3.8.1 Building 36

Building 36 was a one story, slab-on-grade building, located in the southern portion of IA-4. In January and February 2014, TRC completed 10 continuous soil borings (B36IN-1 through B36IN-10) to the top of bedrock within the footprint of the building to characterize the soils beneath the building floor prior to demolition activities. The soils from each boring were field-screened both visually and with a PID. The results of the soil investigation at Building 36 are summarized on Figure 3.

The results of the soil remedial investigation indicated benzo(a)pyrene, mercury, nickel and total PCBs were the only COCs detected above the NJDEP's SRS and IA-4 specific IGWSRS. SPLP analyses were run on the soil samples with the mercury and nickel exceedances of the previously established IA-4 specific IGWSRS. The data was used to calculate revised, IA-4 specific IGWSRS for mercury and nickel of 38 and 150 ppm, respectively. As a result, there were no exceedances for mercury and nickel at Building 36.

At boring B36IN-7, the concentration of benzo(a)pyrene (0.315 ppm) exceeded the applicable soil remediation standard (0.2 ppm) at 1.0 ft, bgs. The vertical extent was delineated to a depth of 9.5 ft, bgs. In March 2014, the horizontal extent of this contamination was delineated with the completion of eight additional soil borings (B36IN-7N1, B36IN-7N2, B36IN-7E1, B36IN-7E2, B36IN-7S1, B36IN-7S2, B36IN-7E1, and B36IN-7E2). Remediation of this exceedance is discussed in Section 6.0 of the IA-4 RAW.

At boring B36IN-10, the concentration of total PCBs exceeded the applicable soil remediation standard (0.2 ppm) in three soil samples collected from 7.0, 9.0 and 11.0 ft, bgs. The vertical extent was delineated to a depth of 12.5 ft, bgs. In March 2014, the horizontal extent of this contamination was delineated with the completion of eight additional soil borings (B36IN-10N1, B36IN-10N2, B36IN-10E1, B36IN-10E2, B36IN-10S1, B36IN-10S2, B36IN-10E1, and B36IN-10E2). Remediation of this exceedance is discussed in Section 6.0 of the IA-4 RAW.

3.8.2 Building 46 (AOC 137)

A SI was conducted in August 2010 by TRC on behalf of Roche based on the lack of historical documentation regarding AOC 137, the footprint of former Building 46. The SI showed SVOCs and metals are present in soil at concentrations above the NJDEP SRS and DIGWSSLs, including

exceedances of benzo(a)pyrene, mercury and nickel. The January 2013 IA-4 RIWP proposed further contaminant delineation and SPLP analyses to calculate IA-4 specific IGWSRS. Some of the proposed boring locations were completed inside Building 46.

Based on the historical maintenance-related operations at Building 46 (maintenance, machine shop/equipment repairs/cleaning, parts cleaner/degreaser operation, etc.), as well as a review of historical engineering drawings, TRC completed 11 additional interior soil borings to address locations of concern (i.e., floor staining, proximity to floor drains, abandoned floor drains, areas of poor concrete integrity, parts and equipment cleaning area, etc.) and to provide general coverage of the footprint of the building. A shallow bedrock ground water monitoring well, MW-235 was installed adjacent to an active floor drain located near the parts and equipment cleaning area. A ground water sample was collected from the well in October 2013. Only total SVOC TICs were detected at a concentration greater than the NJDEP GWQS.

Soils and fill material beneath Building 46 were characterized as part of the ongoing remedial investigation of IA-4. The results of the soil investigation at Building 46 (AOC 137) is summarized on Figure 3.

At boring 137-38, the concentration of benzo(a)pyrene (0.459 ppm) exceeded the applicable soil remediation standard (0.2 ppm) at 1.5 ft, bgs. The vertical extent was delineated to a depth of 2.5 ft, bgs (the top of the underlying bedrock). In March 2014, the horizontal extent was delineated with the completion of eight additional soil borings (137-38-W1, 137-38-W2, 137-38-N1, 137-38-N2, 137-38-E1, 137-38-E2, 137-38-S1, and 137-38-S2). Remediation of this exceedance is discussed in Section 6.0 of the IA-4 RAW.

