FIFTH FIVE-YEAR REVIEW REPORT FOR IMPERIAL OIL/CHAMPION CHEMICALS COMPANY SUPERFUND SITE MONMOUTH COUNTY, NEW JERSEY

Prepared by

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Date

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LIST OF ABBREVIATIONS & ACRONYMS

ARAR	Applicable or Relevant and Appropriate Requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EPA	United States Environmental Protection Agency
FYR	Five-Year Review
ICS	Institutional Controls
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
PRP	Potentially Responsible Party
RAO	Remedial Action Objectives
ROD	Record of Decision
RPM	Remedial Project Manager
TBC	To be Considered

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in FYR reports such as this one. In addition, FYR reports identify issues found during the review, if any, and document recommendations to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR review pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Contingency Plan (NCP) (40 CFR Section 300.430(f)(4)(ii)) and considering EPA policy.

This is the fifth FYR review for the Imperial Oil/Champion Chemicals Company (Imperial) Superfund Site (Site). The triggering action for this discretionary five-year review is the fourth five-year review for the Site completed on July 20, 2015.

The Site consists of three operable units (OUs). OU1 addresses off-Site areas of contamination including contaminated soil and sediment in and adjacent to wetlands, the Birch Swamp Brook and its floodplain, and contaminated soil located on six residential properties near the former facility. Of the six properties, four are located adjacent to the former Imperial Oil facility and the other two are located to the northwest of the Site. The remedial action for this OU has been completed. OU2 addresses contaminated groundwater. This remedy has not been implemented and is currently being evaluated. This FYR will discuss the findings of the biannual groundwater monitoring that has been on-going since 2011 when the groundwater contaminant sources were removed. OU3 addresses contaminated soil and other materials, including the waste filter clay and floating product, at the Imperial Oil facility, as well as on-Site structures and tank farms. Remedial actions for OU3 were completed in January 2012 and met cleanup levels that allow for unrestricted use. OU3 is no longer being reviewed. OU1 and OU2 are the subject of this FYR report.

The Imperial Oil Superfund Site FYR was led by the EPA Remedial Project Manager (RPM), Farnaz Saghafi. Participants included Rachel Griffiths (EPA-Hydrologist), Abbey States (EPA-Human Health Risk Assessor), Michael Clemetson (EPA-Ecological Risk Assessor) and Pat Seppi (EPA-Community Involvement Coordinator). This is a Fund-lead Site.

Site Background

Physical Characteristics

The Site is in Marlboro Township, Monmouth County, New Jersey in a predominantly residential area. Two areas, known as Off-Site areas 1&2, are located approximately 220 feet and 700 feet northwest of the facility, respectively. The soil in these areas was contaminated with arsenic, lead, and polychlorinated biphenyls (PCBs) from the Site.

Site Geology/Hydrogeology

Three distinct geologic formations have been observed at the Site: heterogeneous fill material, the Englishtown Formation sandy soils and the Woodbury Clay Formation. Two groundwater flow systems were identified at the Site: (1) a local perched groundwater system; and (2) the regional water table system, the Englishtown aquifer. Depth to water ranges from grade (within the fence line at the northwestern corner of the property) to fourteen feet below grade (at the southeastern portion of the property). The saturated thickness of the aquifer beneath the Site has been reported to range from forty-nine to fifty-five feet. Groundwater in the shallow part of the aquifer generally flows in a northerly direction, with local components to the east and west as influenced by topographic and geologic conditions. Locally, groundwater in the shallow portion of the aquifer discharges to the Fire Pond and Birch Swamp Brook. The groundwater aquifer underlying the Site is classified as a Class IIAgroundwater aquifer (potable water source) by the State of New Jersey.

Land and Resource Use

The Site is currently zoned for industrial use and is expected to remain so into the future. However, the Site is primarily surrounded by residential properties. Therefore, in evaluating potential risks posed by the Site, the theoretical possibility of residential development was considered.

The State of New Jersey has established a Classification Exception Area (CEA) and Well Restriction Area (WRA) that restrict the use of groundwater beneath and downgradient of the Site. Groundwater flow in the water table aquifer in the vicinity of the Site is currently to the north. Birch Swamp Brook discharges to Lake Lefferts, which is currently used as a swimming and recreational area. Lake Lefferts is located approximately one mile north of the Site.

History of Contamination

Industrial activities were conducted at the Site from 1912 through 2007. From 1917 through 1950, a chemical processing plant was operated at the Site. Chemicals produced during this time period may have included arsenic acids and calcium arsenate. In 1950, the plant was purchased by Champion Chemical and became an oil reclamation facility. The oil reclamation process used diatomaceous earth, also known as filter clay, and caustic solution to remove heavy metals and polychlorinated biphenyls (PCBs) from waste oil. The waste products of the oil reclamation process, including the contaminated waste filter clay and caustic solution, were disposed of on the Site. In 1968, the Site was leased to the Imperial Oil Company who began conducting oil blending operations, including mixing and repackaging unused oil for delivery. Oil blending operations continued until July 2007, when Imperial Oil Company declared bankruptcy and abandoned the facility.

Improper disposal and storage of hazardous materials at the facility released a number of contaminants including, but not limited to arsenic, lead, total petroleum hydrocarbons (TPHs) and PCBs into the environment. Operations at the Site resulted in the contamination of on-Site soils and groundwater, off-Site soils in Off-Site areas 1 & 2 and on six residential properties, sediment in the Birch Swamp Brook, and soils adjacent to the Birch Swamp Brook.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Imperial Oil/Champion Chemicals Company Superfund Site		
EPA ID: NJD980654099		
Region: 2	**State:** NJ	**City/County:** Marlboro Township/Monmouth County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: EPA
Author name (Federal or State Project Manager): Farnaz Saghafi
Author affiliation: EPA
Review period: 7/21/2015 – 2/20/2020
Date of site inspection: 10/9/2019
Type of review: Discretionary
Review number: 5
Triggering action date: 7/20/2015
Due date *(five years after triggering action date)*: 7/20/2020

II. RESPONSE ACTION SUMMARY

The Site was added to the National Priorities List of Superfund Sites (NPL) on September 1, 1983. A remedial investigation (RI) of the Site was conducted by the New Jersey Department of Environmental Protection (NJDEP). The Final RI Report was issued in December 1996. The 1996 RI report describes the nature and extent of contamination in on-Site soils, off-Site soils, sediments, and groundwater.

