FIFTH FIVE-YEAR REVIEW REPORT FOR
AVCO LYCOMING SUPERFUND SITE
LYCOMING COUNTY, PENNSYLVANIA

September 2022

Prepared by

U.S. Environmental Protection Agency
Region 3
Philadelphia, Pennsylvania

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Date

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LIST OF ABBREVIATIONS AND ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIC	Community Involvement Coordinator
COC	Contaminant of Concern
DCA	Dichloroethane
DCE	Dichloroethylene
EPA	United States Environmental Protection Agency
FFS	Focused Feasibility Study
FYR	Five-Year Review
GETS	Groundwater Extraction and Treatment System
IC	Institutional Control
MCL	Maximum Contaminant Level
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
MSC	Medium Specific Concentration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PADEP	Pennsylvania Department of Environmental Protection
PADER	Pennsylvania Department of Environmental Response
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethylene
PFAS	Perfluorinated Alkyl Substances
PRP	Potentially Responsible Party
RAO	Remedial Action Objective
RI/FS	Remedial Investigation and Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
SVOC	Semi-volatile Organic Compound
TCA	Trichloroethane
TCE	Trichloroethylene
UU/UE	Unlimited Use/Unrestricted Exposure
VISL	Vapor Intrusion Screening Level
VOC	Volatile Organic Compound
WMWA	Williamsport Municipal Water Authority

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy 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 pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Section 121, consistent with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations (CFR) Section 300.430(f)(4)(ii)) and considering EPA policy.

This is the fifth FYR for the AVCO Lycoming Superfund Site. The triggering action for this **statutory** review is the signature date of the previous September 25, 2017, Five Year Review. The FYR has been prepared due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure (UU/UE).

The Site consists of two operable units (OU1 and OU2) that will be addressed in this FYR. However, both OU1 and OU2 address the containment, recovery, and treatment of contaminated groundwater at the Site and no distinction between OUs will be made in this FYR.

This FYR was led by David Greaves, Remedial Project Manager, EPA Region 3. Participants included Mark Leipert (EPA Site Hydrologist), Jennifer Hubbard (EPA Site Toxicologist), Katie Page (EPA Site Community Involvement Coordinator (CIC)), Matthew Taynor, EPA Biological Technical Assistance Group (BTAG), Kathy Patnode, US Fish and Wildlife Service (USFWS), and Cheryl Sinclair (Pennsylvania Department of the Environmental Protection (PADEP) Environmental Group Manager, North Central Regional Office. The review began on 9/13/2021

Site Background

The Site consists of the AVCO facility (the facility) located at 652 Oliver Street in Williamsport, Lycoming County, Pennsylvania and the groundwater contaminant plume to the south of the facility (See Figure 1). The facility is approximately 28 acres and is situated next to a residential neighborhood with some light industry. Portions of the facility property were first used for manufacturing purposes in the early 1900's. Historic manufacturing operations consisted of a bicycle and sewing machine facility, a sandpaper plant, a tool and dye shop, and a silk plant.

During the 1920's the facility was purchased by the AVCO Corporation. Since then, facility operations have centered primarily in the manufacture and repair of aircraft engines and the facility is currently operating as an aircraft engine production facility. The facility includes a still for the reclamation of petroleum solvents and, since 1950, a waste treatment facility. The main facility area is surrounded by an eight-foot-high chain link fence, and access to the facility is controlled and monitored by a full-time security force.

In February of 1985, Textron, Inc, acquired AVCO Corporation, which included the AVCO Lycoming Williamsport Division. The facility is currently doing business as Lycoming Engines, a division of AVCO Corporation, a wholly owned subsidiary of Textron, Inc; however, the AVCO facility will be referred to as "the facility" in this FYR and AVCO Corporation (AVCO) is considered the Potentially Responsible Party (PRP) for the Site.

The Site is located in the western part of the Williamsport in a primarily residential neighborhood with some light industry present. All residents within three miles of the Site are supplied water through the Williamsport Municipal Water Authority (WMWA). The drinking water is primarily taken from surface water from the Mosquito Creek and Hagerman's Run watersheds located over 4 miles south of the Site. However, in times of drought, a backup WMWA well field is utilized, and water is extracted from the aquifers. The WMWA well field is about 3,000 feet south (downgradient) of the Site. Extracted groundwater is treated by the WMWA and pumped to a surface reservoir for storage prior to distribution.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: AVCO Lycoming Superfund Site		
EPA ID: PAD003053709		
Region: 3	**State:** PA	**City/County:** Williamsport/Lycoming

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the Site achieved construction completion?** Yes

REVIEW STATUS
Lead agency: EPA
Author name: David Greaves
Author affiliation: EPA Region 3
Review period: 9/13/2021 - 9/25/2022
Date of site inspection: 3/22/2022 (Virtual)
Type of review: Statutory
Review number: 5
Triggering action date: 9/25/2017
Due date *(five years after triggering action date)*: 9/25/2022

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

Historic operation of the facility resulted in impacts to groundwater by volatile organic compounds (VOCs) and metals. Initial groundwater investigation and remediation was completed by AVCO prior to the listing of the Site on the EPA's National Priorities List (NPL) in accordance with a Consent Order and Agreement (COA) executed November 25, 1985, between AVCO and the Pennsylvania Department of Environmental Resources (PADER, now PADEP). The COA directed AVCO to develop and implement a Remedial Action Plan to clean up contaminated groundwater at and near the facility. In accordance with the COA, AVCO evaluated on and off-facility shallow groundwater contamination, installed and sampled groundwater monitoring wells, and installed three on-facility recovery wells and treatment systems.

The Site was placed on the NPL on February 21, 1990. Between 1989 and 1991, a Remedial Investigation/Feasibility Study (RI/FS) was conducted by AVCO under an Administrative Order on Consent (AOC) with EPA and in consultation with PADEP. The RI identified that both the shallow and deep aquifers were contaminated with trichloroethylene (TCE), dichloroethene (DCE), and vinyl chloride. A portion of the shallow aquifer was also contaminated with total chromium and hexavalent chromium. The investigation also concluded that the surface water quality of Lycoming Creek was not impacted by the Site.

The contaminants of concern (COCs) for the Site include DCE, TCE, vinyl chloride, cadmium, manganese, and chromium in groundwater. Groundwater is the media of concern at the Site because it may pose a threat to human health through the ingestion pathway. The Human Health Risk Assessment (HHRA) for the Site determined that the actual or threatened future risk from this Site, if not addressed by a remedial action, presented a potential threat to public health, welfare, or the environment.

Response Actions

EPA documented the Selected Remedy for the Site in the following decision documents:

- June 28, 1991 OU1 Record of Decision (ROD)
- April 9, 1992 OU1 Explanation of Significant Differences (ESD)
- December 30, 1996 OU2 ROD
- April 6, 2000 OU2 ROD Amendment
- March 13, 2012 OU2 ESD

The 1991 ROD identified the overburden aquifer beneath the facility property as OU1; however, the Selected Remedy in the 1991 ROD and 1992 ESD was not implemented. The 1996 ROD selected a new remedy for the overburden aquifer beneath the facility property and identified the overburden aquifer as OU2. The 2000 ROD Amendment revised the Selected Remedy to add Groundwater Extraction, Chemical Pretreatment for Iron, Air Stripping Emission Control and Discharge of Treated Water, for the shallow aquifer throughout the facility and the deep aquifer at the Site. The 2012 ESD modified the groundwater cleanup standards to include a cumulative risk assessment to be conducted following the achievement of MCLs. The 2012 ESD also modified institutional controls for the Site remedy by clarifying the institutional controls for the facility property and establishing institutional controls for groundwater. Both RODs addressed the contamination in the overburden aquifer beneath the facility property. No distinction between OUs will be made in this FYR.

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The goal of the Selected Remedy for the Site is to restore contaminated groundwater to its beneficial use (potential potable water supply) by reducing the VOC mass in the source area until contaminant levels reach the concentrations limits listed in the 1996 ROD and are protective for adult and child residential receptors while containing and remediating contamination in the shallow aquifer beneath the Facility.

The final Selected Remedy for the Site consists of the following components:

- Groundwater extraction and treatment in the overburden aquifer at the facility.
- Source area treatment via air sparging/soil vapor extraction (SVE), groundwater extraction, or in-situ chemical oxidation.
- Groundwater extraction and treatment in the overburden aquifer beyond the facility property and in the deep bedrock aquifer throughout the Site.
- Institutional controls to limit the facility property to industrial use and restricting the installation of new groundwater wells within the groundwater contamination plume.

Table 1: Chemicals of Potential Concern by Media (from 1996 ROD)

COC's	Concentration Limits (ug/L)	Source	Media
Cis-1,2-DCE	70*	MCL	groundwater
Cadmium	3	Risk based	groundwater
Chromium VI	32	Risk based	groundwater
Trichloroethene	5	MCL	groundwater
Vinyl Chloride	2	MCL	groundwater
Manganese	50	State cleanup level	groundwater

*Site decision documents refer to generic 1,2-DCE; however, the identified cleanup level is Consistent with the MCL for cis-1,2-DCE, whereas trans-1,2-DCE has an MCL of 100 µg/L

The 1996 ROD required treatment of metals via in-situ precipitation in a limited portion of the Site. The performance standards for the in-situ metals precipitation were achieved in 2003 and treatment for chromium and cadmium are no longer performed at the Site (as noted in the 2012 ESD). The 2000 ROD Amendment included source area treatment via SVE, in addition to groundwater extraction and treatment or in-situ chemical oxidation. SVE pilot testing indicated that SVE would not be effective due to Site geology; therefore, SVE was not implemented.

Status of Implementation

EPA issued a unilateral administrative order (UAO) to AVCO in May 1992 to implement the Selected Remedy in the 1991 ROD and 1992 ESD. EPA subsequently amended the UAO in 1997 and 2000 to encompass changes to the Selected Remedy in the 1996 ROD and 2000 ROD Amendment. Currently, AVCO operates five groundwater extraction and treatment systems to address contaminated groundwater in the shallow overburden aquifer and deep bedrock aquifer. Background on these systems can be found below:

- Elm Park Recovery System – consists of a single extraction well (Elm Park Recovery Well) and has been in operation since 1987.
- Third Street Recovery System – consists of a single extraction well (Third Street Recovery Well) and has been in operation since 1987.
- Memorial Avenue System – consists of 15 extraction wells (EW-1 through EW-15) and has been in operation since 2001.
- Central Area Recovery System – consist of 5 extraction wells (CAEX-1 through CAEX-5) and has been in operation since 2002.
- East Parking Lot Recovery System – consists of 3 extraction wells (EPLEX-1 through EXPLEX-3) and has been in operation since 2002.

The status of these treatment systems is discussed in detail in the following section. Construction completion of the Selected Remedy was documented in a September 27, 2002, Preliminary Close-Out Report (PCOR). Additional information on implementation of the Selected Remedy is available in the 2004, 2008, 2012, and 2017 FYRs.