3.8.3 Building 50

Building 50 was a one story, slab-on-grade building, located in the northern portion of IA-1 and IA-4. The building was used as a locker room, training facility, and for trade shops (carpentry, insulation, etc.). To characterize the soils beneath the building floor prior to demolition activities, TRC completed nine continuous soil borings (B50IN-1 through B50IN-9) to the top of bedrock within the footprint of the building. In February 2014, five borings (B50IN-3 through B50IN-7) were completed to characterize the underlying historic fill material; and four borings (B50IN-1, B50IN-2, B50IN-8, and B50IN-9) were completed to characterize the soils adjacent to/beneath the floor drains and piping. The soils from each boring were field-screened both visually and with a PID. Only borings B50IN-6, B50IN-7 and B50IN-9 were completed in the IA-4 section of Building 50. No exceedances of the applicable SRS were detected in the soil samples collected from these borings. A soil sample summary table, soil sample analytical results table, the soil sample laboratory analytical report and the electronic data deliverables were provided in the IA-1/IA-5 RAW. The results of the soil investigation at Building 50 are summarized in Figure 3.

No actionable areas of soil contamination were found beneath Building 50 in IA-4.

3.9 Groundwater

The results of several rounds of groundwater sampling and analysis from monitoring wells in IA-4 indicate that groundwater contains VOCs and SVOCs at concentrations above the GWQS in shallow bedrock. The VOCs and SVOCs detected in bedrock groundwater in IA-4 are being addressed as part of the site-wide groundwater investigation.

In addition, as discussed in the November 2014 IA-4 RAW, a groundwater classification exception area (CEA) will be established for the entire site, including IA-4, to address the HFM pursuant to the NJDEP's letter addressing HFM and establishment of a CEA dated September 9, 2014.

4.0 TECHNICAL OVERVIEW

The RIR identified HFM/soil within IA-4 that contained VOCs (PCE and toluene), PAHs, metals (arsenic and mercury), PCBs, and hexavalent chromium at concentrations exceeding the NJDEP's SRS. The NJDEP-approved RAW included a compliance averaging approach for the remediation of HFM/soils to the RDCSRS in accordance with the NJDEP's September 2012 *Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria* (NJDEP Compliance Attainment Guidance) and a NJDEP June 20, 2014 letter clarifying site-specific adaptations of the guidance (Appendix A). As noted in the RAW, ¼-acre functional areas were established and Thiessen Polygons were calculated using the available soil data for the upper 2-foot soil zone and sub-surface (below 2-foot) soil zone. Additionally, concentrations of PCE, TCE, carbon disulfide, benzene, and methylene chloride in soils above the IA-4 site specific IGWSRS were delineated by single point compliance. Areas of residual petroleum product are present at AOCs 9 and 105 and at portions of IA-8 Area G near former Building 46 and 61 and former Building 43. The RAW field activities were implemented from March through October 2015, as described in Section 5.

4.1 Prior Interim Remedial Measures for Soil

There have been no interim remedial measures (IRMs) for soil performed in IA-4.

4.2 Description of Soil Remedial Area

IA-4 occupies approximately 7.05 acres. The RAW identified regional HFM throughout IA-4. Organic and inorganic contaminants were detected in the HFM within IA-4 at concentrations above the SRS and IGWSRS. The HFM/soil in IA-4 contains contaminants, including PAHs and to a lesser extent PCBs, and trace metals at concentrations above the SRS, and VOCs at concentrations above the IGWSRS. Soil analytical results are shown on Figure 3. Figure 5 depicts the areas of excavation as proposed in the IA-4 RAW.

4.3 RAW-Approved Applicable Remedial Standards

Based on current and future land use, the applicable remediation standards for the historic fill in IA-4 are the more stringent of the NJDEP RDCSRS, NRDCSRS, IGWSRS or DIGWSSL (N.J.A.C. 7:26D). If the soil sample location was below the water table, the standard used for comparison was the most stringent of the RDCSRS or NRDCSRS. The soil sample analytical results at locations above the water table were compared to the most stringent of the IA-specific IGWSRS, DIGWSSLs (when no site-specific IGWSRS for a COC is available), RDCSRS, or NRDCSRS. IA-4 specific IGWSRS were developed for PCBs, toluene, dieldrin, beryllium, cadmium, lead, nickel, and mercury.