Several removal actions have also been completed by EPA at the Site to address conditions that presented a serious risk to public health and the environment. In November 1991, EPA removed an on-Site waste filter clay mound contaminated with PCBs, arsenic, lead, and TPHs down to ground level. The excavated material (approximately 660 cubic yards) was disposed of at an approved Resource Conservation and Recovery Act (RCRA) landfill. Waste filter clay material remaining below grade was

covered with a protective liner to limit the migration of this contaminated material. Also, in 1991, EPA installed extraction wells to remove the floating product layer that lay above the groundwater beneath the waste filter clay disposal area. The extracted floating product was properly disposed of off-Site. In 1996, NJDEP assumed responsibility for the removal of floating product. Between 1996 and 2009, approximately 25,000 gallons of floating product were recovered from the Site.

In April 1993, EPA began the removal of several buried drums, which contained contaminated waste oil and sludge. The purpose of the action was to minimize the possibility of further migration of contaminated materials already in the ground.

In April 2002, EPA removed a tar-like material and associated soil from an area of the Site that is accessible to the public. After excavation of these materials, the excavated area was filled with gravel over an impermeable liner to prevent migration of contamination.

Basis for Taking Action

Sampling conducted during the RI indicated that on-Site soils contained elevated levels of numerous contaminants including; PCBs, arsenic, lead, beryllium, antimony, toluene, xylenes, ethylbenzene, pyrene, TPHs, bis (2-ethylhexyl) phthalate, and butylbenzylphthalate. In addition, floating product beneath the Site, which contained elevated levels of PCBs, toluene, ethylbenzene, xylenes, naphthalene and fluorene, was a continuing source of soil and groundwater contamination. Sampling also indicated that the Birch Swamp Brook sediment contained elevated levels of PCBs, arsenic and TPHs.

Exposure to PCBs, arsenic and lead in on-Site soil at the time of the RI and potentially into the future was determined to present a significant human health risk due to exceedance of EPA's risk assessment criteria. In addition, an ecological risk assessment was performed in the following four areas: 1) wooded areas southeast of the Fire Pond and northeast of the facility; 2) the Fire Pond and a 0.5 acre wetland area downstream of the railroad culvert; 3) a shrub habitat in the vicinity of the power transmission lines which traverses Off-Site areas 1&2; and 4) a large wooded area to the west and north of the Off-Site areas 1&2. The contaminants of concern selected for the ecological risk assessment were PCBs, antimony, arsenic, beryllium, lead, and bis-2 (ethylhexyl) phthalate. The ecological risk assessment concluded that exposure to the Site soil and surface water by the various plant, mammal, bird, and reptile species in the vicinity of the Site, if not addressed by the remedy, would present a current or potential future threat to the environment.

Furthermore, the presence of Site-related contamination in the Birch Swamp Brook sediments was determined to present a significant risk to both human and ecological receptors.

Response Actions

OU1

The OU1 ROD for the Site was issued on September 27, 1990. The OU1 Remedial Action Objectives (RAOs) are:

- Reduce exposure risks through incidental ingestion, inhalation, and dermal contact with contaminated soil;

- Eliminate the potential migration of contaminants into the groundwater and surface water;
- Restoration of the affected wetlands; and
- Complete remediation of Off-Site areas 1&2 in a short-term timeframe.

The major components of the remedy selected in the OU1 ROD include the following:

- Installation of fencing to control access to the contaminated soil areas;
- Excavation and appropriate off-site disposal of contaminated soil from within the wetlands; and
- Restoration of the affected wetlands.

In September 1997, EPA issued an Explanation of Significant Differences (ESD) to modify the OU1 ROD to include the remediation of four residential properties located adjacent to the Imperial Oil facility. The ESD also provided for the implementation of engineering controls in the vicinity of the Fire Pond and forested wetland areas of the Site as a precautionary measure against potential recontamination of Off-site areas 1&2, once remediated.

In July 2002, EPA issued a second ESD to further modify the OU1 ROD and the 1997 ESD. The 2002 ESD modified the OU1 remedy to provide for the:

- Excavation of contaminated sediment in Birch Swamp Brook;
- Remediation of contaminated soil located on two additional residential properties located adjacent to Birch Swamp Brook, on Texas Road to the northwest of the site;
- Deletion of certain engineering controls, which were originally selected to prevent the recontamination of Off-Site areas 1&2 as they were determined to not be necessary; and
- Reduction of the amount of soil to be remediated within Off-Site Areas 1 & 2.

<u>OU2</u>

The OU2 ROD was issued on September 30, 1992. The OU2 RAOs are to:

- Prevent further off-Site migration of contaminated ground water; and
- Return the aquifer to its designated use as a source of drinking water by reducing contaminant concentrations in the ground water to drinking water quality.

The major components of the remedy selected in the OU2 ROD include the following:

- Installation of extraction wells to extract the contaminated groundwater;
- Treatment of extracted groundwater via precipitation of inorganic contaminants and carbon adsorption of organic contaminants;
- Discharge of the treated groundwater to Birch Swamp Brook;
- Continuation of the floating product removal action that was initially undertaken by the EPA; and
- Appropriate environmental monitoring to ensure the effectiveness of the remedy.

OU3

The OU3 ROD was issued on September 30, 1999. The OU3 RAOs are to:

- Restore the on-site soil to levels which would allow for unrestricted use of the site;
- Prevent human exposure to contaminated on-site soil and waste filter clay material;
- Prevent ecological exposure to contaminated surface soil; and
- Eliminate continuing source of contamination to groundwater (the floating product), the Birch Swamp Brook, the Fire Pond, and associated wetlands.

The major components of the remedy selected in the OU3 ROD include the following:

- Excavation of contaminated soils and disposal of these soils at appropriate off-site facilities;
- Transportation of those soils which pose the principal threat to Resource Conservation and Recovery Act/Toxic Substances Control Act (RCRA/TSCA) hazardous waste disposal facilities;
- Removal of floating product via vacuum truck and transportation of this material to a TSCA-licensed incinerator;
- Dismantling of buildings and tank farms, as necessary to complete the soil excavation and floating product removal activities;
- Backfilling of all excavated areas with clean fill; and
- Restoration of wetlands impacted by the cleanup activities.