IC Summary Table

The 1991 ROD called for institutional controls limiting future use of the facility property to those activities compatible with Site conditions. The 2012 ESD clarified EPA's intent to limit the future land use of the facility property to industrial use only. The 2012 ESD further provided that if, at a later date, appropriate investigations and plans are submitted and approved by EPA which identify an area, or areas, of the facility which meet residential risk standards within EPA risk assessment guidelines, such portions of the facility would no longer require an industrial use restriction. In the 2012 ESD, EPA also modified the prior decision documents to require institutional controls to restrict groundwater use within the plume of VOC-contaminated groundwater by placing restrictions on the installation of new groundwater wells to prevent exposure to contaminated groundwater through ingestion, dermal contact or inhalation

Table 2: 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)
AVCO Lycoming Facility	Yes	Yes	**Industrial Use Parcels:** Deed Book 1028, Page 314-Parcel 2; Deed Book 317, Page 571- Parcel 3; Deed Book 496, Page 289; Deed Book 1172, Page 232- Parcel 3; Deed Book 318, Page 411; Deed Book 352, Page 393 – Parcel 1; Deed Book 522, Page 420, Parcel-A; Deed Book 523, Page 911; Deed Book 524, Page 436; Deed Book 523, Page 952; Deed Book 524, Page 994; and Deed Book 524, Page 989; Deed Book 318, Page 488; Deed Book 352, Page 393, Rt. Of Way Appurtenant to Parcel 3; Deed Book 522, Page 420, Parcel B;	Limited future facility property to industrial use.	Environmental Covenant – Recorded August 22, 2017

			and, Deed Book 4620, Page 40		
Groundwater	Yes	Yes	All parcels comprising AVCO Lycoming Facility and all remaining parcels overlying the VOC plume.	Restrict groundwater use within the plume of VOC contaminated groundwater and restrict the installation of new groundwater wells.	Environmental Covenant – Recorded August 22, 2017 City of Williamsport ordinance requiring use of public water within the Flood Zone – groundwater contaminant plume is entirely within the Flood Zone.

Systems Operations/Operation and Maintenance (O&M)

The operation and maintenance (O&M) of the groundwater extraction and treatment systems is performed by AVCO in accordance with the UAO. Progress reports on O&M are submitted quarterly to EPA. Annually, AVCO submits an in-depth assessment of the remedial activities performed the prior year. Approximately thirty-three groundwater monitoring wells are sampled at various times throughout the year. A new air stripper for the Third Street Recovery System is scheduled to be installed by the end of calendar year 2022. Inspections of the vapor intrusion mitigation systems installed in homes near and around the Site are conducted quarterly during O&M visits. To date there have been no issues reported in the operation of these vapor intrusion mitigation systems.

Operational Status of Remedial Systems

An optimization study of the of the Remedial Systems at the AVCO Lycoming Superfund Site was conducted by HydroGeoLogic, Inc. (HGL) and ICF Incorporated, LLC (ICF) for the EPA Office of Superfund Remediation and Technology Innovation (OSRTI) in April of 2022. This study provided an intensive review of the operational status of the remedial systems at the Site. The results from the review can be found below:

The objective of the current Site remedy is to return Site groundwater to its designated beneficial use as a potential drinking water source (EPA, 1991 and EPA 2002). However, the optimization review team, based on its review of the Site documents and conceptualization of the overburden-bedrock-overburden migration pathway, believes that the groundwater remedy as described in the 2000 ROD is incapable of meeting these objectives. Based on the conceptual site model (CSM) described in the optimization report, ongoing contaminant concentrations above cleanup levels downgradient of the Facility are in all likelihood primarily due to the current remedy not incorporating a bedrock groundwater extraction component at the Facility to remove contaminant mass from the bedrock aquifer beneath the Facility and to control the source area.

Figures 1 in Appendix F in this document illustrates gallons recovered over time by extraction system, and Figure 2 in Appendix F illustrates total gallons and VOC mass recovered over time for the total system. The optimization review team provided the following input on the performance of the various remedy components:

- Central Area Recovery System: This system has been shut down due to successful recovery of LNAPL. The optimization review team has no further comment on the performance of this system.
- Memorial Avenue Recovery System: The primary goal of this remediation system to is to remove mass and contain the source area in the overburden aquifer. Based on the information in Figure 4 in Appendix F, this system has removed approximately 450 pounds (lbs) of VOC contamination over the past four years. This system has therefore been effective at mass removal, but substantial mass likely remains in this geologic area of treatment given the ability of this system to continue removing approximately 100 lbs of contaminant mass per year. With respect to source control, performance is difficult to evaluate given the sparse network of downgradient performance monitoring. MW-30 may be the only well currently sampled that can help evaluate source control. The TCE concentration at MW-30 have decreased from 610 µg/L in 1989 to concentrations ranging from 13 µg/L to 56 µg/L between 2011 and 2021.

  The recent concentrations are above cleanup goals, but the Site team indicates that this system or individual extraction wells have experienced significant downtime. Figure 3 in Appendix F indicates that some Memorial Avenue Recovery System extraction wells are down for more than 100 days per year, and this downtime may provide gaps in capture that allow MW-30 to continue to exceed cleanup goals. The Memorial Avenue Recovery system is approximately 700 ft wide, and MW-30 alone is not sufficient to evaluate the overall performance of this shallow aquifer remedy.

- East Parking Lot Recovery System: This system was installed to address a contamination "hot spot" in the East Parking Lot that was not well understood. The primary goal is to remove mass and reduce contaminant concentrations. Based on the information presented in Figure 4 in Appendix F, the system has removed approximately 190 lbs of VOC contamination over the past four years. The TCE concentrations in nearby monitoring wells have generally declined but remain well above cleanup goals. For example, the average TCE concentrations at MW-6 and MW-9 in 2002 were 2,750 µg/L and 9,750 µg/L, respectively, and the averages of the four most recent samples from these two wells are 785 µg/L and 2,062 µg/L, respectively.

  These concentration decreases may not be permanent and may rebound if groundwater extraction is discontinued. The optimization review team does not believe there is sufficient information to evaluate source control provided by this remedy component, but believes it is possible that contamination from this area is responsible for the ongoing contamination detected at downgradient well MW-16.

- Elm Park Recovery System: The stated objective of this system (and the Third Street Recovery System) in the 2000 ROD Amendment is "to address the shallow aquifer beyond the Facility/deep aquifer throughout the Site" (EPA, 2000). This objective is inherently vague but given that the remedy is intended to meet cleanup goals, the optimization review team expects that the purpose of the system is to contain contaminated groundwater so that it does not migrate further, and to remove contaminant mass that has already migrated from the source area. Figure 4 in Appendix F indicates that the system has removed approximately 57 lbs of VOC contamination over the past four years. However, ongoing mass flux from the source area to this downgradient location makes it unlikely that this well will restore the aquifer to beneficial use. The optimization review team does not have enough information to evaluate plume control provided by this well because there are not enough water level measurement points to define a hydraulic capture zone and the plume is not delineated in the overburden and bedrock in this area.

- Third Street Recovery System: Similar to the objectives of the Elm Park Recovery System, the objectives for this system in the 2000 ROD Amendment are vague. Due to the very high extraction rate, the discussion in the 1991 RI, and a hydraulic capture zone that can be interpreted from measured water levels, the optimization review team believes that this system provides adequate plume capture. Figure 4 in Appendix F indicates that the system has removed approximately 400 lbs of VOC contamination over the past four years. Because the source area upgradient of this system has not been adequately controlled, this system continues to remove a significant amount of contaminant mass. However, given the continuing sources, it is unlikely that this well will restore the aquifer to beneficial use.

In summary, the groundwater remedy is successfully removing substantial contaminant mass, and concentration reductions are apparent as a result of the remedy. Based on data found in Figures 1 and 2 in Appendix F, mass removal rates have been relatively consistent since 2009 (with the exception of 2011), and this consistent mass removal suggests substantial mass remains in the subsurface. Additionally, the remedy is ineffective at controlling the source area, primarily because it does not address bedrock contamination in the source area (See Figure 2: October 2021 Isopleth Map in Appendix C). As a result, although the remedy is designed and operating consistent with the 2000 ROD Amendment, the optimization review team believes that the remedy will be incapable of meeting the cleanup objectives in the 2000 ROD Amendment. EPA and PADEP are in agreement with the optimization study's assessment of the groundwater remedy.

III. PROGRESS SINCE THE PREVIOUS REVIEW

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

Table 4: Protectiveness Determinations/Statements from the 2017 FYR

OU #	Protectiveness Determination	Protectiveness Statement
1	Short-term Protective	The Selected Remedy for the Site is being implemented in accordance with the decision documents and is functioning as designed; however, additional evaluations of the groundwater treatment systems is necessary to determine if optimization or modification of the systems are necessary to meet groundwater cleanup goals throughout the contamination plume. Direct contact with soil and groundwater is not expected to pose unacceptable risks under current conditions, because the facility is currently being used for manufacturing operations, and residents are being provided public water by the Williamsport Municipal Water Authority. Institutional controls are in place limiting the use of the facility and preventing groundwater use in the vicinity of the Site. Since the 2012 FYR, vapor intrusion mitigation systems were installed at three residences and supplemental vapor intrusion sampling indicated that the systems are operational and functioning as designed. AVCO continues to monitor groundwater concentrations and assess the need for additional vapor intrusion sampling. Therefore, the selected remedy is considered protective of human health and the environment in the short-term. For the remedy to be fully protective of human health and the environment, PFAS sampling needs to be conducted, the surface water to groundwater pathway needs to be evaluated, and an evaluation of the groundwater treatment systems needs to be performed.

Table 5: Status of Recommendations from the 2017 FYR

OU #	Issue	Recommendation	Current Status	Current Implementation Status Description	Completion Date (if applicable)
OU1	The groundwater to surface pathway in the vicinity of the Elm Park and Third Street Recovery Systems was not evaluated during the RI or in previous FYRs.	Evaluate the groundwater to the surface water pathway in the vicinity of the Elm Park and Third Street Recovery Systems to confirm that the systems are effective in preventing the discharge of contaminated groundwater to surface water at concentrations that may result in an unacceptable risk.	Under Discussion	EPA is currently in discussion with the PRP on the correct path to address concerns regarding the discharge of contaminated groundwater to the surface water.	TBD
OU1	The groundwater extraction treatment system may not be able to meet groundwater cleanup goals throughout the contamination plume.	Evaluate the groundwater extraction treatment system to determine if optimization or modification of the system is necessary to achieve groundwater cleanup goals throughout the contamination plume.	Completed	An optimization study was completed by HGL on behalf of EPA Region 3. Decision documents, groundwater data, annual O&M reports and RI/FS documents were reviewed to determine whether the current treatment system is running efficiently enough to remain protective and reach groundwater cleanup goals. The review concluded that the remedy was designed and operating consistent with the 2000 ROD Amendment, however the remedy will be incapable of meeting the cleanup objectives in the 2000 ROD Amendment.	April 2022
OU1	PFAS may be present in Site groundwater due to past chrome plating operations at the facility.	Perform groundwater sampling to determine the presence of PFAS at the Site and determine if modifications to the groundwater treatment systems are necessary.	Completed	Sampling for PFAS was completed in the spring of 2018 by the PRP and found all samples of individual PFOS and PFOA compounds or their summation had not exceeded the HAL of 70 ng/L. Because PFAS toxicity factors have recently been updated, EPA will also reevaluate the data from this sampling event to determine if additional sampling is needed at those sampling locations.	April 2018

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Community Involvement and Site Interviews

On June 24, 2022, a public notice was published in the Sun Gazette announcing the commencement of the FYR process for the Site, providing contact information for EPA CIC, Katie Page, and inviting community participation. The FYR Report will be made available to the public at the link immediately below once it has been finalized. www.epa.gov/superfund/avcolycoming

The EPA CIC contacted the Lycoming County Department of Public Safety to conduct an interview with the Lycoming County Emergency Management Coordinator. The Lycoming County Emergency Management Coordinator reported that there are no current issues with the Avco Lycoming Superfund Site that they can report, and that the site is compliant in all of their reporting requirements. The Emergency Management Coordinator also noted that there have not been any complaints, violations, or incidents that their office has had to respond to at the site. The Emergency Management Coordinator feels well-informed about the site and would prefer email communication from EPA if there is any future need to provide updates to the Department of Public Safety. Otherwise, they did not have additional comments, suggestions, or recommendations regarding the site's operation at this time.