In accordance with the NJDEP's Frequently Asked Questions for the Impact to Ground Water (IGW) Pathway in Soil Remediation Standards (Version 2.0, 3/25/2014), aluminum, iron,

manganese, silver and zinc are not included in the IGW exposure pathway evaluation since they are not health-based, may be found as background contaminants, and are not known to exist at the site due to a site-related discharge. According to the TRSR and the NJDEP's *Historic Fill Material Technical Guidance* (v.2.0; April 29, 2013), evaluation of the IGW pathway for historic fill constituents is not required since a groundwater CEA will be established for the entire site, including the IA-4 parcel.

Alternative SRS for vanadium of 390 ppm for residential and 5,700 ppm for non-residential were approved by the NJDEP on January 2, 2014 (Appendix A), which apply to the entire site and for determination of imported clean fill used as backfill in proposed excavations, as noted in the alternative SRS application. A summary of the applicable remediation standards can be found on Table 1.

PCBs are regulated by NJDEP and, in certain circumstances, by the USEPA pursuant to the Toxic Substances Control Act (TSCA).as described in the IA-4 RAW. For IA-4, the presence of PCBs in HFM is due to pre-1978 activities, and because PCB concentrations are less than 50 ppm, TSCA does not apply. Remediation of PCBs in IA-4 soils is thus subject only to NJDEP jurisdiction and requirements. While the presence of PCBs in HFM is not subject to IGW evaluation it is worth noting that an IA-4 specific IGWSRS for PCBs of 1.07 ppm was developed.

For those compounds unrelated to HFM (i.e., VOCs, dieldrin), the NJDEP has developed a methodology to develop IA-specific IGWSRS (i.e., the NJDEP's April 24, 2013 *Guidance for the Use of the Synthetic Precipitation Leaching Procedure (SPLP) to Develop Site-Specific Impact to Ground Water Remediation Standards).* SPLP sampling was conducted during the RI; however, for various reasons (e.g., no concurrent total sample analytical results at "historic soil samples" and failure issues when using the NJDEP's calculator with respect to VOC field leachate concentrations), some SPLP results could not be used to calculate IA-4 specific IGWSRS for VOCs.

Compliance averaging was completed in accordance with the September 24, 2012 NJDEP Compliance Attainment Guidance, a June 20, 2014 letter from the NJDEP regarding the use of compliance averaging for constituents identified in HFM at the Roche facility (Appendix A), and other site-specific criteria outlined in the November 2014 RAW.

4.4 Contractors and Sub-Contractors

The following Roche contractors and sub-contractors assisted in the remedial action conducted in IA-4:

Function	Contractors and Sub-Contractors	Name/Telephone
Construction Management	Sordoni Construction Company (Sordoni) Bedminster Township, New Jersey 07921	Michael Meechan 973-519-3921

Function	Contractors and Sub-Contractors	Name/Telephone
Survey & Markout	The Osiris Group, Inc. (Osiris) Sparta, New Jersey 07871	Michael Wills (973) 235-8514
Excavations	NorthStar Contracting Group, Inc. (NorthStar) Villa Park, Illinois 60181	John Skinner (973) 445-0078
Air Monitoring	Emilcott Technologies (Emilcott) Morristown, New Jersey 07960	Charles Peruffo (973) 538-1110
Laboratory	Accutest Laboratories, Inc. (Accutest) Dayton, New Jersey 08810 New Jersey Certification No. 121129	Marie Meidhof (732) 329-0200

4.5 Data Reliability and Potentially Influencing Factors

Sampling activities following the submittal of the IA-4 RAW included sampling of certified-clean material utilized as backfill and the collection of subsurface soil samples to delineate excavation areas. A sample summary is included on Table 2; the sample results can be found in Tables 3 and Appendix D1, respectively. Clean fill certifications can be found in Appendix D2.

Sample collection activities and laboratory analyses were performed in accordance with the TRSR and the project QAPP. Sample analysis was completed by Accutest Laboratories of Dayton, New Jersey (Accutest), a New Jersey certified laboratory. Laboratory data packages and electronic data deliverables (EDDs) for post-RAW soil samples are attached in Appendix E. Certified-clean fill sample data were included in Appendix E and with the *AOC 145 (Former Building 30 in IA-1 and IA-2) Soil Remedial Action Report* (B30 RAR), which was approved by the NJDEP on September 9, 2015 and the *Soil Remedial Action Report – AOC 180 (Former Building 86)* in IA-6, which was submitted to the NJDEP on December 1, 2015. The data quality and laboratory case narratives/non-conformance summaries included with the laboratory reports were reviewed. The method-specified calibrations and quality control performance criteria were met for the data generated during this investigation. Based on a review of the laboratory reports, the post-RAW data collected in IA-1/5 described in this report and the clean fill data are usable for their intended purpose and meet the general data quality objectives.