Status of Implementation

OU1

In September 1991, as part of the OU1 remedy, EPA installed a fence around Off-Site Areas 1&2. This fence was installed to control access to contaminated soils located in these areas.

In March 1998, EPA mobilized to the site to initiate the excavation and disposal of lead and arsenic-contaminated soil found on four residential properties located adjacent to the Imperial Oil facility. All soils containing lead levels greater than 400 parts per million (ppm), which is NJDEP's unrestricted use cleanup number, were excavated and disposed of offsite. EPA excavated and disposed of approximately 6,488 cubic yards of soil from the properties. This work was essentially completed in August 1998. However, as part of a later investigation to install a sewer pipe on one of the properties, it was discovered that residual arsenic contamination at the surface and at depth remained near the road and along the property boundary. The contaminated material was removed in 2009 and the area was restored with clean soil.

NJDEP's contractor mobilized to the site on April 26, 2004, to begin implementation of the remaining components of the OU1 remedy. As part of this phase of the work, NJDEP provided for the excavation and off-site disposal of contaminated soil in Off-site Areas 1&2 and on two residential properties located adjacent to Birch Swamp Brook to the northwest of the site. In addition, contaminated sediment

located in Birch Swamp Brook was excavated and disposed of off-site. This phase of the OU1 remedy was substantially completed by November 2004. A total of 14,899 cubic yards of contaminated soil and sediment were excavated and disposed of off-site as part of this cleanup effort. The OU1 RA Report for this phase of the work was never finalized by NJDEP.

In September 2004, during excavation of a portion of the Birch Swamp Brook near the Imperial Oil facility, NJDEP noted that floating product from the site was leaching into the Birch Swamp Brook. As a temporary measure, NJDEP's contractor lined this portion of the Brook with an impermeable liner prior to restoration, in order to mitigate recontamination of the Birch Swamp Brook. This temporary measure was followed by a further investigation effort by NJDEP's contractor in 2005 where several Geoprobe samples were taken in areas of suspected contamination. The report compiled by Kimball & Associates in 2006 indicated that none of the sampling points showed any signs of contamination in the stream.

In late 2006, EPA became the lead Agency for cleanup operations at the site. EPA's review of the draft OU1 RA report indicated that arsenic remained in Off-Site Areas 1&2 soil at concentrations up to 98.9 ppm, and that arsenic, lead and PCBs remained in the Birch Swamp Brook at concentrations up to 2,960 ppm, 12,000 ppm, and 5.4 ppm, respectively. Post-excavation soil sampling results collected from the Texas Road residential properties indicated that arsenic was still present in soil at concentrations up to 1,780 ppm.

Because NJDEP's post-excavation sampling results were not validated and considered preliminary, EPA initiated a sampling program to verify the attainment of cleanup goals in the OU1 remediated areas. This sampling effort was initiated in February 2010. Over 950 surface and subsurface soil samples were collected by EPA in the Off-site areas 1&2 and analyzed for chemical constituents, including TPH, PCBs, arsenic, and lead. This sampling revealed the presence of additional contamination at levels above remediation goals in Off-site Areas 1&2, and on two residential properties near Texas Road to the northwest of the site that were previously remediated by the NJDEP. Remaining contamination on the two residential properties was excavated and backfilled with clean soil by EPA between July 2011 and February 2013. Cleanup activities were performed by EPA's Emergency and Rapid Response Services (ERRS) contractor with EPA oversight. The two 150-foot sections of Birch Swamp Brook were restored using a layer of geotechnical fabric and rip rap in order to prevent erosion. Hydro-seeding was performed to promote grass growth and fifteen trees and numerous shrubs were planted to replace those that had to be removed to facilitate the excavation process. In October 2012, EPA returned to the northern residence property to perform additional restoration work to prevent future ponding of water during rain events.

The results of EPA's confirmation sampling program also indicated that contamination remained throughout the floodplain, with the dominant chemical constituents being TPHs, PCBs, arsenic, and lead. Further, the occurrence of TPH was thought to indicate a potential for residual site-related oil contamination. The added data provided by the EPA study lead to additional follow-up sampling and investigation by the EPA's Environmental Response Team (ERT) beginning in late 2011. The added data also warranted a reassessment of risk; consequently, a Focused Ecological Risk Assessment (ERA) and a supplemental Human Health Risk Assessment for Birch Swamp Brook and surrounding woodlands was initiated in 2012. The Supplemental Human Health Risk Assessment completed in January 2014 found no unacceptable risk for receptors in the study area. The Focused Ecological Risk

Assessment completed in September 2014, used the data to evaluate the forested floodplain and wetlands. In addition to the soil sampling data, small mammal tissue analysis was used to populate food chain modeling in the risk assessment. The Focused Ecological Risk Assessment concluded that there does not appear to be a substantive risk to mammalian or avian receptors from arsenic or lead. Additionally, there is not a direct toxicity risk to the soil invertebrate community. The risk assessment identified some potential ecological risks associated with PCBs in localized areas. The sampling data indicates that PCB concentrations were found above 2.13 milligrams per kilogram (mg/kg) which is the selected cleanup number for PCBs in soil, in a limited number of locations in the sediments of Birch Swamp Brook and its floodplain. Soil and sediment from these hot spot areas were excavated and disposed of off-site between October 2016 and May 2017. Post excavation sampling confirmed that the selected cleanup standards have been met.

OU2

In September 1998, the NJDEP established an institutional control in the form of a CEA/WRA to prevent potential exposure to site-impacted groundwater.

Implementation of the OU2 remedy was deferred until completion of the OU3 remedy that removed the sources of contamination to the groundwater. Since completion of the OU3 remedial action in 2011, residual contaminant concentrations remaining in the groundwater have been monitored through semi-annual sampling, resulting in over 15 rounds of sampling to date. Results of this sampling are used to conduct an analysis of contaminant concentration trends in the groundwater. A decision on the final groundwater remedy implementation is planned for 2020.