Data Review

2017 – 2021 Groundwater Monitoring Assessment:
The primary remaining COCs in the groundwater at the Site are TCE and cis-1,2-DCE and generally define the extent of the groundwater contaminant plume. TCE and cis-1,2-DCE trends for each groundwater recovery system are discussed below.

Memorial Avenue Recovery System
The Memorial Avenue Recovery system consists of 15 extraction wells located near the center of the Memorial Avenue extraction wells, directly downgradient from the facility.

- In 2017 TCE concentrations exceeded the MCL of 5 ug/L in all samples for the Memorial Avenue Extraction wells. Cis-1,2-DCE concentrations exceeded the MCL of 70 ug/L in samples collected from EW-4, EW-6, EW-10, and EW-13.

- In 2018 TCE concentrations exceeded the MCL of 5 ug/L in all samples collected for the Memorial Avenue Extraction wells. Cis-1,2-DCE concentrations exceeded the MCL of 70 ug/L in samples collected from EW-5, EW-6, EW-7, EW-8, EW-9, EW-10, EW-11, EW-12, and EW-13. Concentrations of trans-1,2-DCE were below the laboratory detections limits for all samples collected from the Memorial Avenue Extraction wells. Concentrations of vinyl chloride were below the laboratory detection limits in all samples collected from the Memorial Avenue Extraction wells; however, the laboratory reporting limit for vinyl chloride was greater than the MCL of 2 ug/L in all samples with the exception of EW-2.

- In 2019 TCE concentrations exceeded the MCL of 5 ug/L in all samples collected with the concentrations ranging from 41 ug/L to 3,600 ug/l. Cis-1,2-DCE concentrations exceeded the MCL of 70 ug/l in samples collected from EW-4, EW-5, EW-6, EW-7, EW-8, EW-9, EW-10, EW-11, EW-12 and EW-14. Cis-1,2-DCE was not detected in EW-2, but was detected in the rest of the extraction well samples at concentrations ranging from 15 ug/L to 5,300 ug/L. Trans-1,2-DCE was not detected above laboratory specified detection limits in all samples; however, the laboratory reporting limit was greater than the MCL of 2 ug/L in all samples.

- In 2020, TCE concentrations exceeded the MCL of 5 ug/L in samples collected from each well with concentrations ranging from 30.5 ug/L to 810 ug/L. Cis-1,2-DCE concentrations exceeded the MCL of 70 ug/L in samples collected from EW-4, EW-8, EW-10, EW-11, EW-12, EW-13, EW-14, and EW-15. The cis-1,2-DCE concentrations ranged from 2.35 ug/L to 632 ug/L. Trans-1,2-DCE was detected in samples from EW-4, EW-8, EW-9, EW-10, EW-11, EW-12, EW-13, EW-14, and EW-15; however, detected concentrations remained below the MCL of 100 ug/L with concentrations ranging from 1.23 ug/L to 2.26 ug/L. Trans-1,2-DCE was not detected above the laboratory specified detection limits of 1 ug/L in samples collected from EW-1, EW-2, EW-3, and EW-7. Vinyl chloride was not detected above the laboratory specified detection limit of 1 ug/L in any Memorial Avenue recovery well samples.

- In 2021, TCE concentrations exceeded the MCL of 5 ug/L in samples collected from each extraction well with concentrations ranging from 9.72 ug/L to 958 ug/L. Cis-1,2-DCE concentrations exceeded the MCL of 70 ug/L in samples collected from EW-4, and EW-7 through EW-15. The cis-1,2-DCE detections ranged from 0.6 ug/L to 1,310 ug/L. Trans-1,2-DCE was detected in samples from EW-9, EW-11, EW-12 and EW-15, however, detected concentrations remained below the MCL of 100 ug/L, with detected concentrations ranging from 1.21 ug/L to 4.05 ug/L. Trans-1,2-DCE was not detected above the laboratory specified reporting limit of 1 ug/l in samples collected from EW-1 through EW-8, EW-10, EW-13, and EW-14. Vinyl chloride was detected at concentration of 9.55 ug/l in EW-9, exceeding the MCL of 2 ug/L. Vinyl chloride was not detected above the laboratory specified reporting limit of 1 ug/L in the remaining extraction wells.

East Parking Lot Extraction System

The East Parking Lot Extraction system consists of four groundwater extraction wells (CAEX-1 through CAEX-4).

- In 2017, the East Parking Lot Extraction System recovered 495,008 gallons of groundwater during 2017. The average total VOC concentrations based on sampling conducted at MW-9, was 7,070 ug/L and approximately 29 pounds of VOCs were captured and destroyed in 2017. Of this total, approximately 1% was DCE and approximately 99% was TCE.

- In 2018, the East Parking Lot Extraction System recovered approximately 8,066,453 gallons of groundwater during 2018. The average VOC concentration results based on sampling conducted at MW-9 was 223 ug/L and approximately 15 pounds of VOCs were captured and destroyed in 2018. Of this total, approximately 11.7% was DCE and approximately 88.3% was TCE. Vinyl chloride remained undetected in 2018.

- In 2019 the East Parking Lot Extraction System recovered approximately 8,209,806 gallons of groundwater. Approximately 56 pounds of VOCs were removed in 2019. Of this total approximately 4.5% was DCE and approximately 95.5% was TCE. Vinyl chloride in MW-9 remained undetected in 2019.

- In 2020 the East Parking Lot Extraction System recovered approximately 3,962,688 gallons of groundwater. Approximately 57 pounds of VOCs were removed in 2020 from this system. Of this total, approximately 5.1% was DCE and approximately 94.9% was TCE. Vinyl chloride in MW-9 remained undetected in 2020.

- In 2021 the East Parking Lot Extraction System recovered approximately 5,250,955 gallons of groundwater. Approximately 64 pounds of VOCs were removed in 2021 from this system. Of this total approximately 4.4% was DCE and approximately 95.6% was TCE. Vinyl chloride remained undetected in 2021.

Elm Park Extraction System

- In 2017, the Elm Park Extraction System recovered approximately 16,158,280 gallons of groundwater. The total VOC concentration based on sampling conducted at MW-14B and MW-72, was 144 ug/L and approximately 19 pounds of VOCs were captured and destroyed in 2017. Of this total approximately 11% was DCE and approximately 89% was TCE. Vinyl chloride remained undetected in 2017.

- In 2018, the Elm Park Extraction System recovered 18,263,107 gallons of groundwater. The average total VOC concentration based on samples taken from MW-14B and MW-72, was 125 ug/L and approximately 19 lbs of VOCs were captured and destroyed in 2018. Of this total approximately 11% was DCE and approximately 89% was TCE. Vinyl chloride remained undetected in 2018.

- In 2019, the Elm Park Extraction System recovered 15,917,646 gallons of groundwater. The mass of VOCs recovered from MW-14B and MW-72 was approximately 17 pounds of VOCs. Of this total, approximately 14.3% was DCE and approximately 85,7% was TCE. Vinyl chloride in MW-14B and MW-72 remained undetected in 2019.

- In 2020, the Elm Park Extraction System recovered 10,440,709 gallons of groundwater. Approximately 9 pounds of VOCs were recovered and treated in 2020. Of this total, approximately 11.3% was DCE and approximately 88.7% was TCE. Vinyl chloride in MW-14B and MW-72 remained undetected in 2020.

- In 2021, the Elm Park Extraction System recovered 3,483,300 gallons of water. 12 pounds of VOCs were recovered and treated in 2021 from this system. Of this total, approximately 12.3% was cis-1,2-DCE and approximately 87.7% was TCE.

Third Street Extraction System

- In 2017 the Third Street Extraction System recovered approximately 121,784,666 gallons of groundwater. The average VOC concentration, based on samples collected by the WMWA at the extraction well influent was 36 µg/L and the total mass of VOCs destroyed was approximately 37 pounds. Of that total approximately 15% was DCE and the approximately 85% was TCE.

- In 2018, the Third Street Extraction System recovered approximately 335,395,798 gallons of groundwater. The average total VOC concentration, based on samples collected by the WMWA at the extraction well influent was 38 µg/L and the total mass of VOCs destroyed was 107 pounds. Of that total, approximately 14% was DCE and approximately 86% was TCE.

- In 2019, the Third Street Extraction System recovered approximately 332,680,997 gallons during the year. The total mass of VOCs recovered and treated was approximately 104 pounds. Of that total, approximately 13.5% was DCE and approximately 86.5% was TCE.

- In 2020, the Third Street Extraction System recovered and treated approximately 332,680,997 gallons groundwater during the year. Approximately 104 pounds of VOCs was recovered and treated in 2020.

- During 2021, the Third Street Extraction System recovered approximately 350,652,240 gallons of groundwater. The total mass of VOCs recovered and treated was approximately 94 pounds. Of that total, approximately 10.9% was DCE and approximately 89.1% was TCE.

Site Inspection

During the optimization study for the Site, a virtual site inspection was performed by HydroGeoLogic, Inc. (HGL) on March 22, 2022. The Optimization Team met with EPA, PADEP, and the PRP virtually, while using historical and current data from periodic sampling and monitoring of each of the operating remedial systems, the CSM, Institutional Controls, and all Site decision documents to discuss and assess the state of the remedy. The findings from the virtual site visit can be found in the "Systems and Operations" section of this document. An on-site inspection will be scheduled for 2023 to view the scheduled upgrade to the Third Street Remedial System as well as to conduct a general O&M assessment of all the components of the Selected Remedy.

V. TECHNICAL ASSESSMENT

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

The Selected Remedy for the Site is being implemented in accordance with the decision documents and is functioning as designed; however, the current remedy will be incapable of meeting the cleanup objectives in the 2000 ROD Amendment, therefore additional evaluation of bedrock contamination beneath the Facility, additional monitoring locations to determine performance of remedy components throughout the contaminants plume, evaluation of additional clean-up technologies/components in a focused feasibility study and selection of a remedy that will meet the clean-up objectives in an appropriate decision document is essential for meeting the remedy cleanup goals for aquifers both beneath and beyond the Facility boundaries.

Direct contact with soil and groundwater is not expected to pose unacceptable risks under current conditions, because the facility is currently being used for manufacturing operations, most of the facility is covered by asphalt, and residents are being provided public water by the Williamsport Municipal Water Authority.

Institutional controls are in place limiting the use of the facility property and restricting groundwater use in the vicinity of the Site. Since the 2012 FYR, vapor intrusion mitigation systems were installed at three residences and supplemental vapor intrusion sampling indicated that the systems are operational and functioning as designed. AVCO continues to monitor groundwater concentrations and assess the need for additional vapor intrusion sampling.

No active treatment is continuing for metals, and the metals do not meet performance standards. They no longer appear to be declining. Furthermore, the amount of downtime for the wells has been a cause for concern, as the monitoring reports regularly show wells going offline for weeks at a time, although there has been some recent improvement in this situation. As mentioned above, an optimization study has been conducted at the Site to evaluate the remedial action, and it does not appear that the selected remedy as it is currently implemented will meet the RAO of aquifer restoration.