4.6 Factors Influencing Data

No significant events or seasonal variations are known to have influenced the sampling procedures or the results of the sampling events reported in this RAR.

4.7 Variances and Deviations

There are no known variances from the TRSR. There were slight deviations from the November RAW, which are summarized below.

- The IA-4 RAW indicated that a draft deed notice would be included with this RAR. However, based on subsequent discussions with the NJDEP, it was determined that a deed notice that addresses all of the IAs would be submitted following the completion of soil remediation activities at the site.

- The IA-4 RAW indicated that the excavated polygon areas would be backfilled and the site would be returned to its original condition. Due to future site use, not all polygon areas were paved or seeded. Most excavated areas were backfilled with clean fill (quarry process [QP]) and covered with stone/gravel (e.g., American Society for Testing and Materials [ASTM] #3, ASTM #10, ASTM# 57) to prevent erosion. In addition, RA-22 was paved with asphalt.

- The IA-4 RAW proposed transporting the excavated soil to an off-site facility for thermal treatment by low-temperature thermal desorption; the treated soil was to be returned to the site for reuse as clean backfill (contingent on being treated to acceptable remediation standards). However, as discussed below in Section 5.0, the excavated soil was disposed of off-site at a Roche-approved facility for proper disposal without treatment, and the excavations were backfilled with certified-clean fill.

- The IA-4 RAW proposed excavation of petroleum-impacted soils between former Building 50 and former Building 61, and extending northeast to the IA boundary. The RAW also proposed the removal of buried pipeline between the buildings (AOC 105). As part of the remedial action, additional soil samples were collected along the pipeline to further delineate the petroleum contamination in the area. Based on the analytical results and the absence of petroleum product observed in the excavation, it was determined that the excavation did not need to extend to the northeast of the former buildings. Sample locations are presented on Figure 4 and laboratory results are presented in Tables 3-1 and 3-2.

- Additional soil samples were collected and rock cores were completed along the northern extent of the petroleum excavation that was proposed in the IA-4 RAW around AOC 105. Based on analytical results and visual observations, the proposed excavations were extended. Additionally, an institutional and engineering control will be established to address soils that were not accessible for excavation along the Jersey City Water Supply Right of Way. Sample locations are presented on Figure 4, laboratory results are presented in Tables 3-1 and 3-2, and boring logs are presented in Appendix C.

- The IA-4 RAW proposed two excavations between Building 39 and former Building 43 along the PSEG right-of-way, which includes two high-pressure natural gas lines. Further review of the area after the submission of the RAW indicated that given the proximity of these lines, the fragility of the cast iron pipe, and the risk of damage, the treatment and/or removal of residual petroleum product was determined to be impracticable. Furthermore,

the lack of LNAPL or petroleum sheen on groundwater, no actionable soil contamination, and no dissolved groundwater contamination did not warrant the excavation of these soils. Finally, it is unlikely that the future owner of the site would develop the land within the PSEG natural gas line easement. This information was presented to and approved by the NJDEP case management team on July 19, 2015.

5.0 SUMMARY OF REMEDIAL ACTIVITIES

The NJDEP-approved RAW included a spatially-weighted compliance averaging evaluation that identified several areas of HFM/soil requiring remediation for the following contaminants of concern: PAHs. The compliance averaging evaluation was completed in accordance with the NJDEP's Compliance Attainment Guidance, the NJDEP's June 20, 2014 letter and related discussions with the NJDEP's case team regarding the use of compliance averaging for constituents identified in fill soils and HFM at the Roche facility (Appendix A).

The RAW proposed excavation and off-site disposal of the HFM/soil containing elevated concentrations of benzene, carbon disulfide, methylene chloride, PCE, TCE, and toluene based on single point delineation. Soils impacted with petroleum were delineated using single point compliance. The excavations were backfilled with imported clean fill pursuant to the NJDEP's *Alternative and Clean Fill Guidance for SRP Sites*, Version 3.0 (April 2015). A summary of the remedial activities is provided below.

Note that disposal of structures, including but not limited to, concrete floor slabs, tank saddles, footings, etc. that were encountered during soil remedial activities proposed in the RAW is documented in this RAR.