OU3

All remedial actions associated with OU3 are complete, allowing for the OU3 area's unrestricted use. The RA report for the final phase of the OU3 remedial action work was approved by EPA in March 2012.

IC Summary Table

Table 1: Summary of Planned and/or Implemented ICs

Media, engineered controls, and areas that do not support UU/UE based on current conditions	**ICs Needed**	**ICs Called for in the Decision Documents**	**Impacted Parcel(s)**	**IC Objective**	**Title of IC Instrument Implemented and Date (or planned)**
Groundwater	Yes	Yes	Impacted Groundwater Areas (see Appendix B)	Restrict installation of ground water wells and ground water use.	CEA, September 1998

System Operations/Operation & Maintenance

Operation and Maintenance activities at the site include groundwater sampling and monitoring conducted semiannually at all on-site and off-site monitoring wells. EPA is conducting said sampling and monitoring to support a decision on the implementation of the OU2 groundwater remedy. The sampling includes all contaminants of concern for the groundwater. This data will be evaluated as part of this FYR. Survival and growth of all species planted in the restored wetlands and bike path areas are also monitored on a yearly basis.

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the site.

III. PROGRESS SINCE THE LAST REVIEW

This section includes the protectiveness determinations and statements from the last FYR as well as the recommendations from the last FYR and the current status of those recommendations.

Table 2: Protectiveness Determinations/Statements from the 2015 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Will be Protective	The remedy at OU1 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks in these areas.
3	Protective	The remedy at OU3 is protective of human health and the environment.

Sampling and delineation of remaining areas of concern in OU1 were completed by EPA in August 2013. Two residential properties near Texas Road underwent additional cleanup work to achieve the cleanup standards called for in the ROD during this work. Results of the sampling effort further indicated that some hot spot areas of contamination existed within the Birch Swamp Brook floodplain and along the banks of the stream. Since the last five-year review, remedial action to address these remaining areas of contamination was implemented between October 2016 and May 2017. The remedial actions at OU1 have been completed and post-excavation sampling has confirmed that previous soil and sediment contaminated areas have achieved cleanup goals.

The remedial actions at OU3 have been completed and are protective of human health and the environment. No recommendations on this OU were made during the last five-year review report. Therefore, it will no longer be included in FYRs.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement & Site Interviews

On October 1, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at Superfund sites in New York, New Jersey, Puerto Rico and the Virgin Islands, including the Imperial Oil Site. The announcement can be found at the following web address: https://www.epa.gov/superfund/R2-fiveyearreviews. In addition to this notification, a public notice was made available by EPA Region 2 on December 20, 2019, stating that there was a FYR and inviting the public to submit any comments to the U.S. EPA. The results of the review and the report will be made available at the Site information repository located at the Marlboro Township Municipal Building Mayor's Office, located at 1979 Township Drive Marlboro, New Jersey and the site information page located at https://cumulis.epa.gov/supercpad/cursites/csitinfo.cfm?id=0200764.

During the five-year review process, interviews were conducted with the Site Remediation Program at the NJDEP. The purpose of the interview was to document any perceived problems or successes with the remedy that has been implemented to date. Interviews were conducted on August 7, 2019. The remedy is deemed as successful by the NJDEP and no issues or concerns were raised.

Data Review

OU1

OU1 addressed contaminated soil and sediment in Off-site Areas 1&2, including areas in and adjacent to wetlands and Birch Swamp Brook, and contaminated soil located on four residential properties in the vicinity of the Imperial Oil facility, and two residential properties near Texas Road. NJDEP post-excavation sampling in 2004 revealed the presence of additional contamination in Off-site Areas 1&2, and on the two residential properties near Texas Road which was confirmed by EPA sampling activities from 2010 to 2013. Residual contamination on the two residential properties was excavated and backfilled with clean soil by EPA between July 2011 and February 2013. The objectives were to excavate arsenic-contaminated soils to prevent human exposure and minimize migration from contaminated soils. The soil in this area was cleaned up to unrestricted residential use according to background levels established in the ROD. Construction activities were performed by EPA's Emergency and Rapid Response Services (ERRS) contractor with EPA oversight. Two-150 foot sections of Birch Swamp Brook were restored using a layer of geotechnical fabric and rip rap in order to prevent erosion. Hydro-seeding was performed to promote grass growth and fifteen trees and numerous shrubs were planted to replace those that had to be removed to facilitate the excavation process. In October 2012, EPA returned to the northern residence property to perform additional restoration work to prevent future ponding of water during rain events.

An additional sampling effort which started in 2010 further investigated Off-site Areas 1&2 involving the Birch Swamp Brook, forested floodplain and the adjacent wetlands. The resulting data were used to conduct supplemental ecological and human health risk assessments. The risk assessment identified some potential ecological risks associated with PCBs in localized areas. The sampling data indicated that PCB concentrations were found above 2.13 ppm in a limited number of locations in the sediments

of Birch Swamp Brook and its floodplain. These hot spot areas were remediated, and all affected wetlands were restored during a remedial action implemented by EPA between October 2016 and May 2017.

OU2

Following completion of the OU3 source removal remedial action, EPA has been performing semiannual groundwater sampling at the site that started in 2011 and continues through present day to evaluate the effects of the source removal on groundwater contamination. The results of this sampling indicate that concentrations of the contaminants of concern (COCs) identified in the OU2 ROD have decreased to the point where many identified COCs are no longer detected at concentrations above the ROD remedial goals. An immediate decrease in COC concentrations was observed following the remedial action and while fluctuations in concentrations were observed, since May 2016 the concentrations have shown a greater degree of stability with an apparent downward trend. Specifically, since May 2016, two volatile organic compound (VOC) COCs, benzene and trichloroethene (TCE), were detected at concentrations slightly above the remedial goals. Two metals (arsenic and beryllium) also continued to be detected above the remedial levels, with arsenic being the most prevalent and considered the main COC. However, while there was a sharp increase in arsenic concentrations and exceedances of the ROD remedial levels (up to 1,000 ppm) at the northeastern edge of the plume less than a year after completion of the OU3 source removal RA; over time, the arsenic concentrations in this area have progressively decreased. This decrease in concentration is demonstrated by the 15 rounds of groundwater sampling conducted at the Site (See summary in Appendix C), with the last event from May 2018 showing arsenic concentrations in the same location at 120 ppm. Some metal concentrations may also be attributable to regional background conditions, as metals were found at the monitoring points considered representative of regional background conditions (up to 6 ppm for arsenic and 1.3 ppm for beryllium).