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

Changes in Standards and TBCs
Have the standards identified in the ROD been revised, and does this call into question the protectiveness of the remedy? Do newly promulgated standards call into question the protectiveness of the remedy? Have TBCs used in selecting cleanup levels at the Site changed, and could this affect the protectiveness of the remedy?

The groundwater standards currently in effect were set in the 1996 ROD: cadmium 3 ug/L; chromium 32 ug/L; manganese 50 ug/L; 1,2-DCE 70 ug/L; TCE 5 ug/L; and vinyl chloride 2 ug/L. The 2000 ROD Amendment set the VOC cleanup levels at the same standards as the 1996 ROD. These standards are at or below current federal

MCLs of cadmium 5 ug/L; chromium 100 ug/L; 1,2-DCE 70 ug/L (cis) or 100 ug/L (trans); TCE 5 ug/L; and vinyl chloride 2 ug/L.

Manganese does not have a federal MCL. The 1996 ROD indicates that 50 ug/L was a state MCL, which was derived from a secondary MCL. The secondary MCL is not health-based, and may be difficult to achieve, because it appears to be below background concentrations at this site. In 2008, EPA found that the manganese also did not appear to correlate with the VOC concentrations. In 2006, PADEP adopted the EPA Lifetime Health Advisory Level for manganese of 300 ug/L as the Act 2 MCL. However, even this concentration may be below naturally occurring background in this area. Data are currently being collected to establish site-specific background concentrations for manganese, so that a determination can be made as to whether the remaining manganese is site related. In the meantime, the current manganese goal is protective.

The 2012 ESD modified the cleanup standards to include cumulative risk. After the individual groundwater cleanup standards have been attained, EPA will evaluate data from the monitoring program to develop a trend analysis and risk assessment. The risk assessment will be based on the cumulative human health risk across all applicable exposure routes for all COCs remaining in groundwater using the most up-to-date risk assessment methodology. The groundwater remediation will continue until EPA's risk-based cleanup standards (1E-4 for cancer risk and a Hazard Index less than or equal to 1) are achieved. Therefore, because the final assessment of cleanup will be risk-based, these goals are protective.

Changes in Toxicity and Other Contaminant Characteristics
Have toxicity factors for contaminants of concern at the Site changed in a way that could affect the protectiveness of the remedy? Have other contaminant characteristics changed in a way that could affect the protectiveness of the remedy?

The risk assessment was performed for the original 1991 ROD and has not been updated. Of the chronic toxicity factors listed in Table 8 of the 1991 ROD, there have been significant changes. Some factors increased and others decreased, making it impossible to generalize about whether risks would be higher or lower if recalculated today. Lead is no longer assessed using a reference dose, as it was then, but by using predictive models of blood lead.

Therefore, in assessing the protectiveness of the remedy, three questions can be asked:

Are the current groundwater and soil concentrations protective?

The performance standards in groundwater have not been met yet, and treatment is ongoing. Therefore, the actual concentrations are not expected to represent protective conditions yet. In the meantime, until groundwater performance standards are achieved, groundwater is not being used and is not typically expected to be used for potable purposes. The WMWA uses the groundwater in times of drought. The extracted groundwater is treated by the WMWA and pumped to a surface water reservoir prior to distribution.

The 2012 ESD clarified that institutional controls will limit the facility property to industrial use. For soil, the Site records mention lead and chromium. However, the lead levels reported in the RI do not exceed screening levels in use today (maximum 185 mg/kg). The 2012 five-year review included an assessment of soil that found that residual chromium concentrations in soil might pose a direct-contact concern for future workers, although this relied on conservative assumptions. Risk assessment methodologies and inputs continue to evolve. The soil is currently covered almost completely by asphalt, minimizing any potential exposure. If the asphalt were disturbed or if the land use changed, EPA would have to be consulted and a new assessment could be performed if necessary.

Would any new chemicals that were not previously identified as COCs qualify as COCs by today's standards?

This third question has already been answered with respect to soil, above. With respect to groundwater, the monitoring data had become limited to the COCs identified in the decision documents. As evaluated in 2012, the RI data indicated MCL exceedances not only for those COCs but also for 1,1DCE, antimony, barium, copper, and lead. Additionally, other VOCs, pesticides, and metals would warrant evaluation in a revised risk assessment (i.e., they exceeded screening-level RSLs), but they might or might not be COCs after completion of the risk assessment.

Therefore, AVCO submitted a full-scan analysis of all VOCs, SVOCs, pesticides and metals in 2016. Overall, these data demonstrated that the remedial goals have not yet been met in groundwater. EPA recommended addressing well maintenance issues, (recovery wells not operational; a carbon vessel not in use due to water in the tank; inaccurate flow gauges) but did not identify new COCs as a result of this sampling.

1,4-Dioxane was a contaminant unanticipated at the time of the ROD, that came to EPA's attention later. Subsequent sampling has shown it not to be a COC at this Site, based on data obtained to date.

By the time of the 2017 five-year review, EPA had become aware that perfluorinated substances (PFAS) may be present at sites where chromium plating took place or where such plating wastes were disposed. Therefore, groundwater at the Site was sampled for PFAS in 2018. (The WMWA was also consulted; WMWA data collected in 2014 and 2015 were non-detect for PFAS, although those data were mostly for surface water.)

PFAS were not detected in the upgradient well at the Site but were detected in the wells in the chrome-plating area and were detected at even higher concentrations downgradient. The maximum concentration of PFOA + PFOS was approximately half the drinking water Lifetime Health Advisories at the time (70 ng/L) but exceed revised values issued in 2022. Furthermore, the downgradient extent was not established. It is also not known at this time whether the PFAS concentrations at the Site are increasing, decreasing, or stable. Therefore, EPA recommends further PFAS sampling to answer these questions. In addition, EPA has recently updated the toxicity factors for several PFAS, indicating they are more toxic than previously understood.

In summary, direct contact with soil and groundwater is not expected to pose unacceptable risks under current conditions (i.e., exposure is currently being prevented because 95% of the Site soils are covered with pavement and the WMWA provides drinking water.) If land use were changed, a reassessment of the risk would need to be performed first. Groundwater has not met performance standards and would not be suitable for potable use at this time. When MCL-based performance standards have been met, a risk-based assessment of the cumulative risk will be performed. Further characterization of PFAS is recommended.

Changes in Risk Assessment Methods
Have standardized risk assessment methodologies changed in a way that could affect the protectiveness of the remedy?

There have been significant changes in EPA's risk assessment guidance since the original risk assessment was performed. These include changes in dermal guidance, inhalation methodologies, exposure factors, and the evaluation of mutagenic carcinogens. However, these will be addressed at the time of the final risk assessment, when cleanup is confirmed.

Changes in Exposure Pathways
Has land use or expected land use on or near the Site changed?

Local land use still remains a mixture of residential and industrial. Over the years, additional residential units have been built in the vicinity of the AVCO facility.

Have human health or ecological routes of exposure or receptors been newly identified or changed in a way that could affect the protectiveness of the remedy? Are there newly identified contaminants or contaminant sources? Have physical Site conditions or the understanding of these conditions changed in a way that could affect the protectiveness of the remedy?

At the time the Site was identified and evaluated for a remedy, the major pathway of concern was potable use of the local groundwater. All residents within three miles of the Site are on municipal water. The City of Williamsport requires connection to the public water system in the area that has groundwater contamination from the Site.

The WMWA maintains a backup water supply well field about 3000 feet south of the facility. Periodic monitoring and/or review of the water authority sampling are conducted to confirm that the contaminant plume does not adversely affect these wells.

Vapor intrusion is a newer route of concern for the Site. In 2014, EPA issued an Addendum to the 2012 Five-Year Review to document that vapor mitigation systems were installed on two homes where vapor intrusion conditions indicated a potential future unacceptable risk. AVCO also installed a system as a preventive measure on another nearby home where access had not been granted for sampling. AVCO has installed separate electrical supplies for some of the systems at the property owners' requests, and the systems are monitored regularly for vacuum. Therefore, conditions at these homes are expected to be protective for both current and future exposures.

By the 2017 five-year review, EPA had reviewed information about newly constructed residences in the neighborhood and concluded that based on groundwater data, the location of the apartments and a new house in relation to a residence where vapor intrusion has been mitigated, VI was not then a concern at those locations.

Air emissions from the air strippers were evaluated in 2008 and found to be acceptable. In subsequent five-year reviews, EPA has revisited this question with updated data, and has continued to find the risks in the acceptable range.

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

No other information has come to light that could call into question the protectiveness of the remedy.

VI. ISSUES/RECOMMENDATIONS

Issues/Recommendations
OU(s) without Issues/Recommendations Identified in the FYR:
None

Issues and Recommendations Identified in the Five-Year Review:					
OU: 01	**Issue Category:** Remedy Performance				
	Issue: The April 2022 Optimization Study has concluded that the remedy is ineffective at controlling the source area contamination and therefore cannot meet the Remedial Action Objectives selected in the 2000 ROD Amendment.				
	Recommendation: Prepare a Work Plan to implement the recommendations included in the April 2022 Optimization Report to address the following: Bedrock contamination beneath the facility, improved monitoring of the Facility and pump and treat systems, delineation of contamination to the southwest of the facility, the characterization of the remaining source area in the West Parking Lot and improve contamination concentrations maps by incorporating knowledge of the CSM.				
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**	
No	Yes	PRP	EPA	8/15/2023	

Issues and Recommendations Identified in the Five-Year Review:				
OU: 01	**Issue Category:** Remedy Performance			
	Issue: The April 2022 Optimization Study has concluded that the remedy is ineffective at controlling the source area contamination and therefore cannot meet the Remedial Action Objectives selected in the 2000 ROD Amendment.			
	Recommendation: Following implementation of the recommendations of the April 2022 optimization report evaluate additional clean-up technologies/components in a focused feasibility study and select a remedy that will meet the clean-up objectives in an appropriate decision document.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**
No	**Yes**	**PRP**	**EPA/State**	**8/15/2023**

Issues and Recommendations Identified in the Five-Year Review:					
OU: 01	**Issue Category:** Remedy Performance				
	Issue: Cadmium and chromium concentrations in groundwater continue to remain above cleanup goals in the West Parking Lot wells for over 20 years since remediation occurred				
	Recommendation: Revisit historical metals characterization and remediation data, conduct additional sampling for chromium and cadmium, and develop a workplan to address the chromium and cadmium exceedances of performance standards				
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**	
No	Yes	PRP	EPA	8/15/2023	

Issues and Recommendations Identified in the Five-Year Review:					
OU: 01	**Issue Category:** Monitoring				
	Issue: The groundwater to surface water pathway in the vicinity of the Elm Park and Third Street Recovery Systems was not evaluated during the RI or in previous FYRs				
	Recommendation: Evaluate the groundwater to surface pathway in the vicinity of the Elm Park and Third Street Recovery Systems to confirm that the systems are effective in preventing the discharge of contaminate groundwater to surface water at concentrations that may result in an unacceptable risk.				
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**	
No	Yes	PRP	EPA	8/15/2023	

Issues and Recommendations Identified in the Five-Year Review:					
OU: 01	**Issue Category:** Monitoring				
	Issue: The downgradient extent of PFAS was not established during the 2018 PFAS sampling event. It is also not known at this time whether the PFAS concentrations at AVCO are increasing, decreasing, or stable.				
	Recommendation: Establish downgradient extent of PFAS at the Site by submitting a sampling plan that addresses downgradient wells.				
Affect Current Protectiveness	**Affect Future Protectiveness**	**Party Responsible**	**Oversight Party**	**Milestone Date**	
No	Yes	PRP	EPA	9/10/2023	

OTHER FINDINGS

AVCO Lycoming Site Remedy Climate Resilience:

As a part of the April 2022 Optimization Study conducted at the Site a climate screening was performed in order to evaluate potential changes in climate that might impact the remedy in the future. Four climate factors were assessed: temperature and precipitation changes, flood risks, and wildfire potential. The Pennsylvania Department of Environmental Protection released the fifth iteration of the Pennsylvania Climate Impacts Assessment in May 2021 (PADEP, 2021). This report uses downscaled global climate models to project changes in Pennsylvania's climate. Additionally, the EPA factsheet What Climate Change Means for Pennsylvania (EPA, 2016) summarizes projected changes to the state's climate.