Engineering and institutional controls will be established in IA-4 for soils at AOC 8a, beneath the former Building 61 footprint, around AOC 105, and along the Jersey City Water Supply easement that lies between IA-4 and IA-12.

5.1 Description of Soil Remedial Action

Prior to conducting the excavation activities, the proposed excavation areas were surveyed to establish the planned physical extents of the excavations and mark-out any underground utilities.

The excavation work in IA-4 was completed during March and October 2015 under TRC oversight. Based on TRC's field observations, and as confirmed by final site survey of excavated areas, HFM/soil was excavated from the pre-defined polygon areas to the designated depths as proposed in the RAW (Figure 5).

A total of approximately 19,500 tons of HFM/soil/weathered bedrock were removed from the remediation polygon areas in IA-4. The total area of the combined excavations is approximately 25,588 square feet, and excavation depths ranged from 2 ft. bgs in shallow areas and up to 13 ft. bgs in the deeper excavations. The final post-remediation conditions, including the location of excavated polygon areas and corresponding depths are presented on Figure 7. The final compliance averaging calculations from the IA-4 RAW are included in Tables 4 through 7. It should be noted that the RDCSRS were used to represent post-remediation backfill quality in the compliance averaging calculations (submitted for both the RAW and the RAR). However, the analytical results from samples of the clean fill actually used to backfill the excavations indicate

contaminants were either not detected or, if detected were at concentrations well below the RDCSRS. As a result, the calculated average spatially-weighted contaminant concentrations are conservative values.

During remedial activities associated with implementing the RAW in IA-4, approximately 171,500 gallons of water were generated as a result of excavation dewatering. The water was discharged via the municipal sanitary sewer system to the regional public treatment works facility (PVSC) in accordance with Roche's PVSC discharge permit

Excavated HFM/soil was either direct loaded into trucks or stockpiled at a temporary staging area. The staging area was protected from dispersion using hay bales and plastic sheeting. Stockpiled soils were then transported by truck for off-site disposal. When the excavation was completed, Osiris resurveyed the boundaries of the excavation, TRC approved the boundaries and depth, and NorthStar backfilled the excavation.

The HFM/soil generated as a result of the remedial activities in IA-4 was transported to one of the following facilities for proper off-site disposal:

- Clean Earth of Southeast Pennsylvania in Morrisville, Pennsylvania;
- Environmental Quality/Wayne Disposal, Inc. Site #2 Landfill in Belleville, Michigan;
- Waste Management GROWS North Landfill in Morrisville, Pennsylvania; or
- New Jersey Meadowlands Commission (NJMC) – Keegan Landfill in Kearny, NJ.

The table below summarizes the total weight sent to each facility. Soil disposal documentation is included in Appendix F1.

Facility	Material Origin	Weight (tons)
NJMC – Keegan Landfill, Kearny, NJ	Building 36	128.72
Waste Management - G.R.O.W.S. North Landfill, Morrisville, PA	Building 36	121.52
NJMC – Keegan Landfill, Kearny, NJ	Building 46	24.26
Clean Earth of Southeast Pennsylvania, Morrisville, PA	RAW remediation	5,781.95
Environmental Quality Wayne Disposal, Inc. Site #2 Landfill - Belleville, MI	RAW remediation	157.44
Waste Management - G.R.O.W.S. North Landfill, Morrisville, PA	RAW remediation	13,559.10
	Total Weight:	19,772.99

Additionally, the asphalt generated during remedial activities in IA-4 was transported to Tilcon New York, Inc. in West Nyack, NY for asphalt recycling. The table below summarizes the total weight sent to this facility. Asphalt disposal documentation is included in Appendix F2.

Facility	Material Type	Weight (Tons)
Tilcon New York Inc., West Nyack, NY	Asphalt	656.91
	Total Weight:	656.91

A combination of certified-clean material from the Weldon Materials Hopatcong Quarry in Lake Hopatcong, NJ, Tilcon Mount Hope Quarry in Wharton, New Jersey, and the Tilcon Pompton Lakes Quarry in Pompton Lakes, New Jersey was used to backfill the excavations. Clean fill laboratory data and clean fill certifications can be found in Appendices D1 and D2, respectively. The table below summarizes the total weight and type of clean fill. Clean fill shipping documentation is included in Appendix D3.