Logarithmic decay analysis of the groundwater data over the last three years, suggests that VOC COCs may achieve their ROD remedial levels by the end of year 2025 and metal COCs may achieve theirs by the end of year 2030 without active remediation, as shown on Figures 1 through 6 in Appendix E. Acidic groundwater conditions in the area likely cause the reductions in metal COC concentrations, primarily through dilution, as a result of hydrodynamic mechanisms such as dispersion and diffusion, without the added effects of adsorption.

These results suggest that the groundwater extraction and treatment remedial alternative selected in the OU2 ROD may no longer be necessary at the site and long-term monitoring via monitored natural attenuation (MNA) may instead be appropriate to observe further progress in reductions in COC concentrations in groundwater.

Site Inspection

The inspection of the site was conducted on October 9, 2019. In attendance were: Farnaz Saghafi, EPA; Michael Clemetson, EPA; Abbey States, EPA; and Thomas Roche of the Army Corps of Engineers (USACE). The purpose of the inspection was to assess the protectiveness of the remedy. The fence surrounding the former Imperial Oil property was observed to be secure with no visible signs of trespassing. Planted vegetation within the property was in good condition. No specific issues were observed during the site inspection.

V. TECHNICAL ASSESSMENT

QUESTION A: Is the remedy functioning as intended by the decision documents?

OU1

Post-excavation confirmation samples were collected from each grid within the excavation area following removal of PCB-contaminated soil in the shallow zone areas in the floodplain and PCB-contaminated sediments within Birch Swamp Brook. The objective of the post-excavation sampling was to verify that the OU1 remedial action had achieved project specific remediation goals. Results of the confirmation sampling are available in the Final Remedial Action Report for Imperial Oil Superfund Site, OU1 Stream and Floodplains, dated July 2017. Monitoring of the restored areas in the floodplain of Birch Swamp Brook continues on a yearly basis.

All OU1 remedial activities have been completed and cleanup levels have been achieved.

OU2

In 1992, EPA issued the ROD for OU2 which selected extraction and treatment as the remedial alternative for contaminated groundwater. Following completion of the OU3 source removal action in 2011, EPA has been performing semiannual groundwater sampling at the site which continues through present day to evaluate the effects of the source removal on groundwater contamination.

The results of this sampling indicate that concentrations of the COCs identified in the ROD have decreased to the point where many identified COCs are no longer detected at concentrations above the ROD remedial levels. These observations also suggest that the groundwater remedial alternative selected in the ROD may no longer be necessary at the site. EPA is therefore considering modifying the remedy.

QUESTION B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy still valid?

There are no changes in the physical conditions of the site or site uses that would affect the protectiveness of the selected remedies. The land use considerations and potential exposure pathways considered in the baseline human health risk assessment are still valid. The exposure assumptions and the toxicity values that were used to estimate the potential risks and hazards to human health followed the general risk assessment practice at the time the risk assessments were performed for each OU.

Cleanup levels selected at the time of the OU2 ROD for groundwater are still protective. Although specific parameters and toxicity values may have changed since that time, the risk assessment process that was used is still consistent with current practice and the need to implement a remedial action remains valid. The OU2 remedial action objectives of preventing further off-site migration of contaminated groundwater and returning groundwater to its designated use as a source of drinking water are still valid.

Since the last five-year review of the site, remedial actions for OU1 have been completed. PCB-contaminated soil and sediments from the banks of Birch swamp Brook, its floodplains, and Off-site Areas 1&2 have been removed and the associated wetland areas restored. The cleanup goal for lead for the

completed soil remediation areas for OU1 was 400 ppm based on the NJ Residential Direct Contact Soil Remediation Standards, which exceeds the current regional target residential area-wide average of 200 mg/kg. Available post-excavation and backfill sample results from the 2012 RARs for the two Texas Road residential properties and the 1999 RAR for Orchard Road property 37 were reviewed in comparison to the new regional target. All backfill results and post-ex averages were below 200 mg/kg, therefore the OU1 remedy remains protective. Although not subject to this FYR, it should be noted that the change in regional target for lead would not affect the protectiveness of the OU3 remedy either. Cleanup levels for all contaminants other than lead have remained protective since the time of OU1 remedy selection.

Several groundwater contaminants remain in excess of state and federal MCLs both in the source area and downgradient of the former facility. The evaluation of the direct pathway (ingestion as a potable water source) showed that since there are no potable wells in the contaminated area, there is no exposure. Institutional controls are in place to restrict the installation of new wells in the groundwater contamination area. Therefore, the remedy is protective even though groundwater exceeds drinking water standards. Continued groundwater monitoring will ensure that concentrations decrease over time and contamination is not migrating off-site.

As mentioned in the previous five-year review, one potential exposure pathway that was not evaluated at the time of remedy selection is vapor intrusion. Since the site does not contain any buildings above the groundwater plume at this time, the vapor intrusion pathway is incomplete. Groundwater concentrations of trichloroethylene exceeded EPA's upper-bound residential Vapor Intrusion Screening Level (VISL) set at a cancer risk of 10^{-4} and a HQ of 1. Maximum detected groundwater concentrations of benzene and vinyl chloride fell within the residential acceptable risk range (10^{-6} to 10^{-4} and HQ of 1). This indicates that further evaluation may be necessary if development were to occur on the site and will be evaluated as part of the next five-year review.

The 1990 OU1 remedy, which covered Off-site Areas 1&2, involved the excavation of contaminated soil in the wetlands. The second ESD for the 1990 OU1 ROD, issued in 2002, included remediation of Birch Swamp Brook. In 1992, the OU2 ROD was issued to address groundwater, calling for extraction and treatment. Additionally, a Focused Ecological Risk Assessment was conducted in 2014 to evaluate ecological risk in a forested floodplain associated with Birch Swamp Brook and adjacent wetlands. This focused assessment identified some potential ecological risks associated with PCBs in localized areas. These areas were remediated in 2016 and 2017 which resulted in wetland impacts. Consequently, a wetland restoration was initiated. The 2018 Wetland Monitoring Report indicated that the restoration has been successful with over 85 percent vegetative cover. However, the percent coverage of invasive species at 12% exceeded 10 percent cover. A more aggressive approach will be implemented if this excessive coverage continues.