All counties in Pennsylvania are projected to experience warming and increased precipitation over the coming decades. Historically, Lycoming County's average annual temperature was 46.5 degrees Fahrenheit (°F) (1971 to 2000), and the observed average daily maximum temperature in Lycoming County was 57.2°F (1961 to1990).

The Climate Impacts Assessment report projects the average annual temperature for the county to rise to 52.4°F by mid-century (2041 to 2070) and to 55.7°F by the end of the century (2070 to 2099). Anticipated higher temperatures may result in increased ground-level ozone concentrations, causing hazardous conditions to human health on extreme temperature days.

Precipitation from severe rainstorms has increased 70% over the last 60 years, an increasing trend that is anticipated to continue. These heavier precipitation events could exacerbate existing flood hazards along the Susquehanna River and smaller tributaries. Annual precipitation is projected to increase 6.8%, with an additional 2.6 days of baseline "very heavy" precipitation.

The Site currently has a very low threat of wildfire. Although temperatures are projected to increase, the current low threat and projected increase in precipitation indicates the wildfire threat will remain low in the coming decades.

With respect to flooding, a 100-year storm has a minor flood threat, and a 500-year storm has a more significant flood threat causing deeper and more extensive inundation for the Site. Over the next 30 years, the extent of flooding experienced during a 500-year flood event is projected to increase slightly. The Site's flood risk is reduced by levees along nearby waterways. While these flood projections consider this reduction, risks may substantially increase in the event of the levee being overtopped or breached. Based on this screening-level resilience review, potential changes to climate indicators such as temperature, precipitation, dry days, and flood threat are not expected to adversely affect corrective actions at the Site.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: 1	*Protectiveness Determination:* Short-term Protective	*Planned Addendum Completion Date:* Choose an item

Protectiveness Statement:

The Selected Remedy for the Site is being implemented in accordance with the decision documents and is functioning as designed; however, additional evaluation of bedrock contamination beneath the Facility is essential for meeting the remedy cleanup goals for aquifers both beneath and beyond the Facility boundaries.

Direct contact with soil and groundwater is not expected to pose unacceptable risks under current conditions, because the facility is currently being used for manufacturing operations, most of the facility is covered by asphalt, and residents are being provided public water by the Williamsport Municipal Water Authority.

Institutional controls are in place limiting the use of the facility and preventing groundwater use in the vicinity of the Site. Since the 2012 FYR, vapor intrusion mitigation systems were installed at three residences and supplemental vapor intrusion sampling indicated that the systems are operational and functioning as designed.

AVCO continues to monitor groundwater concentrations and assess the need for additional vapor intrusion sampling. Therefore, the selected remedy is considered protective of human health and the environment in the short-term.

However, in order for the remedy to be protective in the long term, the following actions should be taken:

- Submit an Optimization/Remedial Action Work Plan to implement the recommendations included in the April 2022 Optimization to address the following: Bedrock contamination beneath the facility, improved monitoring of the Facility and pump and treat systems, delineation of contamination to the southwest of the, the characterization of the remaining source area in the West Parking Lot and improve contamination concentrations maps by incorporating knowledge of the CSM.
- Following implementation of the recommendations of the April 2022 optimization report evaluate additional clean-up technologies/components in a focused feasibility study and select a remedy that will meet the clean-up objectives in an appropriate decision document.
- Revisit historical metals characterization and remediation data, conduct additional sampling for chromium and cadmium, and develop a workplan to address the chromium and cadmium exceedances of performance standards.
- Evaluate the groundwater to surface pathway in the vicinity of the Elm Park and Third Street Recovery Systems to confirm that the systems are effective in preventing the discharge of contaminate groundwater to surface water at concentrations that may result in an unacceptable risk.
- Establish downgradient extent of PFAS at the Site by submitting a sampling plan that addresses downgradient wells.

VIII. NEXT REVIEW

The next FYR Report for the AVCO Lycoming Superfund Site is required five years from the completion date of this review.

APPENDIX A – REFERENCE LIST

Explanation of Significant Differences, AVCO Lycoming Superfund Site
Prepared by EPA Region 3, March 13, 2012

Record of Decision Amendment, AVCO Lycoming Superfund Site
Prepared by EPA Region 3, April 6, 2000

Record of Decision Amendment, AVCO Lycoming Superfund Site
Prepared by EPA Region3, December 30, 1996

Explanation of Significant Differences, AVCO Lycoming Superfund Site
Prepared by EPA Region 3, April 9, 1992

Record of Decision, AVCO Lycoming Superfund Site
Prepared by EPA Region 3, June 28, 1991

Fourth Five-Year Review, AVCO Lycoming Superfund Site, Williamsport, PA
Prepared by EPA Region 3, September 25, 2017

Addendum to Five-Year Review Report, AVCO Lycoming Superfund Site, Williamsport, PA.
Prepared by EPA Region 3, September 4, 2014

Third Five-Year Review Report, AVCO Lycoming Superfund Site, Williamsport, PA.
Prepared by EPA Region 3, September 26, 2012

Addendum to Five Year Review Report, AVCO Lycoming Superfund Site, Williamsport, PA.
Prepared by EPA Region 3, December 14, 2011

Second Five-Year Review Report, AVCO Lycoming Superfund Site, Williamsport, PA.
Prepared by EPA Region 3, September 24, 2007

First Five-Year Review Report, AVCO Lycoming Superfund Site, Williamsport, PA.
Prepared by EPA Region 3, July 7, 2002

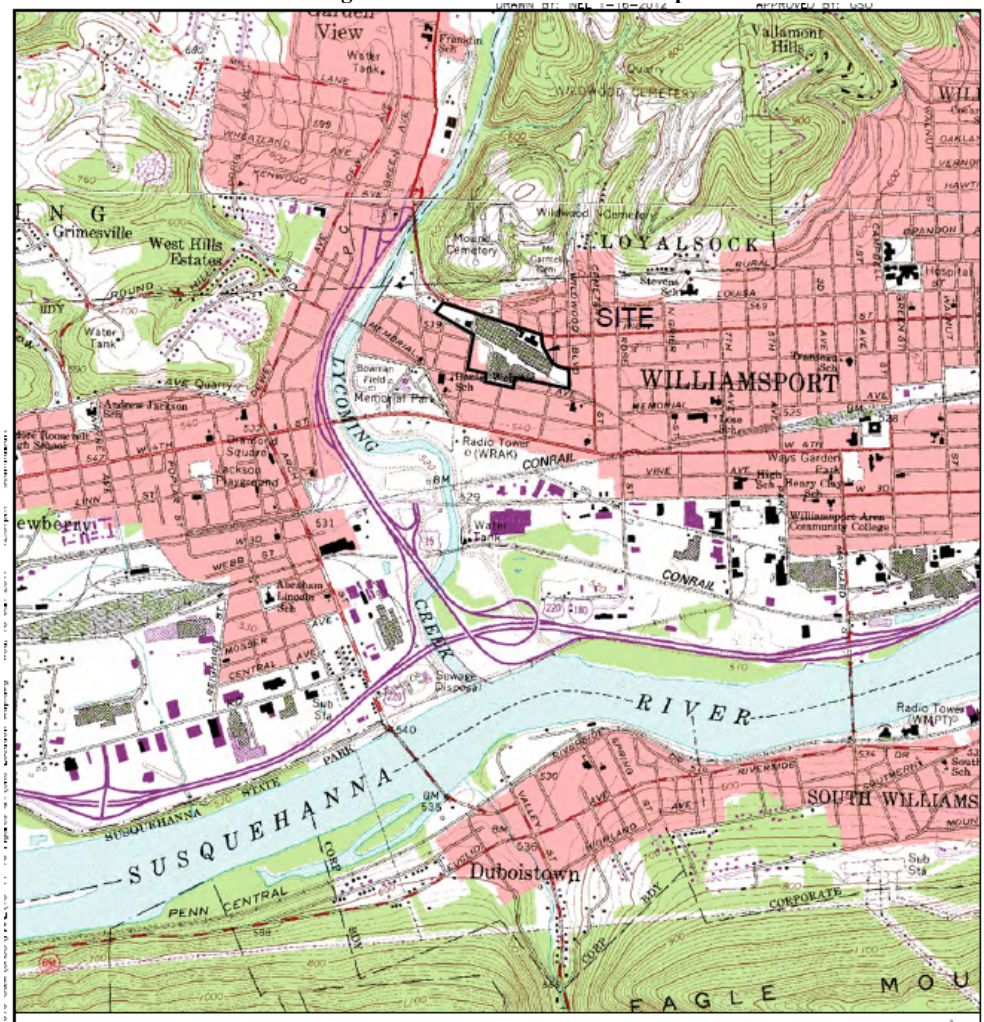
APPENDIX B – SITE CHRONOLOGY

Table B-1: Site Chronology

Event	Date
EPA proposed the Site for listing on the National Priorities List (NPL)	February 2, 1987
EPA began the remedial investigation/feasibility study (RI/FS)	June 27, 1998
EPA listed the Site on the NPL	June 10, 1986
EPA issued the OU1 Record of Decision (ROD)	June 28, 1991
Explanation of Significant Differences (ESD) for OU1	April 9, 1992
Second Feasibility Study	June 20, 1996
Remedial Design (RD) Initiated for Metals Precipitation	September 3, 1996
ROD Signature for OU2	December 30, 1996
RD initiated for Air Sparging/Soil Vapor Extraction	January 9, 1997
RD Completed and RA initiated Metals Precipitation	May 2, 1997
Air Sparging/Soil Vapor Extraction RD Approved	September 24, 1997
Third Feasibility Study initiated	January 30, 1999
ROD Amendment to the 1996 ROD for Groundwater Pump and Treat Facility	April 6, 2000
RD Initiated for groundwater Pump and Treat Facility	May 11, 2000
RD Completed and RA initiated for Groundwater Pump and Treat Facilities	October 18, 2000
EPA approves termination of in-situ Metals Precipitation System with 12 quarters of post-termination monitoring	September 6, 2000
Groundwater Pump and Treat System activated	August 15, 2001
Source Area Remediation Technology Evaluation Field and Laboratory Pilot Test Work Plan approved	September 26, 2001
Source Area Remediation Technology Evaluation Field and Laboratory Pilot Test initiated.	October 29, 2001
First Five-Year Review Report issued	July 24, 2002
Preliminary Closeout Report Issued	September 27, 2002
Second Five-Year Review Report issued	September 24, 2007
Five-Year Review Addendum	December 2011
ESD for 1991 and 1996 RODs	March 13, 2012
Second Vapor Intrusion Evaluation Report - Draft	January 2012
Third Five-Year Review issued	September 26, 2012
Five Year Addendum dated 9/26/2012	September 4, 2014
Environmental Covenant Signed	August 17, 2017
Fourth Five-Year Review issued	September 25, 2017