Facility	Type	Weight (Tons)
Tilcon Mount Hope Quarry, Wharton, NJ or Pompton Lakes Quarry, Pompton Lakes, NJ	DGA	2,925.02
Weldon Materials Hopatcong Quarry, Lake Hopatcong, NJ	DGA	936.87
Tilcon Mount Hope Quarry, Wharton, NJ	QP	3,775.24
Tilcon Mount Hope Quarry, Wharton, NJ	ASTM #3	52.74
Tilcon Mount Hope Quarry, Wharton, NJ or Pompton Lakes Quarry, Pompton Lakes, NJ	ASTM #57	4,881.09
Tilcon Pompton Lakes Quarry, Pompton Lakes, NJ	ASTM #4	789.11
Transfer to IA-4 from IA-7	ASTM #3	21.18
Transfer to IA-4 from IA-7	ASTM #57	67.98
Transfer to IA-4 from IA-6	ASTM #57	26.15
Transfer to IA-4 from IA-9 Building 73	ASTM #57	183.94
Transfer to IA-4 from IA-7 Stock Pile	ASTM #57	3,098.46
Transfer to IA-4 from IA-7 Stock Pile	DGA	386.76
Transfer to IA-4 from IA-9 Building 73	DGA	55.96
Transfer to IA-4 from IA-1	QP	109.82
Transfer to IA-4 from IA-7	QP	96.49
Transfer to IA-4 from IA-6 Building 86	QP	74.29
Transfer to IA-4 from IA-9 Building 73	QP	29.42
Transfer from IA-4 to IA-6	QP	*-386.79*
Transfer from IA-4 to IA-10S	QP	*-29.75*
	Total Weight:	16,707.22

QP – Quarry Process
DGA – Dense-Graded Aggregate
ASTM – American Society for Testing and Materials
ASTM #57 – 3/4-inch coarse aggregate
ASTM #4 – 1 ½ -inch stone
ASTM #3 – 2-inch coarse aggregate

Due to anticipated future site use, excavated polygon areas were not paved or seeded. Excavated areas were backfilled with sand, DGA, and QP and covered with ASTM# 57 to prevent erosion.

5.2 Perimeter Air Monitoring Plan

Continuous air monitoring was performed by Emilcott Technologies of Morristown, New Jersey for all ground-intrusive activities, including, but not limited to, soil excavation and handling. Selected air monitoring response levels were based on TRC's experience with air monitoring programs conducted during similar NJDEP-approved remediation projects.

The VOCs and particulate concentrations were monitored during excavation activities as per the IA-4 RAW (Section 6.4). There were two incidents where VOCs exceeded the site action levels; these exceedances were due to device malfunction. There were 14 incidents where particulate concentrations exceeded the site action level of 150 ug/m3, one of which was due to remediation activities in IA-4 and was promptly addressed. The other 13 exceedances were either due to meter malfunction or interference from humidity/fog (6 exceedances), site work unrelated to IA-4 remediation activities (6 exceedances), or unknown sources on site (1 exceedance). A copy of Emilcott's November 30, 2015 air monitoring report is included in Appendix G.

5.3 Remedial Action Permits

As noted in this report, engineering and institutional controls will be established in IA-4 and will be incorporated into a site-wide Soil RAP application. The deed notice will include details of the engineering and institutional controls at specific locations at all IAs at the Roche site.

Remediation actions for groundwater are being performed on a site-wide basis, and will be addressed separately from this soil RAR.

5.4 Remedial Action Costs

The total cost for the implementation of the remedial actions in IA-4 was approximately $4,600,000.

6.0 CONCLUSIONS AND RECOMMENDATIONS

As described above, 21 AOCs were identified in the IA-4 RAW. The NJDEP-approved RAW included compliance averaging, using spatially weighted contaminant concentrations, to the residential soil remediation standards for HFM/soil. DIGWSSL exceedances of PCE, TCE, carbon disulfide, benzene, and methylene chloride were delineated using single-point compliance.

The compliance averaging approach for remediation to the residential soil standards was performed in accordance with the NJDEP's Compliance Attainment Guidance, the NJDEP's June 20, 2014 letter, and related discussions with the NJDEP's case team regarding the use of compliance averaging for COCs identified in soils and HFM at the Roche site.

The remedial activities and selected remedial measures were completed in IA-4 during March and October 2015, in accordance with the approved RAW. The HFM/soil was excavated and transported off-site for proper disposal. Excavated areas were backfilled with clean fill material. Therefore, no further remedial action is recommended for the HFM/soils in IA-4.