Although the ecological risk assessment screening and toxicity values used to support the various RODs may not necessarily reflect the current values, the current Focused Ecological Risk Assessment used updated values to supplement the existing Site record.

QUESTION C: Has any other information come to light that could call into question the protectiveness of the remedy?

Based on the evaluation of the potential human exposures at the site there is no new information that could call into question the protectiveness of this remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the Five-Year Review:
OU1/OU2

There are currently no issues that would affect the protectiveness of the remedies. However, in order to ensure appropriate long-term management of the site, wetland monitoring of invasive species and MNA monitoring of the groundwater should continue.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: OU1	*Protectiveness Determination:* Protective	*Addendum Due Date (if applicable):*
The remedy at OU1 is protective of human health and the environment.		
Operable Unit: OU2	*Protectiveness Determination:* Will be protective	*Addendum Due Date (if applicable):*
The remedy for OU2 is expected to be protective of human health and the environment upon completion. In the interim, remedial activities completed to date have adequately addressed all exposure pathways that could result in unacceptable risks to potential receptors.		

VIII. NEXT REVIEW

This FYR was conducted at EPA's discretion. In the next five years, EPA anticipates that the groundwater remedy will be implemented. Therefore, the next five-year review report for the Imperial Oil Superfund site will be conducted as a matter of policy five years from the completion date of this review.

APPENDIX A: REFERENCE LIST

Documents, Data and Information Reviewed in Completing the Five-Year Review	
Document Title, Author	**Submittal Date**
Operable Unit One Record of Decision, EPA	September 1990
Operable Unit Two Record of Decision, EPA	September 1992
Remedial Investigation Report, ABB Environmental Services, Inc.	December 1996
Operable Unit One Explanation of Significant Differences, EPA	September 1997
Summary of July 1997 Ground Water Sampling, NJDEP	N/A
Operable Unit Three Record of Decision, EPA	September 1999
Birch Swamp Brook Sediment Focused Feasibility Study, EPA	July 2000
Texas Road Residential Properties Focused Feasibility Study, EPA	July 2000
First Five-Year Review Report, EPA	September 2000
Summary of December 2000 Ground Water Sampling, NJDEP	April 2001
Second Operable Unit One Explanation of Significant Differences, EPA	July 2002
Summary of April/May 2002 Ground Water Sampling, NJDEP	January 2003
OU3 Pre-Design Investigation Report, H2M Group	December 2004
OU1 Post-Excavation Sampling Results, L. Robert Kimball & Associates, Inc.	September 2005
Comments from Ed Modica, EPA Geologist	September 2005
Comments from Michael Sivak, EPA Risk Assessor	September 2005
Draft Remedial Action Report, Imperial Oil Off-Site Areas 1 & 2, Kimball & Associates	March 2006
100% Remedial Action Design Submittal, Operable Unit 3, HDR	September 2008
Final Remedial Action Report Submittal, Operable Unit 3, HDR	March 2012
Final Remedial Action Report, OU1 – Conomos Property	May 2013
Supplemental OU1 Sampling and Investigation Report	September 2014
Comments from Ed Modica, EPA Geologist	November 2014

Documents, Data and Information Reviewed in Completing the Five-Year Review	
Comments from Abbey States, EPA Human Health Risk Assessor	November 2014
Comments from Michael Clemetson EPA Ecological Risk Assessor	November 2014
Summary of EPA Groundwater Sampling Data	2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019

APPENDIX B: Chronology of Site Events

Event	Date(s)
Final NPL listing	9/1983
Removal actions	1991, 1993, 2002
Phase I and Phase II Remedial Investigation conducted	9/1984 - 12/1990
OU1 ROD signature	September 1990
OU2 ROD signature	September 1992
OU3 ROD signature	September 1999
OU1 ESD signature dates	September 1997 and July 2002
Final Site-wide RI Report issued	12/1996
OU1 cleanup of four residential properties	9/1997 – 7/1999
OU3 building demolition conducted	7/2000 - 2/2001 and 6/2008 – 8/2008
OU3 Remedial Design initiated	9/2000
OU1 Off-Site Area 1 & 2 and Birch Swamp Brook cleanup performed	2004
EPA becomes lead Agency for Site cleanup	11/2006
OU3 Remedial Design Completion	12/2008
OU3 On-site remedial action construction start	10/2009
OU3 RA Construction completion	12/2011
OU1 Confirmation Re-sampling initiated	2/2010
OU1 Confirmation Re-sampling completed	9/2013
OU1 Supplemental Human Health and Ecological Risk Assessment	1/2014
OU1 Stream and Floodplains, Final Remedial Action Report	6/2017
OU2 Focused Remedial Investigation/Feasibility Study Report	5/2019
Previous five-year reviews	9/2000, 9/2005, 7/2010, 7/2015

APPENDIX C: Site COC Summary OU1, Soils and OU2, Groundwater

Site COC Summary OU1, Soils

Contaminant of Concern	NJDEP RDCSS (mg/Kg)	Max Conc 2010-2014 (mg/Kg)*	Sample Location	Sample Date
PCBs	0.2	92	IOC-ISP-69	2010
Arsenic	19**	687	IOC-IOP-167	2010
Lead	400	4,130	IOC-ISP-88	2011