APPENDIX C – SITE MAPS

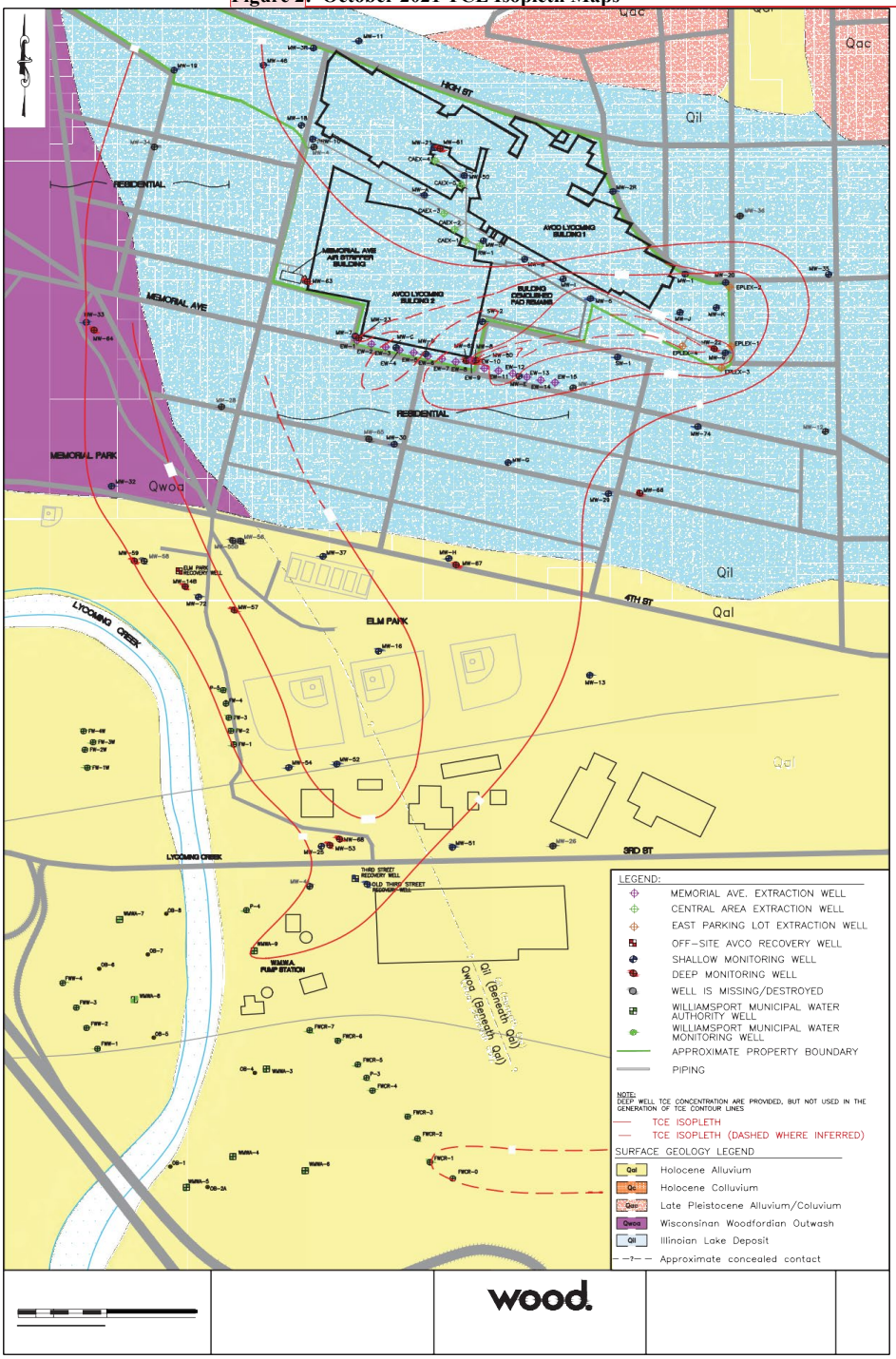
Figure 1: AVCO Site Location Map



AVCO-LYCOMING ENGINES FACILITY WILLIAMSPORT, PENNSYLVANIA Project No.: 3482210762	Environment and Infrastructure, Inc. 437 Grant Street Suite 918 Pittsburgh, PA 15219 wood.	SITE LOCATION MAP 2021 ANNUAL PROGRESS REPORT Figure: 1	

Figure 2: AVCO Lycoming Superfund Site Aerial Map with Remedial System Locations

Figure 2: October 2021 TCE Isopleth Maps



Commented [VEA1]: Two Figure 2s?

Figure 3: Memorial Avenue Extraction System

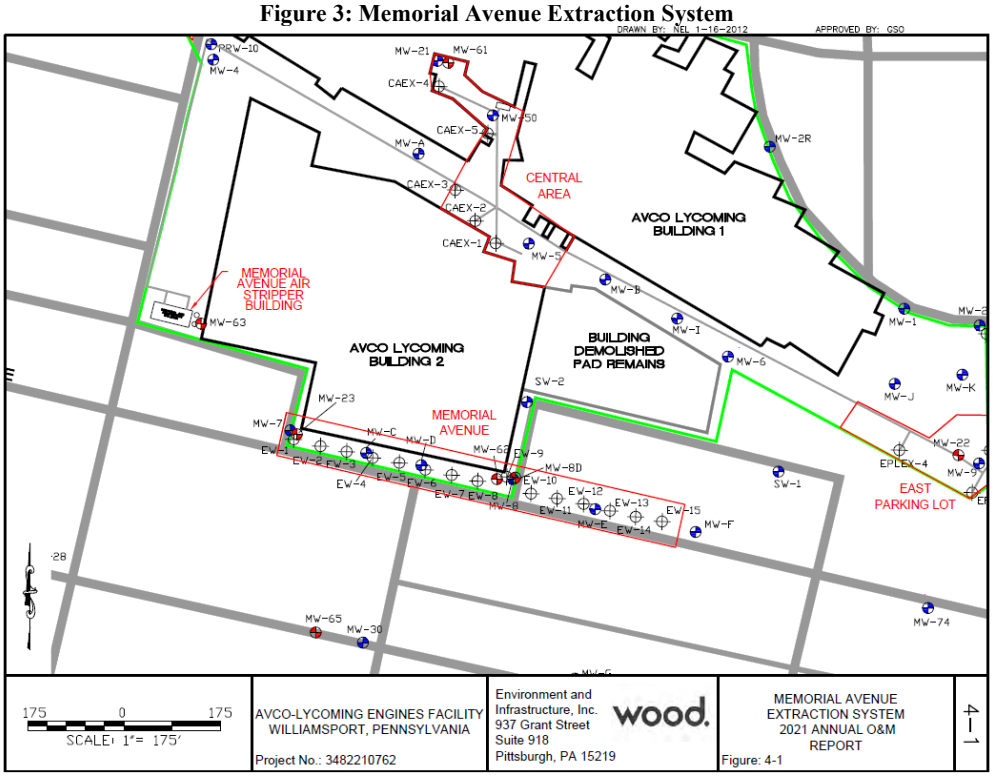


Figure 4: Central Area Recovery System

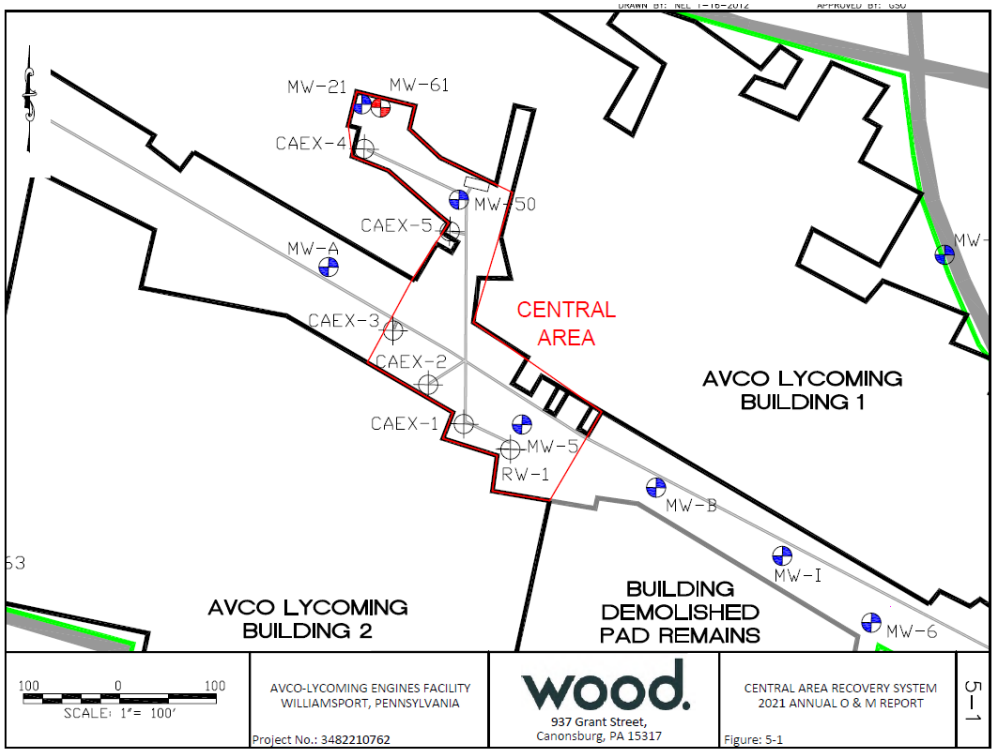


Figure 5: East Parking Lot Recovery System:

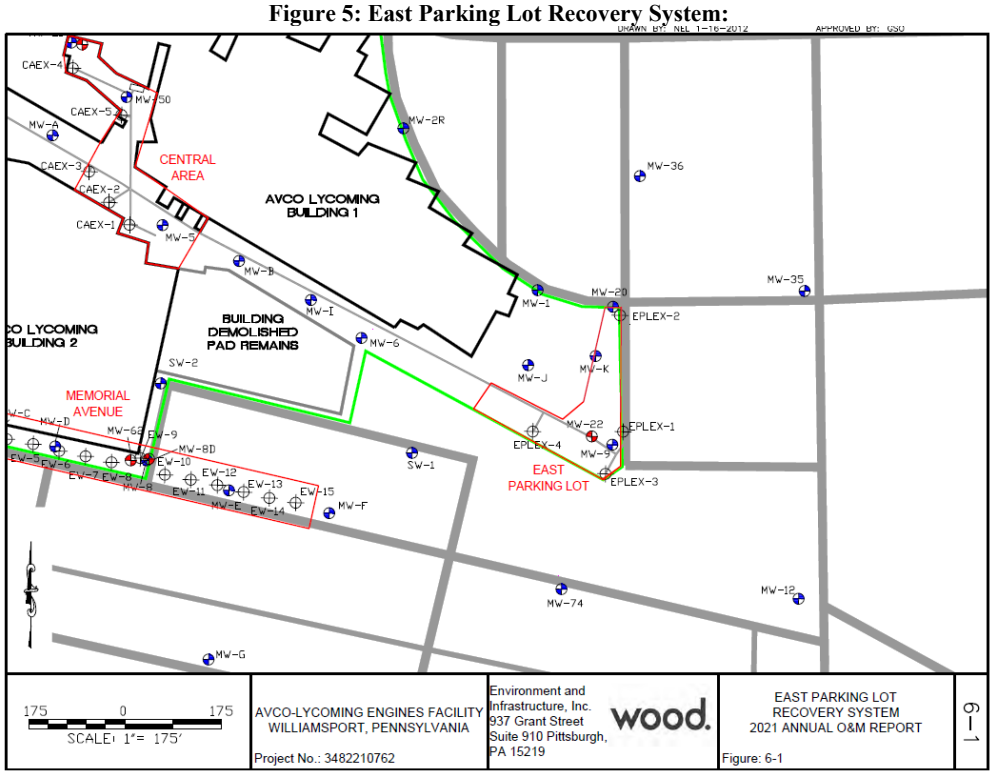
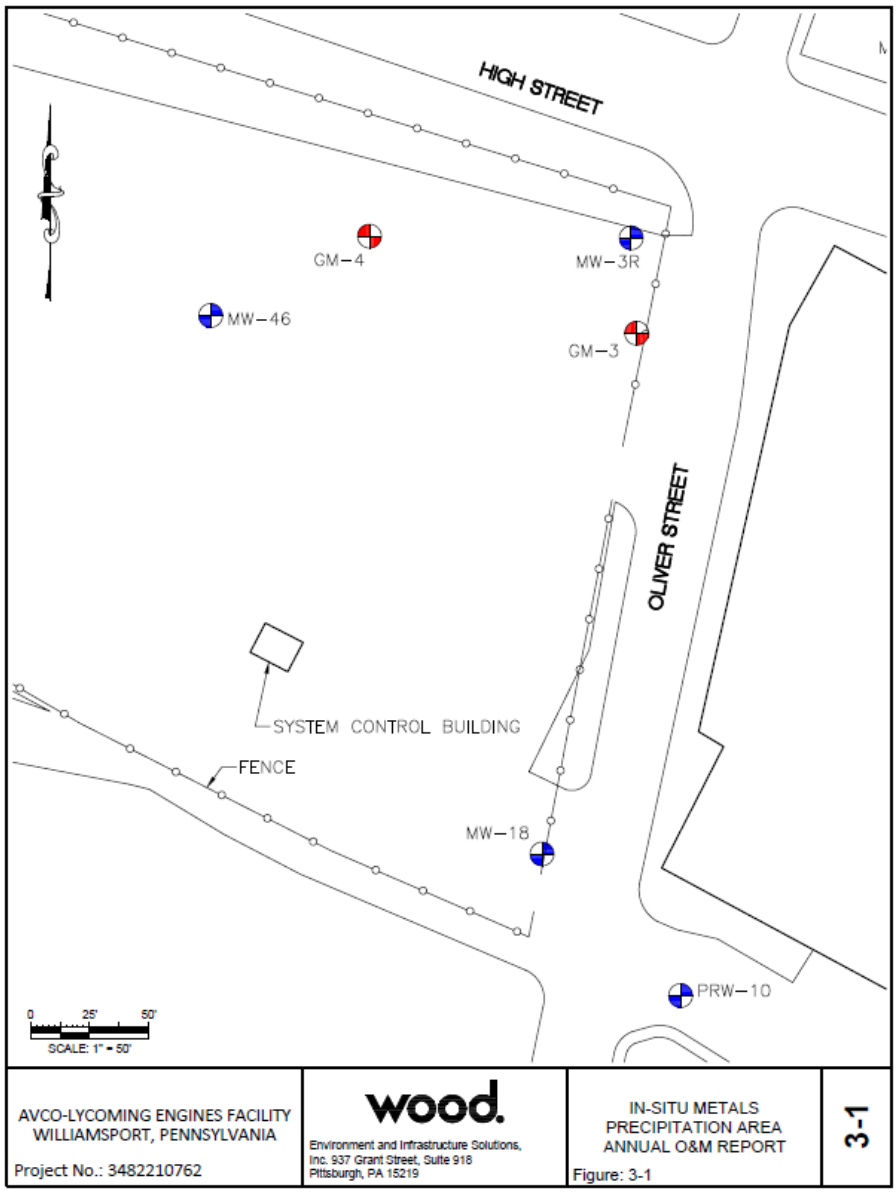


Figure 6: In-Situ Metals Precipitation Area



APPENDIX D – PUBLIC NOTICE

Published in Williamsport Sun-Gazette, Friday, June 24, 2022

EPA PUBLIC NOTICE

EPA REVIEWS CLEANUP
AVCO LYCOMING SUPERFUND SITE

The U.S. Environmental Protection Agency (EPA) is reviewing the cleanup that was conducted at the AVCO Lycoming Superfund Site located in Williamsport, Pennsylvania. EPA conducts Five-Year Reviews to ensure that cleanups continue to protect public health and the environment. EPA conducted the previous Five-Year Review in 2017 and concluded that the remedy was working as designed. EPA will make the findings from this Five-Year Review available in September 2022.

To access site information, including the Five-Year Review, visit:
www.epa.gov/superfund/avcolycoming

For questions or to provide site-related information for the review, contact:
Katie Page, EPA Community Involvement Coordinator
215-814-2409 or page.katherine@epa.gov

APPENDIX E – GROUNDWATER MONITORING DATA

4TH Quarter 2017 Monitoring Results

LOCATION	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L)	Trichloroethene (µg/L)	Vinyl Chloride (µg/L)
MSC[1]	70	100	5	2
MW-2R	<1[2]	<1	**11**	<1
MW-3R	**510**	19 J[3]	**450**	<25
MW-5	**1700**	<50	**68**	**60**
MW-6	**270**	10	**1600**	**5.7**
MW-7	3.2	<1	**15** F1[4]	<1
MW-8	**5700**	<250	**5700**	<250
MW-8D	**430**	<25	**790**	<25
MW-9	<250	<250	**6700**	<250
MW-13	1.7	2.3	3.1	<1
MW-14B	20	<1	**140**	<1
MW-18	**620**	<50	<50	<50
MW-19	<50	<50	**170**	<50
MW-20	**760**	<50	**620**	<50
MW-23	4.7 F1	<1	**35** F1	<1
MW-25	43	<1	**140**	<1
MW-29	<1	<1	4.1	<1
MW-30	18	<1	**47**	<1
MW-32	9.8	<1	**96**	<1
MW-35	0.71 J	<1	**9.0**	<1
MW-52	17	<1	**110**	<1
MW-53	0.73 J	<1	**6.9**	<1
MW-72	25	<1	**190**	<1
SW-1	**110**	<25	**440**	<25

Notes:

BOLD indicates concentration greater than the MSC

1 - Medium Specific Concentration

2 - "<" indicates concentration below detection limit

3 - "J" indicates estimated result

4 - "F1" indicates MS and/or MSD Recovery is outside acceptable limits

4th Quarter 2018 Monitoring Results

LOCATION	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L)	Trichloroethene (µg/L)	Vinyl Chloride (µg/L)
MSC[1]	**70**	**100**	**5**	**2**
MW-2R	<1[(2)]	<1	<1	<1
MW-3R	5.4	<1	**25**	<1
MW-5	**1200**	<100	<100	<100
MW-6	**280**	<100	**1900**	<100
MW-7	2.5	<1	**36** F1[(3)]	<1
MW-8	**3300**	<5	**3900**	<5
MW-8D	**680**	1.8	**900**	<1
MW-9	17	<5	**92**	<5
MW-13	<1	<1	2.7	<1
MW-14B	16	<10	**96**	<10
MW-18	**660**	<50	<50	<50
MW-19	<10	<10	**110**	<10
MW-20	**87**	<25	**330**	<25
MW-23	2.2	<1	**33** F1	<1
MW-25	<1	<1	1.7	<1
MW-29	<1	<1	1.5	<1
MW-30	7.2	<1	**41**	<1
MW-32	7.2	<5	**79**	<5
MW-35	<1	<1	1.7	<1
MW-52	53	<25	**320**	<25
MW-53	<1	<1	<1	<1
MW-57	<1	<1	<1	<1
MW-72	12	<10	**110**	<10
SW-1	68	2.1	**290**	<1

Notes:

BOLD indicates concentration greater than the MSC

1 - Medium Specific Concentration

2 - "<" indicates concentration below detection limit

3 - "F1" indicates MS and/or MSD Recovery is outside acceptable limits

4th Quarter 2019 Monitoring Results

LOCATION	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L)	Trichloroethene (µg/L)	Vinyl Chloride (µg/L)
MSC[1]	**70**	**100**	**5**	**2**
MW-2R	<1[(2)]	<1	<1	<1 ^c[(3)]
MW-3R	12.0	<1	<1	**2.1**
MW-5	**860**	1.5	**13**	**42** ^c
MW-6	**200**	5.7	**1000**	<1 ^c
MW-7	0.76 J[(4)]	<1	**11** F1[(5)]	<1
MW-8	**2200**	<50	**1600**	<50
MW-8D	**710**	1.7	**930**	<1
MW-9	**88**	<5	**2000** H[(6)]	<5
MW-13	0.78 J	1.2	1.8	<1 ^c
MW-14B	34	<1	**160** F1, F2 [(7)]	<1 ^c
MW-18	**670** F1	2.8	1	**17**
MW-19	<10	<10	**110**	<10
MW-20	**77** H[(7)]	<25 H	**240** H	<25 H
MW-23	2.1	<1	**40**	<1
MW-25	2.7	<1	**17**	<1
MW-29	<1	<1	1.8	<1
MW-30	13	<1	**50**	<1
MW-32	6.5	<5	**78**	<5
MW-35	0.71 J	<1	**5.3**	<1 ^c
MW-52	56	<50	**380**	<50
MW-53	<1	<1	<1	<1 ^c
MW-57	<1	<1	<1	<1 ^c
MW-72	13	<10	**140**	<10
SW-1	**88**	<25	**290**	<25

Notes:

BOLD indicates concentration greater than the MSC

1 - Medium Specific Concentration

2 - "<" indicates concentration below detection limit

3- "^c" CCV Recovery is outside acceptable limits

4- "J" Result is less than the RL but greater than or equal to the MDL and the concentation value is an approximate value

5- "F1" indicates MS and/or MSD Recovery is outside acceptable limits

6- "H" Sample was prepped or analyzed behond the specified holding time

7- "F2" MS/MSD RPD exeeds control limits

4th Quarter 2020 Monitoring Results

LOCATION	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L)	Trichloroethene (µg/L)	Vinyl Chloride (µg/L)
MSC[1]	**70**	**100**	**5**	**2**
MW-2R	<[2]1	<1	<1	<1
MW-3R	1.65	<1	1.64	<1
MW-5	**640** R[3]	<5	**11**	**92.2**
MW-6	**228**	5.1	**811** R	<5
MW-7	1.58	<1	**16.6**	<1
MW-8	<1	4.28	**870** Q[4]	**11.6**
MW-8D	**504** I[5]	1.49 I	**504**	<1 I
MW-9	**82.2**	<5	**1410** R	<5
MW-13	<1	<1	3.18	<1
MW-14B	2.96	<1	**32**	<1
MW-18	**895** Q	3.94	3.36	**23.6**
MW-19	9.07 K[6]	<1	**71.4** Q	<1
MW-20	62.1	<5	**146**	<5
MW-23	9.13	<1	**72.2**	<1
MW-25	9.16	<1	**48.1**	<1
MW-29	<1	<1	2.7	<1
MW-30	9.5	<1	**36.3**	<1
MW-32	4.34	<1	**47.8**	<1
MW-35	<5	<5	**10.5** K	<5
MW-52	35.1	<1	**259**	<1
MW-53	<5	<5	<5	<5
MW-57	<1	<1	<1	<1
MW-72	16.9	<1	**210** R	<1
SW-1	**94.9** H[7]	1.69	**133** Q	<1

Notes:

BOLD indicates concentration greater than the MSC

1 - Medium Specific Concentration

2 - "<" indicates concentration below detection limit

3- "R" The result was above the calibration range for the noted analyte; therefore, it is an estimated value

4- "Q" Sample was analyzed at a dilution. Reporting limits were adjusted accordingly.

5- "I" The spike recovery was below the acceptance range for the Matrix Spike (MS) and/or Matrix Spike Duplicate(MSD) sample analyzed with the preparation batch.

6- "K" the RPD result exceededthe quality control limits for the duplicate. Laboratory Control Sample Duplicate (LCSD), or Matrix Spike Duplicate (MSD) sample analyzed with the perparation batch.

7- "H" The spike recovery was above the acceptance range for the Matric Spike (MS) and/or Matrix Spike Duplicate (MSD) sample analyzed with the preparation batch.

4th Quarter 2021

LOCATION	Cis-1,2-Dichloroethene (µg/L)	Trans-1,2-Dichloroethene (µg/L)	Trichloroethene (µg/L)	Vinyl Chloride (µg/L)
MSC[1]	**70**	**100**	**5**	**2**
MW-2R	<[2]1	<1	<1	<1
MW-3R	<1	<1	<1	<1
MW-5	**441** R[3]	<10	<10	**61.6**
MW-6	**186**	<10	**891** R	<10
MW-7	2.16	<1	**29.2**	<1
MW-8	**2480**	<25	**1190** Q[4]	<25
MW-8D	**366** I[5]	<10 I	**490**	<10 I
MW-9	12.6	<10	**67.8** R	<10
MW-13	<1	0.81	4.49	<1
MW-14B	15.2	<5	**113**	<5
MW-18	**431** Q	<10	<10	**11.6**
MW-19	1.42 K[6]	<1	**73.5** Q	<1
MW-20	69.2	<5	**197**	<5
MW-23	4.42	<1	**53.1**	<1
MW-25	<1	<1	**6.32**	<1
MW-29	<1	<1	1.73	<1
MW-30	4.15	<1	**23.8**	<1
MW-32	6.55	<1	**75.1**	<1
MW-35	<1	<1	2.3 K	<1
MW-52	41.8	<5	**157**	<5
MW-53	<1	<1	<1	<1
MW-57	<1	<1	<1	<1
MW-72	9.55	<5	**81.7** R	<5
SW-1	46.6 H[7]	<5	**135** Q	<1

Notes:

BOLD indicates concentration greater than the MSC

1 - Medium Specific Concentration

2 - "<" indicates concentration below detection limit

3- "R" The result was above the calibration range for the noted analyte; therefore, it is an estimated value

4- "Q" Sample was analyzed at a dilution. Reporting limits were adjusted accordingly.

5- "I" The spike recovery was below the acceptance range for the Matrix Spike (MS) and/or Matrix Spike Duplicate(MSD) sample analyzed with the preparation batch.

6- "K" the RPD result exceededthe quality control limits for the duplicate. Laboratory Control Sample Duplicate (LCSD), or Matrix Spike Duplicate (MSD) sample analyzed with the perparation batch.

7- "H" The spike recovery was above the acceptance range for the Matric Spike (MS) and/or Matrix Spike Duplicate (MSD) sample analyzed with the preparation batch.

Shallow well on-site

Bedrock well on-site

Shallow well off-site

Bedrock well off-site

APPENDIX F- 2022 SITE OPTIMIZATION STUDY FIGURES

Figure 1: Cumulative Groundwater and VOC Recovery

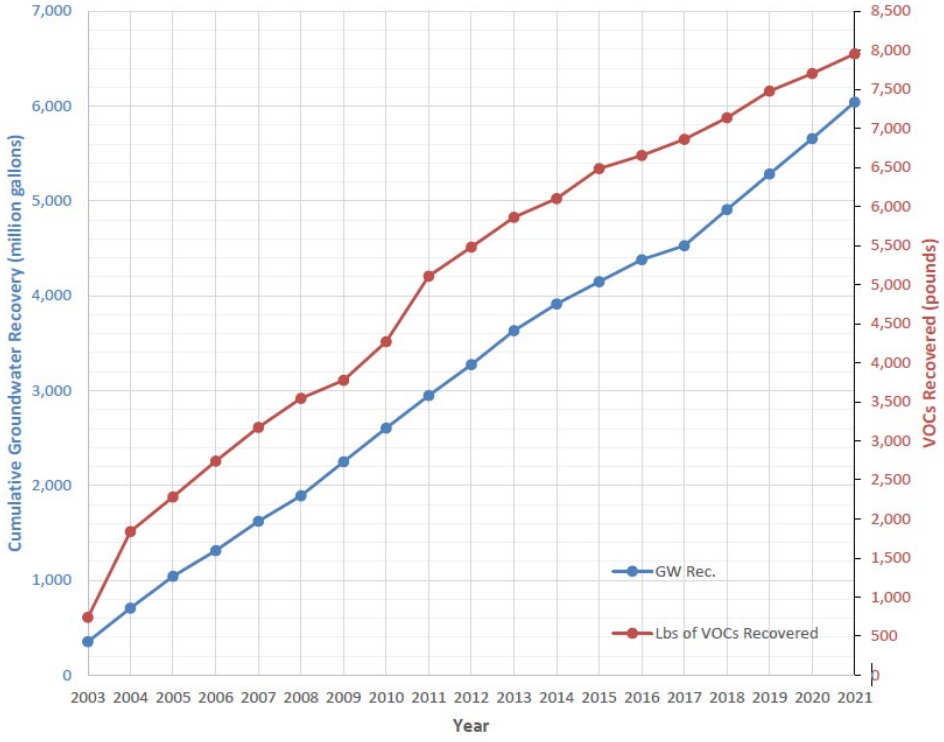


Figure 2: Recovered VOC Mass per year vs Groundwater Recovery

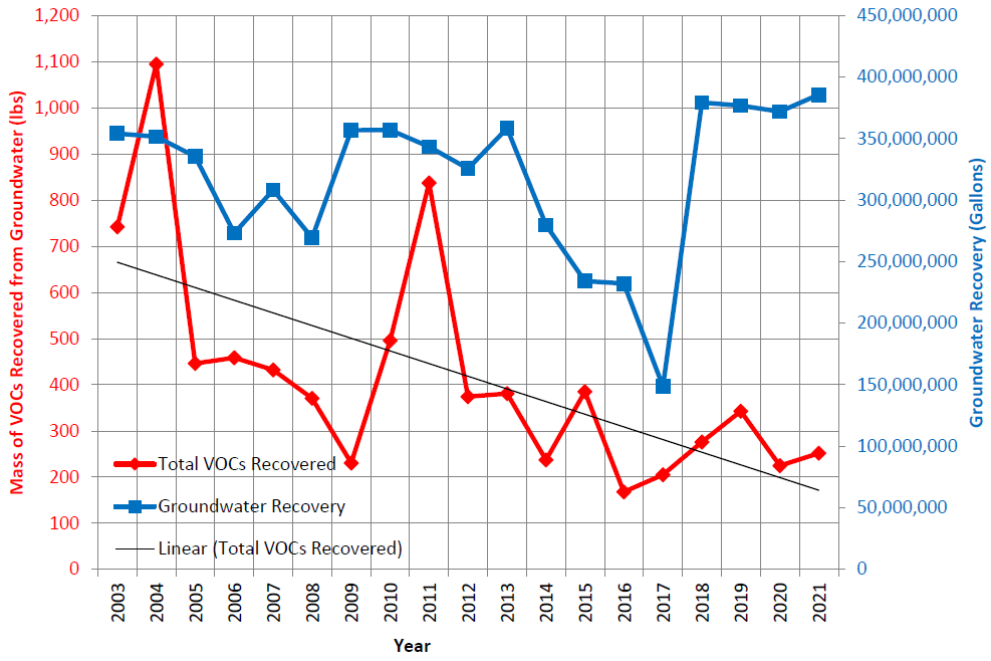


FIGURE 3: Recent Annual Extraction Well Offline Summary

EXTRACTIONWELL	DAYS OFFLINE	PRIMARY REASONS
2021 Offline Summary		
EW-1	29	Damaged wire caused an electrical short and pump failure.
EW-2	153	Pump appears to be turning on, but the system is sensing no flow and shuts the pump off.
EW-6	99	Motor and wiring issue.
EW-8	44	Damaged wire causing an electrical short.
EW-9	94	Regular on/off cycles. Cause is build-up of fouling or "slime" on the pump.
EW-11	24	No downtime reason was noted by maintenance personnel (18 days) and system went into alarm due to potential short (6 days).
EW-13	29	No downtime reason was noted by maintenance personnel (4 days) and system went into alarm due to potential short (25 days).
EPLEX-1	21	Flow switch failure (13 days) and well did not reset after power outage (8 days).
EPLEX-3	21	Flow switch failure (13 days) and well did not reset after power outage (8 days).
2020 Offline Summary		
EW-6	192	Electrical wiring issues.
EW-7	91	Well was overloaded (9 days), electrical short caused by damaged wire (54 days), and flow meter failure (28 days).
EW-9	49	Electrical issues (43 days) and well ceased pumping and needed to be reset (6 days).
EW-10	106	Faulty well pump and motor.
EW-11	119	Electrical overload issues (31 days) and pump was in fault mode due to a loose motor component (88 days).
EW-12	105	Electrical wiring issues.
EW-15	138	Water intrusion into electrical components (18 days) and electrical short caused by damaged wire (120 days).
2019 Offline Summary		
EW-3	3	Electrical issues with the pump.
EW-8	40	Faulty switch (18 days) and flow sensor override (22 days).
EW-9	34	Biological fouling of pump components and intake screen.
EW-13	18	Faulty switch (18 days) and flow sensor override (unknown offline time).
EW-14	73	Pump and wiring failure (18 days) and flow sensor override (55 days).
EW-15	33	Pump and wiring failure (18 days) and electrical overload (15 days).
2018 Offline Summary		
Entire System	83	Inspection of the tray-stripper indicated that corrosion had compromised the integrity of the unit to the degree that repairs were required, and a decision was necessary regarding the future continued use of the stripper. Repairs were made to the stripper during January and February. Old stripper tray was also replaced over the course of 3 days in June 2018.

Figure 4: Recent Mass Removal and Extraction Rates for Recovery System

RECOVERY SYSTEM	AVERAGE OPERATIONAL FLOW RATE (gpm)	TOTAL RECOVERED GROUNDWATER (gallons)	MASS OF VOCS REMOVED (lbs)
2021			
Memorial Avenue	33.8	17,763,435	84
East Parking Lot	10.0	5,250,955	64
Elm Park	23.1	12,137,525	12
Third Street	691.8	350,652,240	94
2020			
Memorial Avenue	27.3	14,401,208	67
East Parking Lot	8.1	3,962,688	57
Elm Park	21.5	10,440,709	9
Third Street	702.9	343,110,735	92
2019			
Memorial Avenue	38.4	20,066,491	166
East Parking Lot	15.7	8,209,806	56
Elm Park	30.4	15,917,646	17
Third Street	700.1	332,680,997	104
2018			
Memorial Avenue	--	17,528,870	135
East Parking Lot	--	8,066,453	15
Elm Park	--	18,263,107	19
Third Street	--	335,395,798	107

Figure 5: Recommended Monitoring Well and Extraction Well Locations