Engineering and institutional controls will be established in IA-4 for soils at AOC 8a, beneath the former Building 61 footprint, around AOC 105 and along the Jersey City Water Supply easement. These controls will be incorporated into a deed notice and Soil RAP application to be submitted to the NJDEP following the completion of all soil remediation activities at the Site. Following NJDEP approval of this IA-4 RAR and the deed notice/Soil RAP application, a soil-only RAO will be issued for IA-4 by the LSRP.

7.0 REFERENCES

NJDEP 2008 Guidance Document. Development of Site-Specific Impact to Ground Water Soil Remediation Standards Using the Soil-Water Partition Equation. Revised. December 2008.

NJDEP 2011a NJDEP's Historic Fill Material and Diffuse Anthropogenic Pollutants Technical Guidance, dated October 20, 2011.

NJDEP 2011b Frequently Asked Questions for the Impact to Ground Water (IGW) Pathway in Soil Remediation Standards dated January 27, 2011.

NJDEP 2012a N.J.A.C. 7:26E Technical Requirements for Site Remediation, date last amended May 7, 2012.

NJDEP 2012b Technical Guidance for Site Investigation of Soil, Remedial Investigation of Soil, and Remedial Action Verification Sampling for Soil, August 1, 2012.

NJDEP 2012c Technical Guidance for the Attainment of Remediation Standards and Site-Specific Criteria, dated September 24, 2012.

NJDEP 2013 Vapor Intrusion Technical Guidance Document. NJDEP. March 2013.

NJDEP 2014a NJDEP IA-4 RIWP Final Comments, January 6, 2014.

NJDEP 2014b Frequently Asked Questions for the Impact to Ground Water (IGW) Pathway in Soil Remediation Standards, March 2014.

NJDEP 2014c Historic Material Technical Guidance, April 29, 2013.

NJDEP 2015a NJDEP IA-4 RAW Approval Letter, February 3, 2015.

NJDEP 2015b NJDEP Fill Material Guidance for SRP Sites, April 2015.

TRC 1998 PA/RCRA Facility Assessment Report. Prepared for: Hoffmann-La Roche, Inc. Prepared by TRC, May 1998.

TRC 2001 Environmental Site Investigation Report - Proposed Daycare Center Candidate Locations (1) Contractor Parking Area (2) Parking Lot 900 Annex Area. January 2001. Prepared by TRC.

TRC 2002 Annual Ground Water Monitoring Report Calendar Year 2001. Prepared by TRC. September 2002.

TRC 2012a Site-Wide Health and Safety Plan, Prepared for: Hoffmann-La Roche, Inc. Prepared by TRC. November 2012.

TRC 2012b Quality Assurance Project Plan, Prepared for: Hoffmann-La Roche, Inc. Prepared by: TRC. November 2012.

TRC 2012c Remediation Road Map for the Hoffmann-La Roche Inc. Facility. September 17, 2012.

TRC 2012d Investigative Area IA-4 – Remedial Investigation Workplan, NJDEP PI ID #009949, Revision 1. January 30, 2013.

TRC 2012e Ecological Evaluation and Surface Water Remedial Investigation Workplan NJDEP PI ID #009949, Revision 2. Prepared by TRC. December 21, 2012.

TRC 2013a NFA Summary Report for Investigative Area 4, NJDEP PI ID #009949, Revision 3. May 8, 2013.

TRC 2013b NJDEP's IA-4 Remedial Investigation Workplan Comment Letter – Response to Comments, NJDEP PI ID #009949. Prepared by TRC. February 6, 2013.

TRC 2013c Quality Assurance Project Plan, Revision 3. Prepared by TRC. August 2013

TRC 2014a IA-4 Remedial Investigation Report . Prepared by TRC. March 20, 2014.

TRC 2014b Excavation and Soils Management Plan, Revision 2.2. Prepared by TRC. March 26, 2014

TRC 2014c Ecological Evaluation and Surface Water Remedial Investigation Report. Prepared by TRC. April 10, 2014.

TRC 2014d Site-Wide Receptor Evaluation, Update. Prepared by TRC. April 30, 2014.

TRC 2014e Soil Remedial Action Workplan – Investigative Area (IA) 4, Revision: 0. Prepared by TRC. November 14, 2014.