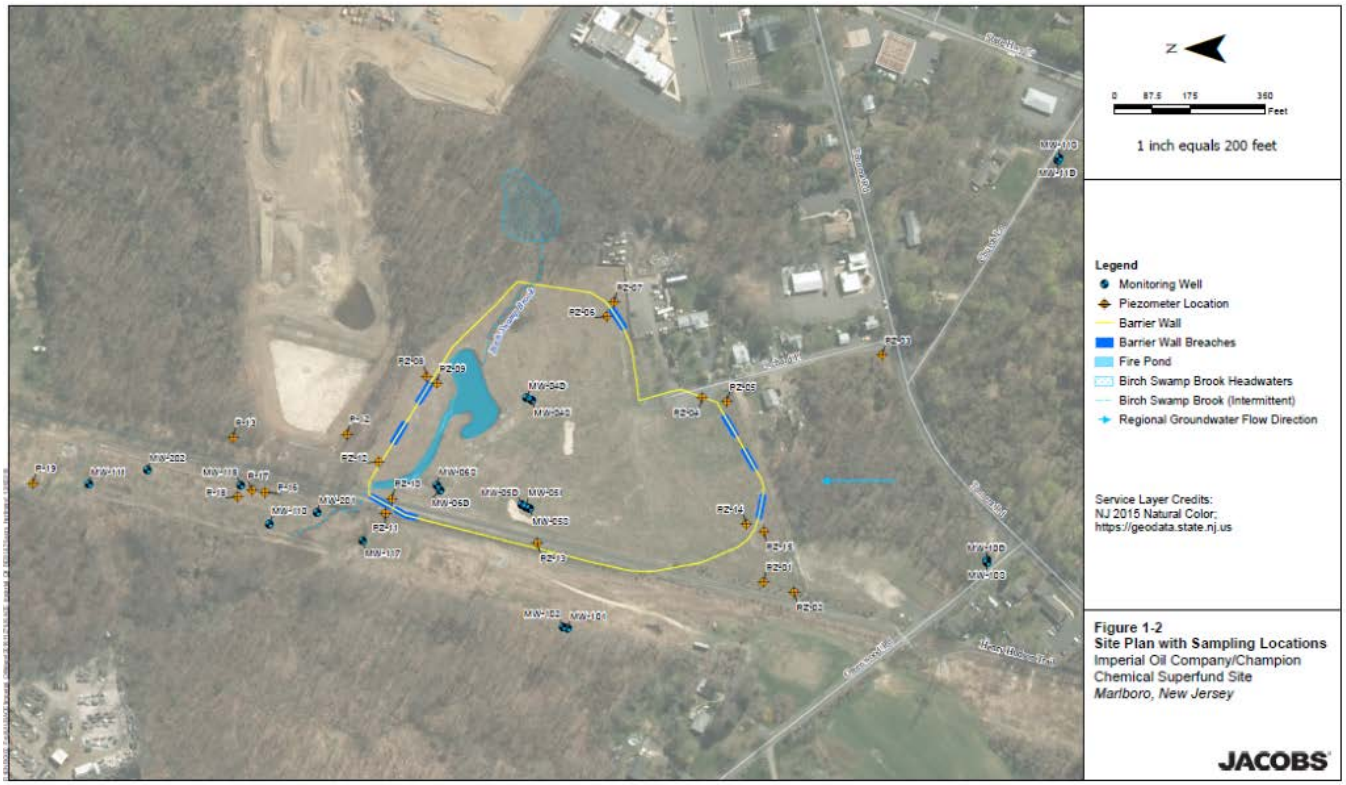
* Maximum contaminant concentrations have been removed and no longer exist at the site.
**NJDEP residential direct contact soil standard is based on natural background.

Site COC Summary OU2, Groundwater

Contaminant of Concern	OU2 ROD Cleanup Standard (ug/L)	NJDEP Groundwater Quality Standard (ug/L)	NJDEP MCL (ug/L)	USEPA VISL***	Max Conc 2014-2018 (ug/L)	Max Sample Date
Benzene	1	1	1	140	10	Jan 2014
Trichloroethylene	1	1	1	5.2	8.9	May 2015
Antimony	20	6	6	NA	91.9	May 2016
Arsenic	8	3	5	NA	540	Jan 2014
Beryllium	20	1	4	NA	56.4	May 2016
Lead	10	5	5	NA	23.7	May 2016
Chromium (total)	100	70	100	NA	220	Nov 2015

***VISLs were calculated using a carcinogenic risk of 10^{-4} and a hazard index of 1.

APPENDIX D: Imperial Oil Superfund Site – Monitoring Well Locations



APPENDIX E: Imperial Oil Superfund Site - COC Trends

Figure 1:

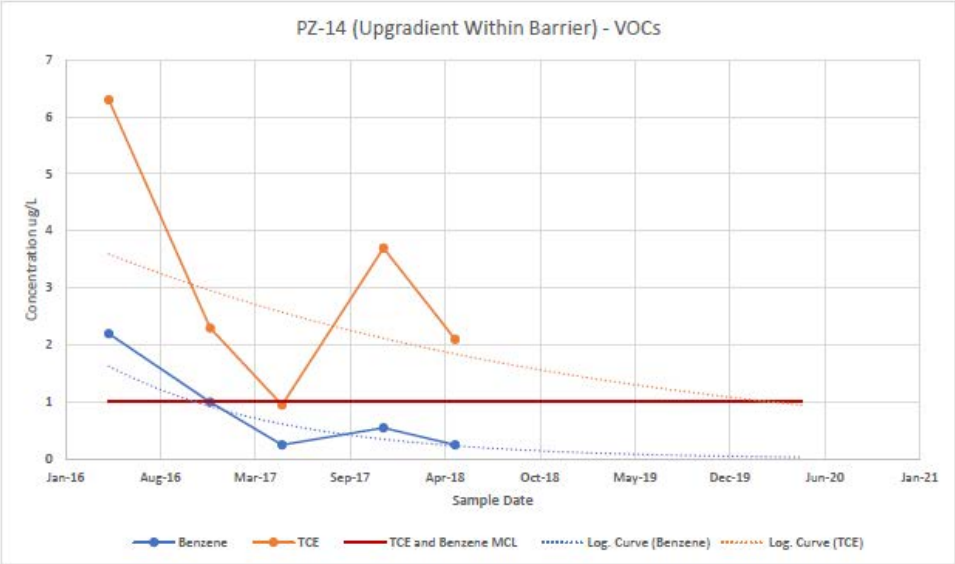
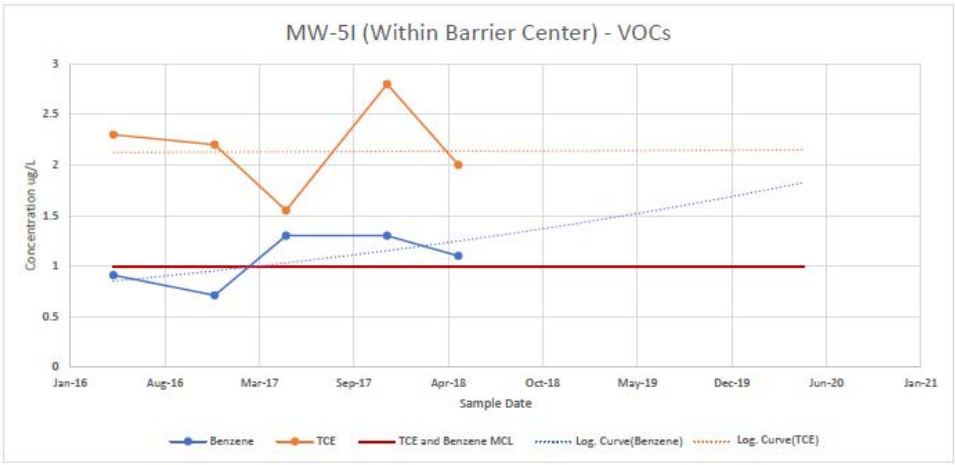


Figure 2:



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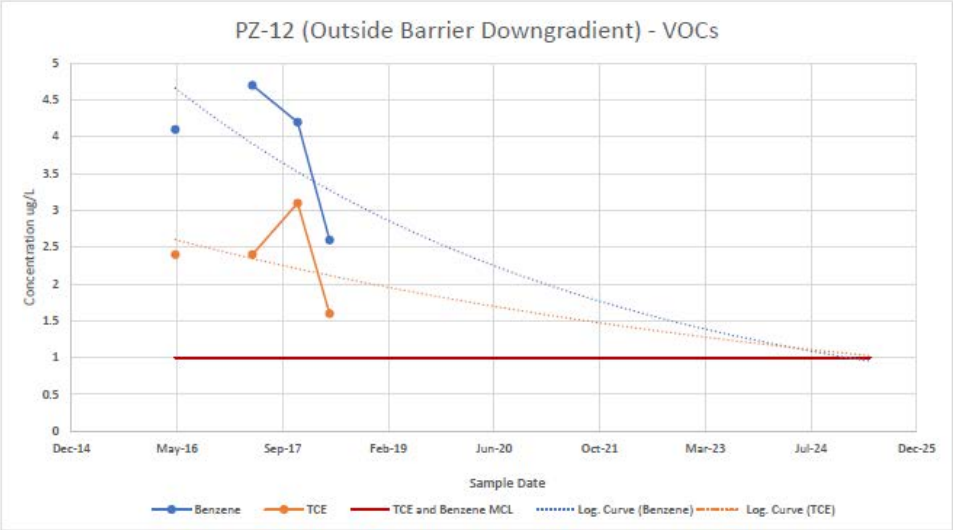

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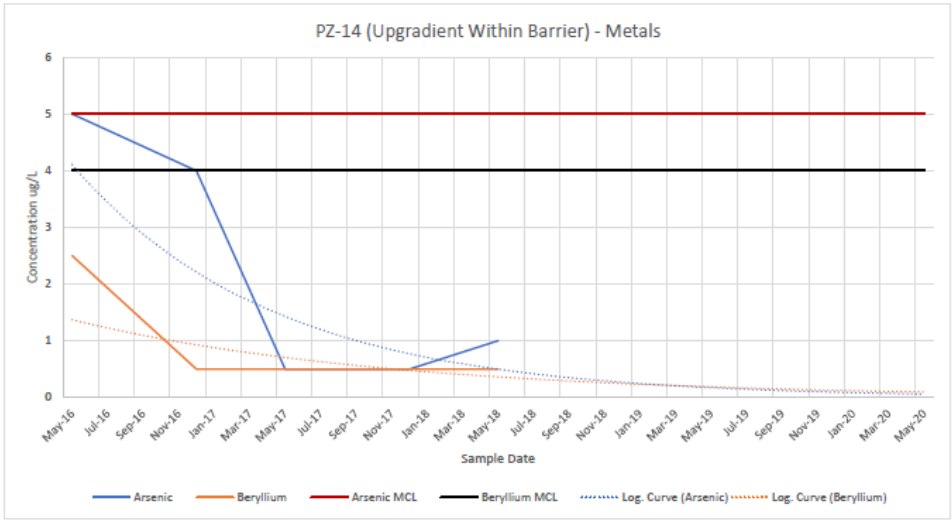

Figure 5:

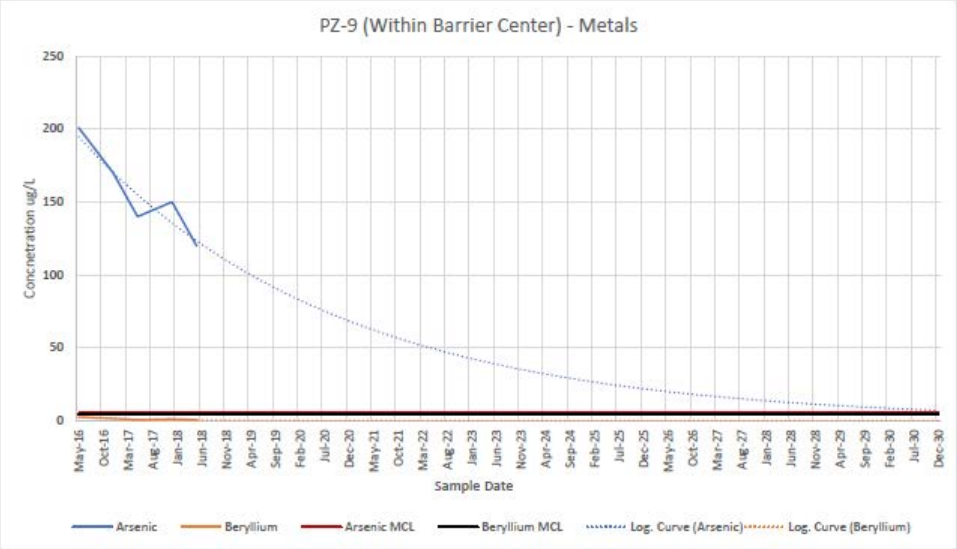

Figure 6: