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INTERIM ACTION PROPOSED PLAN CHARLEVOIX MUNICIPAL WELL SITE CITY OF CHARLEVOIX, MICHIGAN EPA SITE ID NO. MID980794390

PREPARED BY:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION 5



NOVEMBER 2019

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ACRYONYMS, ABBREVIATIONS, AND UNITS OF MEASURE

ARAR	Applicable or Relevant and Appropriate Requirement
AS	Air Sparging
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Constituent of Concern
COPC	Constituent of Potential Concern
EGLE	Michigan Department of Environment, Great Lakes and Energy
FFS	Focused Feasibility Study
EPA	United States Environmental Protection Agency
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HI	Hazard Index
ICs	Institutional Controls
ISCO	In-Situ Chemical Oxidation
MCL	Maximum Contaminant Level
MDEQ	Michigan Department of Environmental Quality
MDNR	Michigan Department of Natural Resources
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPDES	National Pollutant Discharge Elimination System
O&M	Operation & Maintenance
OU	Operable Unit
PCE	Tetrachloroethene
ppb	Parts per billion
PRG	Preliminary Remediation Goal
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	Record of Decision
SLERA	Screening Level Ecological Risk Assessment
SSC	Superfund State Contract
SVE	Soil Vapor Extraction
TAT	Technical Assistance Team
TBC	To-Be-Considered
TCE	Trichloroethene
µg/kg	Micrograms per kilogram
μg/L	Micrograms per liter
$\mu g/m^3$	Micrograms per cubic meter
USACE	United States Army Corps of Engineers
VI	Vapor Intrusion
VOCs	Volatile Organic Compounds

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A. INTRODUCTION

The United States Environmental Protection Agency (EPA) is issuing this interim action Proposed Plan as part of its public participation requirements under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, and Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The objective of this interim action Proposed Plan is to present EPA's Preferred Alternative for interim remedial action at Operable Unit 2 (OU2) of the Charlevoix Municipal Well Site ("Site") in the City of Charlevoix, Charlevoix County, Michigan. EPA's Preferred Alternative is intended to address unacceptable risks to human health and the environment.

This interim action Proposed Plan summarizes information gathered during the Remedial Investigation (RI) (EPA 2019a) of Site-wide groundwater, soil, and soil vapor and preparation of the interim action Focused Feasibility Study (FFS) (EPA 2019b) for the Site. Contaminated soil, soil vapor, and groundwater plumes are known to exist at the Site. The soil and groundwater are contaminated with chlorinated volatile organic compounds (VOCs), primarily tetrachloroethene (PCE) and trichloroethene (TCE), and to a much lesser extent, cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride, breakdown products of PCE and TCE. These contaminants can affect human health through vapor intrusion (VI) when contaminants volatilize from soil and/or groundwater, move upward through the subsurface, and enter residences and other structures.

EPA's Preferred Alternative for OU2 – Alternative 6 – addresses groundwater, soil, and soil gas contamination and vapor intrusion through soil excavation, groundwater chemical treatment, air sparging (AS)/soil vapor extraction (SVE), institutional controls (ICs), and vapor mitigation. The capital cost is \$11,359,000. The annual Operation & Maintenance (O&M) cost is \$298,886. The present value of the total cost is \$15,447,000. The estimated timeframe for construction completion of the remedial action components is 3 years and the timeframe to remedial completion is 35 years.

This document is issued by EPA, the lead agency for remedial Site activities. The Michigan Department of Environment, Great Lakes, and Energy (EGLE), formerly referred to as the Michigan Department of Environmental Quality (MDEQ) and Michigan Department of Natural Resources (MDNR), is the support agency. EPA and EGLE are soliciting community involvement in the selection of the remedial action and invite the public to comment on all alternatives presented in the FFS and summarized in this interim action proposed plan. EPA, in consultation with EGLE, will select a remedial action for OU2 after considering relevant comments submitted during a public comment period. The public comment period runs for thirty (30) days from November 18, 2019 to December 18, 2019. Please review and comment on this interim action Proposed Plan. EPA also encourages community members to attend a public availability session at the Charlevoix Public Library, 220 West Clinton St., Charlevoix, Michigan on Tuesday, December 10, 2019. The public availability session will begin at 5:00 p.m. EPA will accept oral comments during the public availability session and written comments at any time during the public comment period.

EPA will issue its final decision on the selected interim remedial action in a decision document called an interim action Record of Decision (ROD). The public will be notified of the ROD in a local newspaper notice and through EPA's website for the Site: <u>https://cumulis.epa.gov > supercpad > cursites > csitinfo</u>. The ROD will include a responsiveness summary that summarizes EPA's responses to public comments on this interim action Proposed Plan. Based on new information and/or public comments received during the public comment period, the selected interim remedial action for OU2 may differ in some details from the Preferred Alternative presented in this interim action proposed plan.

EPA and EGLE encourage the public to review the documents in the Administrative Record to gain a more comprehensive understanding of the Site and the Superfund activities conducted at the Site to date. Supporting documents for the Site are available at the following locations:

Charlevoix Public Library 220 W. Clinton St. Charlevoix, MI 49720 (231) 547-2651 Monday-Thursday: 10 am to 8 pm Friday-Saturday: 10 am to 5 pm Sunday: 1 pm to 5 pm EPA Region 5 Records Center 77 W. Jackson Blvd. (SRC-7J) Chicago, IL 60604 (312) 886-0900 Mon-Fri: 8 am to 4 pm Call for appointment

B. SITE BACKGROUND

Site Description

The Charlevoix Municipal Well Site is located in the City of Charlevoix (City), Charlevoix County, Michigan, and includes Operable Unit 1 (OU1) and OU2. The Site is bounded by the Pine River Channel, also known as the Round Lake Channel, to the north; Round Lake to the northeast; May Street to the east; Carpenter Street to the south; Sherman Street and Beacon Street to the west; and Lake Michigan to the northwest. The Site location is depicted on Figure 1 in Appendix A.

OU1 (contaminated groundwater) was initially addressed by the EPA in the 1980s when an interim remedy was selected including the installation of a water intake and associated treatment facilities to provide a safe drinking water source from Lake Michigan to the City of Charlevoix. OU2 includes contaminated Site-wide groundwater, soil, and soil vapor that may collectively contribute to vapor intrusion at the Site. A final remedy was selected for OU2 in 1985 including long-term monitoring and institutional restrictions. The most recent five-year review of these remedies determined that the OU1 remedy remained protective while the protectiveness determination for OU2 was deferred pending the completion of vapor intrusion and source investigations. The 2019 RI (EPA 2019a) determined that additional remedial actions are warranted to ensure continued protection of human health and the environment. The 2019 FFS (EPA 2019b) identified and evaluated alternatives to address this finding. This interim action proposed plan summarizes the findings of the RI and FFS and presents EPA's Preferred Alternative for OU2.

History of Contamination and Response Actions at the Charlevoix Municipal Well Site In September 1981, while conducting tests for chemicals in the City's chlorinated water supply, Michigan Department of Public Health detected TCE in concentrations ranging from 13 to 30 parts per billion (ppb). A new monitoring program continued to detect gradually rising levels of TCE in the raw water. In December 1982, concentrations of TCE exceeded 100 ppb. At that point, the City installed a temporary diffused aeration system in the municipal well to remove some of the VOCs. This aeration system was only partially effective in removing contaminants from the water.

Initial Response

In November 1981, the City drilled four of the six monitoring wells that it would install in its effort to identify the source and extent of TCE contamination in the aquifer. The City placed the four wells around the City's pump house in hopes of intercepting the TCE contamination and establishing its direction of approach. Sampling results from these monitoring wells verified that the source of the contamination in the municipal well was groundwater rather than surface water. EPA's Technical Assistance Team (TAT) conducted a hydrogeological study in June and July 1982. The TAT installed nine additional groundwater monitoring wells near the municipal well. Although sampling of the test wells found varying amounts of TCE, the source of contamination could not be located. The TAT also identified PCE in a number of the monitoring wells. In 1982 and 1983, MDNR (predecessor to MDEQ and EGLE) sampled soils to locate the source of contamination.

Interim Remedy (OU1)

On June 12, 1984, EPA issued a ROD for an interim action for a new water supply to replace the contaminated municipal well. The 1984 ROD stated that the objective of the interim action was to provide a safe drinking water supply to meet the City's needs, until EPA implemented final remedial measures. The selected interim action included the following two components:

- Construction of a lake water intake line and a two million gallons per day direct filtration water treatment plant to provide a clean water supply; and
- Future O&M activities to ensure the continued effectiveness of the interim remedy.

EPA estimated the capital cost for the interim remedy to be \$1,954,000, with annual O&M costs of \$118,000. The State of Michigan agreed with the interim remedy selected in the 1984 ROD.

Final Remedy (OU2)

After completing an RI and Feasibility Study (FS) at the Site in 1985, EPA issued a second ROD on September 30, 1985. The 1985 ROD selected a remedy for the groundwater contamination. The 1985 ROD stated that the "objective of remedial action at the Site was identified as minimizing the potential risk to the public from direct consumption of the contaminated ground water through inadvertent use of private wells by individuals unaware of the hazard." The 1985 ROD further stated that groundwater would return to a "useable state after 50 years." The 1985 ROD clarified that, for groundwater defined as Class 1 under the Ground Water Protection Policy (aquifer of drinking water quality), the maximum contaminant level (MCL) standards promulgated under the Safe Drinking Water Act (SDWA) would be the applicable standard for cleanup.

The 1985 ROD selected a remedy consisting of three distinct elements:

- 1. Allow the contaminant plumes to discharge under natural flow conditions to Lake Michigan.
- 2. Continue long-term monitoring of the plumes during the natural purging period.
- 3. Provide institutional restrictions on the installation of private wells in the contaminated aquifer enforced by local health officials through an existing well permitting program.

The endangerment assessment concluded that the natural discharge of contaminated groundwater to Lake Michigan did not pose unacceptable risks to human health or aquatic life. Based on studies during the RI, the 1985 ROD stated the aquifer would return to a usable state after 50 years and ICs would be required during that 50-year purging period. The 1985 ROD stated that the necessary ICs were already in place, specifically the existing well permitting program in Charlevoix County. The 1985 ROD also stated that "because the source(s) of TCE and PCE contamination are believed to no longer exist, only remedial actions for management of migration of contaminated ground water were evaluated." The 1985 ROD included no capital costs and estimated the O&M costs at \$17,000 per year for the required semi-annual groundwater monitoring and sampling of surface water in Lake Michigan and Round Lake.

The State of Michigan did not immediately concur with the selected final remedy but instead requested EPA to consider a groundwater restoration remedy. The Governor of Michigan sent a letter to the EPA Regional Administrator on December 2, 1985, withholding concurrence and requesting that EPA reconsider the selected remedy. On May 1, 1986, the Governor of Michigan sent a letter to the Administrator of EPA requesting that EPA select an active groundwater remedy. After failing to get EPA to consider groundwater restoration, on December 4, 1986, the Director of the MDNR sent a letter to EPA in which the state decided to "accept the ROD"; although the state did "not find the limited action alternative, as described in the ROD, to be adequate for a final remedy."

The 1985 ROD noted that there were several former or currently operating commercial facilities up-gradient with possible PCE use, including dry cleaners and the Charlevoix airport. The 1985 ROD discussed that the state had identified PCE contamination in soils underlying a former dry cleaner in 1983, but that it appeared unrelated to the larger, Site-wide PCE groundwater plume. The 1985 ROD also stated, "[MDNR] is presently evaluating whether to address PCE contamination from this, and other suspected sources through its state Superfund Program (Act 307)." The 1985 ROD concluded that these potential PCE sources were not sources of the PCE groundwater plume. The TCE and PCE appeared to be two separate plumes that originated from different sources. Even though portions of the PCE plume overlapped with the TCE plume, EPA had not fully defined the sources of contamination during the RI/FS. As EPA noted in the 1993 Close-Out Report, "[T]he results were less conclusive regarding the origin of the PCE contamination but indicated an area up-gradient of the intersection of Hurlbut and State Streets."

On January 30, 1986, the state scored and listed the PCE plume as a state cleanup site known as the Charlevoix Municipal Well Field (PCE) Site on the state's list of contaminated sites. The state conducted an RI and issued a RI report dated August 1989. The Charlevoix Municipal Well

Field (PCE) Site includes three adjacent source areas: PCE sources at 204 W. Lincoln and 207 W. Garfield, and a petroleum source at 206 W. Lincoln. The PCE sources identified by the state are immediately up-gradient of the PCE plume area identified in the 1985 ROD. Based on current data, the PCE releases at 204 W. Lincoln and 207 W. Garfield are clearly contributing sources to the PCE plume identified by EPA's RI. The state conducted interim actions between 1997 and 2003 at these source areas, which consisted of SVE and AS systems. Although these interim actions acted to reduce the levels of contamination, PCE remains in the soil and groundwater.

The state also conducted similar interim actions at Art's Dry Cleaners from 1994 to 1995, and Hooker's Cleaners from 2001 to 2002.

Remedy Implementation

In June 1984, EPA entered into an Interagency Agreement with the U.S. Army Corps of Engineers (USACE) to review the design of the intake structure prepared for the City and to complete the design of the water treatment plant. EPA and the State of Michigan executed a Superfund State Contract (SSC) for the interim remedy for OU1 in June 1984. The SSC provided that the state pays 10% of the interim remedy costs. EPA and the State of Michigan amended the SSC to increase the state's costs based on actual awarded construction contracts.

USACE awarded the construction contract for the water intake structure on September 10, 1984 and the contractor completed the work on November 11, 1985. USACE accepted the work on September 17, 1986. USACE awarded the construction contract for the water treatment plant on August 15, 1985. The City began operating the plant on March 31, 1987. The contractor completed all Site work and punch list work on October 6, 1987. A minor modification (riprap along the shoreline to protect the plant) changed the completion date to October 25, 1988. USACE accepted the work on January 4, 1989. USACE submitted a remedial action report on January 23, 1989. The report signified the successful completion of all construction activities. The final construction cost of the remedial action for OU1 was \$3,105,832.64.

C. SITE CHARACTERISTICS

Physical Characteristics and Land Use

The Site is located in the City of Charlevoix, Charlevoix County, Michigan. The geographic coordinates of the approximate center of the investigation area are 45°18'50.88" north latitude and 85°15'44.22" west longitude (see Figure 1 in Appendix A). For the purpose of this interim action proposed plan, the Site area is bounded approximately by the Pine River Channel, also known as the Round Lake Channel, to the north; Round Lake to the northeast and May Street to the east; Carpenter Street to the south; and Sherman Street and Beacon Street to the west and Lake Michigan to the northwest (see Figure 2 in Appendix A).

The Site is located in a small tourist community on the shore of Lake Michigan in northwest Michigan. The City's permanent population of 2,500 swells to about 10,000 people during the summer tourist season, with more than one-half of the community's income derived from tourism. The land use is mostly residential mixed with a few business or commercial properties.

The municipal water source is Lake Michigan. A City ordinance and the health department's groundwater well permitting program restrict potable use of groundwater.

The Site has been divided into four study areas based on impacts from known and potential sources. The boundaries of the four study areas are shown on Figure 2 in Appendix A and are as follows:

- Area A Study Area A is associated with the location of a former dry cleaner (ST-001)¹ (207 W. Garfield Avenue), the former Impac Tool Co. (ST-003) (204 W. Lincoln Avenue), and the former Hoskins Manufacturing (ST-002/005) (208 W. Lincoln Avenue). Area A is bounded by Antrim Street to the north, Bridge Street to the east, Carpenter Street to the south, and Beacon Street and between Sherman Street and Grant Street to the west.
- Area B Study Area B is associated with the location of a former commercial laundry facility and the former Hooker's Dry Cleaners (ST-011) (100 W. Hurlbut Avenue). Area B is bounded by Antrim Street to the north, May Street to the east, Upright Street to the south, and midblock between Grant Street and State Street to the west.
- 3. Area C Study Area C is associated with the location of the former Art's Dry Cleaners (ST-021) (230 Antrim Street). Area C is bounded by Mason Street to the north, midblock between Grant Street and State Street to the east, W. Hurlbut Street to the south, and Sherman Street the west.
- 4. Area D Study Area D is not associated with any identified source at this time. Elevated soil vapor concentrations are centered on a location southwest of the intersection of Park Avenue and State Street. Area D is bounded by the Pine River Channel to the north, Round Lake to the east, Antrim Street and Mason Street to the south, and Sherman Street and Lake Michigan to the west.

Site Geology and Hydrogeology

The Site is located over fine to coarse sands to a depth varying between 120 and 150 feet. The Site is at the southwest edge of a northwest-southeast oriented glacial channel that extends to a depth of at least 450 feet. Within about one-quarter mile to the west-southwest of the Site, Devonian shale and limestone is within 25 to 30 feet of the surface. Limestone is found at a depth of 120 feet about 1,100 feet south of the Site.

The water table under the Site is approximately 25 to 55 feet in depth, depending on surface elevation. Groundwater flow direction is predominantly to the north-northeast (see Figures 3 and 4 in Appendix A). A north-south trending groundwater divide is present between approximately State Street and Grant Street and creates a radial flow trend under Charlevoix. Groundwater to the east of this divide flows towards Round Lake, while groundwater to the west of this divide flows towards Lake Michigan. Deep sheet pilings installed along the banks of the Pine River Channel deflect northerly groundwater flow towards both Round Lake and Lake Michigan. Hydraulic conductivity of the sandy soils ranges from 20 to 140 feet/day (7 x 10^{-3} to 5 x 10^{-2} cm/second). An estimate of the effective porosity of the sand is 25% due to the poorly graded distribution of grain sizes in the sediments.

¹ Note: structures associated with the potential source areas have been given unique identifiers starting with "ST-..."

Site Contamination

The following section details the nature and extent of Site contaminants in soil gas, soil, groundwater, and vapor intrusion. No contaminants were identified in surface water or underground utilities requiring remedial action. As described further below in the "Summary of Site Risks" section of this Proposed Plan, PCE and TCE are the main constituents of concern (COCs) at the Site.

Soil Gas

Elevated PCE soil gas concentrations were detected in Areas A, B, and C.

- The highest soil gas concentrations were detected in Area A. The impacts in Area A are localized in the vicinity of former dry cleaners, former Hoskins Manufacturing, and former Impac Tool Co. with one additional location exceeding screening levels identified southeast of this area along West Garfield Avenue. Two sample locations in Area A also contained elevated soil gas TCE concentrations, both in the vicinity of the former dry cleaner.
- In Area B, soil gas PCE concentrations are highest at the southwest corner of the former Hooker's Cleaners and concentrations decrease radially away from that point. No TCE was detected in soil gas above the screening levels in Area B.
- In Area C, elevated PCE concentrations in soil gas were identified exceeding screening levels in two locations: to the south of the former Art's Dry Cleaners, and to the southwest across Grant Street in the right of way. No elevated TCE concentrations were detected in soil gas in Area C.
- No concentrations of COCs in soil gas were detected in Area D above the screening levels.

<u>Soil</u>

Elevated concentrations of PCE exceeding the screening level in soil samples were observed in Areas A, B, and C of the Site and TCE exceeded the soil screening level in Area A. The highest concentrations of soil impacts were detected in Area A with surface soil samples reaching up to 13,000,000 micrograms per kilogram (μ g/kg) PCE and 34,000 μ g/kg TCE.

- Elevated concentrations of PCE exceeding the screening level in soil samples were observed in Areas A, B, and C of the Site and TCE exceeded the soil screening level in Area A.
- In Area A, PCE exceeding screening levels was detected in shallow soils located near the northwest corner of the former dry cleaners and in shallow soils along the west side of the former Impac Tool Co.
- In Area B, elevated PCE concentrations were found in borings along the east side and at the southwest corner of the former Hooker's Cleaners.
- In Area C, elevated PCE concentrations were present in shallow soils and in the clayey silt layer around 16 feet below ground surface.

Groundwater

PCE was the main contaminant detected in groundwater samples. The PCE plume is present in shallow and intermediate groundwater and starts near the source areas in Area A (former dry cleaners, former Hoskins Manufacturing, and former Impac Tool Co.). The plume continues in the general direction of groundwater flow toward Area D. A separate PCE groundwater plume is centered on the former Art's Dry Cleaners in Area C; this weaker source produces only a localized plume that proximately attenuates in groundwater. The highest concentration of PCE detected at the Charlevoix Municipal Well Site was 90 micrograms per liter (μ g/L) at monitoring well MW011 located downgradient of the Area A source and near the corner of State Street and West Hurlbut Avenue. Typically detected concentrations generally range from 5 to 20 μ g/L.

Although TCE was also identified as a COC at the Charlevoix Municipal Well Site, and historical Site characterization identified a TCE plume separate from the PCE plume, the RI determined that the current Site conditions have changed. Groundwater contained concentrations of TCE above the laboratory method detection limit in only 3 of 35 groundwater samples collected from 35 unique locations. The concentrations of TCE are also significantly lower (ranging from 0.29 μ g/L to 1.7 μ g/L) than the concentrations of PCE; TCE is collocated with PCE in soil and groundwater and thus any preferred PCE alternative would address TCE sources.

The groundwater plume as of the October 2017 sampling event is depicted on Figure 5 in Appendix A.

Vapor Intrusion

Sixteen structures across the Site have been mitigated based on exceedances of health-based screening levels. These structures are located across Areas A, B, C, and D. The source of vapor intrusion varies based on the location of the structure. Structures located in Areas A, B, and C are located in areas of relatively deep groundwater. In addition, soil/soil gas sources for contaminants have been identified in the vicinity of structures with identified VI risk in Areas A, B, and C. In contrast, the depth to groundwater in Area D is relatively shallow (less than 10 feet), and no soil/soil gas sources have been identified in the vicinity of structures subject to vapor mitigation in Area D. The source of VI concerns in Areas A, B, and C is therefore linked to soil/soil gas while the source in Area D is likely groundwater.

D. SCOPE AND ROLE OF OPERABLE UNIT OR RESPONSE ACTION

EPA has currently identified two separate OUs at the Site. The OUs are:

- OU1 The new water supply drawing water from Lake Michigan provides a safe drinking water source to the City of Charlevoix; and
 - OU2 Site-wide contamination including groundwater plume, soil and soil vapor.

This Proposed Plan for an interim action at OU2 presents information necessary to inform the public about the potential for vapor intrusion at the Site and presents EPA's Preferred Alternative to address vapor intrusion for buildings which overlie the contaminated soil, soil vapor and groundwater plume. The proposed response action is intended to address all buildings within the

potential vapor intrusion area of concern at which EPA has determined or may determine in the future that remedial action is required.

The response action discussed in this Proposed Plan is considered by EPA to be an interim action. It is an interim action because it primarily addresses the risks due to vapor intrusion from contaminated groundwater and/or subsurface vapor sources. The Site's contaminated groundwater is treated by this interim action but may require additional response action in subsequent decision documents, as necessary. This proposed response action also addresses source materials that may constitute principal threats.

Given that the work at OU2 is ongoing, EPA anticipates selecting a final remedy for OU2 to remediate groundwater source areas contributing to soil vapors and the contaminated groundwater plume as necessary in a final ROD for OU2. EPA expects that the remedy selected in a future final ROD for OU2 will eliminate the vapor intrusion threats, restore groundwater to drinking water standards, and allow termination of the mitigation systems proposed as response actions for OU2 in this Proposed Plan.

E. SUMMARY OF SITE RISKS

The RI included a baseline risk assessment (BRA) to determine the current and potential future effects of constituents of potential concern (COPCs) on human health and the environment. The Site and surrounding areas are zoned for residential or commercial/mixed use and future land use is not expected to differ from the current land use. Therefore, a range of potential future users were evaluated including residential, commercial worker, construction worker, and recreational users. The overall level of Site risk indicated the need for remedial action and a FFS to evaluate remedial action alternatives. The BRA included a baseline human health risk assessment (HHRA) and screening level ecological risk assessment (SLERA).

Human Health Risks

The baseline HHRA evaluated receptor exposure to Site contamination associated with current and reasonably foreseeable land uses. As previously mentioned, the land use is mostly residential mixed with a few business or commercial properties. No changes in land use are anticipated in the future. Accordingly, the current and future potential receptors for the Site include residents (adult and children), commercial workers, construction/utility workers, and recreational users. Groundwater was assessed as a theoretical drinking water source for residential exposure, although drinking water for the City of Charlevoix is obtained from surface water resources and use of groundwater beneath the Site for potable purposes is restricted.

Human health COPCs were identified in groundwater, soil, outdoor soil gas, and sub-slab soil vapor (for indoor air). Ambient air, utility atmosphere, and utility waste water were also sampled and assessed but were found to not pose a risk to receptors who might be exposed to those media. Exposure routes considered ingestion, dermal contact, inhalation (of both vapors and fugitive dust). Standardized toxicity criteria developed and used by the EPA and other health agencies were used in conjunction with the exposure assessment to characterize carcinogenic risks and non-carcinogenic hazards for each media and receptor. The HHRA established a total cancer risk acceptable risk threshold of 1 in 100,000 or 10⁻⁵, consistent with Michigan's

preferred target cancer risk limit. When the risk is above this level, action is generally warranted; when risk is below this level, action is generally not warranted unless there are adverse environmental impacts. A hazard index (HI) of one or less is considered protective of non-cancer human health hazards.

Unacceptable risks (incremental lifetime cancer risk greater than 10⁻⁵ or 1 in 100,000) or noncarcinogenic hazards (HI greater than 1.0) were identified due to the concentrations of PCE and/or TCE at the Site. Accordingly, these compounds are identified as the main COCs for all media. Specific media, receptors, and exposure pathways include:

- Groundwater exposures to residents and/or construction workers via ingestion, inhalation, and dermal contact;
- Surface soil exposures to commercial workers via incidental ingestion and inhalation (of volatiles and particulates);
- Soil exposures to residents and/or construction workers via incidental ingestion and inhalation (of volatiles and particulates);
- Outdoor soil gas exposures to construction workers via inhalation; and
- Sub-slab soil vapor exposures, via volatilization to indoor air (vapor intrusion), to residents or commercial workers via inhalation.

Sampling of sub-slab vapors and indoor air is ongoing at the Site, and some structures have already had mitigation systems installed.

Ecological Risks

The potential for ecological risks to occur from exposure to Site contaminants was evaluated in a SLERA. Adequate ecological habitat does not exist within the City of Charlevoix where Site contamination is present. The adjacent surface water bodies, where adequate habitat and aquatic life are present, are not impacted by Site contaminants. Therefore, no complete ecological exposure pathways exist at this Site. No ecological risks are evident, and no further action is warranted for protection of ecological receptors.

Basis for Taking Action

It is the lead agency's current judgment that the Preferred Alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

F. REMEDIAL ACTION OBJECTIVES

The following remedial action object (RAO) was carried forward from the 1985 ROD and applies to PCE and TCE in groundwater in Area A and Area C:

• Minimize the potential risk to the public from direct consumption of the contaminated groundwater through inadvertent use of private wells by individuals unaware of the hazard.

In addition, the following RAOs serve to address newly-identified risks identified in the RI:

- Restore groundwater to its highest level of beneficial use to the extent practicable within a timeframe that is reasonable;
- Reduce to the extent practicable contributions to the VI pathway from PCE and TCE sources in soil, soil gas, and groundwater;
- Prevent unacceptable risk from exposure to COCs (PCE and TCE) to building occupants via the VI pathway;
- Prevent building occupants from direct contact with PCE-impacted soil that would result in unacceptable risk; and
- Prevent unacceptable risk to utility and construction workers at Area A and portions of Area C from exposure to COCs (PCE and TCE) via inhalation of soil gas.

Preliminary remediation goals (PRGs) are established as the proposed performance requirements and the main basis for measuring the success of the response actions. PRGs are considered "preliminary" until final remediation goals are selected in a ROD. The PRGs are based on applicable or relevant and appropriate requirements (ARARs) where applicable, or are based on risk where no ARAR is currently available or protective of potential receptor(s). The PRGs are presented in the table below.

Media	Area	COC	PRG	Units	Basis
Media Of Con	cern				
Groundwater	A, B, C, D	PCE	2.2	μg/L	Risk
	A, B, C, D	TCE	0.11	µg/L	Risk
Soil	A, B, C, D	PCE	100	µg/kg	ARAR (MI Part 201)
	A, B, C, D	TCE	100	µg/kg	ARAR (MI Part 201)
Soil Gas	A, B, C, D	PCE	820	µg/m³	Risk
	A, B, C, D	TCE	40	µg/m³	Risk
Additional Cri	teria				
Indoor Air ¹	A, B, C, D	PCE	41	µg/m³	Risk
	A, B, C, D	TCE	2	µg/m³	Risk
Subslab Vapor ¹	A, B, C, D	PCE	1,400	µg/m³	Risk
	A, B, C, D	TCE	67	$\mu g/m^3$	Risk

Summary of PRGs for OU2

¹ Risk-based indoor air and subslab vapor PRGs were developed for comparison in future assessments of VI at the residential and commercial buildings at the Charlevoix Municipal Well Site.

COC = constituent of concern

PCE = tetrachloroethylene

PRG = preliminary remediation goal

TCE = trichloroethylene

 $\mu g/m^3 = micrograms$ per cubic meter

Applicable or Relevant and Appropriate Requirements

Potential chemical-, location-, and action-specific ARARs and to-be-considered (TBC) criteria identified to address PCE and TCE in groundwater, soil, outdoor soil gas, and sub-slab vapor via indoor air at the Charlevoix Municipal Well Site are presented below.

Potential chemical-specific ARARs include:

- Federal: Safe Drinking Water Act MCLs for Organic Contaminants $(40 \text{ CFR } 141.61)^2$
 - Groundwater underlying Charlevoix is classified as a Class II aquifer; potential source of drinking water and waters having other beneficial uses.
 - The MCL for PCE in drinking water is 5 μ g/L.
 - The MCL for TCE in drinking water is 5 μ g/L.

Note: Although the federal MCL protects potential drinking water, Site-specific calculations discussed in the RI (Section 7.1.5) indicate that the MCLs are not protective of the VI pathway in Area D, where the groundwater is found at less than 10 feet in depth. Therefore, the groundwater cleanup goals for PCE and TCE in Area D will both utilize modeled Site-specific PRGs of 2.2 μ g/L and 0.11 μ g/L, respectively, as discussed in the RI (Section 6.3.2).

- State: Michigan cleanup programs under Part 111, Hazardous Waste Management, and Part 201, Environmental Remediation, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended:
 - \circ The residential soil criterion for PCE in soil is 100 μ g/kg.
 - \circ The residential soil criterion for TCE in soil is 100 μ g/kg.
 - The soil volatilization to indoor air criterion for PCE is $11,000 \ \mu g/m^3$.
 - The soil volatilization to indoor air criterion for TCE is 1,000 μ g/m³.

Potential action-specific ARARs address the potential for hazardous and/or non-hazardous waste, erosion control, discharge of storm water pollutants and underground injection including the following:

- Federal: National Pollutant Discharge Elimination System (NPDES) requirements [40 CFR 122.44(a)(1), (b)(1) (first sentence), (d), (e), (i)(1), and (k); 122.45(a), (c)-(f)]
 - Any groundwater treatment system will comply with the substantive requirements of these provisions.
- Federal: Fugitive dust emissions [40 CFR 50.6-50.7]
 - Any construction and/or excavation activities will comply with the substantive requirements of these provisions.

² Table 1 of Part 201 Residential Drinking Water Criteria (Rule 299.44 of the Michigan Administrative Code [MAC]) was not identified as an ARAR to address PCE and TCE in groundwater at the Charlevoix Municipal Well Site since the State Residential Drinking Water Criteria for PCE and TCE are not more stringent than federal MCLs.

- Federal: Emissions from hazardous waste processes [40 CFR 264; Subparts AA, BB, and CC]
 - Establishes limits on the amounts of pollutants that can be discharged to the air from hazardous waste processes.
- Resource Conservation and Recovery Act (RCRA) [42 U.S.C. 6901 *et seq.* and 40 CFR 261]
 - Standards for identification and listing of hazardous waste.
- Federal: Non-hazardous waste management (RCRA) [40 CFR 258]
 - Provides standards for the management of non-hazardous waste.
- Federal: Hazardous waste management (RCRA) [40 CFR 264.171-175]
 Provides standards for the management of hazardous waste.
- Federal: Erosion and Sediment Control (NPDES Program) [40 CFR 122]
 Regulates point source discharges of storm water pollutants to surface water.
- Federal: Underground Injection Control (Clean Water Act) [40 CFR 144, 146, and 147]
 - Regulates the subsurface emplacement of fluids (including air) with standards for the design and operation of five classes of injection wells.

Potential location-specific ARARs address migratory birds, coastal zone management, and the protection of natural resources including the following:

- Federal: Migratory Bird Treaty Act [16 United States Code (U.S.C.) 703(2)(a)]
 - Potentially applicable requirement if migratory birds or nests are identified during remedial action.
- Federal: Coastal Zone Management Act [15 CFR 930]
 - Federal activities must be consistent with, to the maximum extent practical, state coastal zone management programs.
- State: Part 17, Michigan Environmental Protection Act of the Natural Resources and Environmental Protection Act [MCL 324.1701, *et seq.*] and Michigan Administrative Code [R 324.1701-1706]
 - Prohibits any action that pollutes, impairs, or destroys the state's natural resources due to any activities conduced at the site of environmental contamination.

Potential TBC criteria includes:

- Volatilization to Indoor Air Recommendations for Interim Action Screening Levels and Time-Sensitive Interim Action Screening Levels [MDEQ 2017]
 - $\circ~$ Residential Recommended Interim Action Screening Level for PCE in indoor air is 41 $\mu g/m^3.$
 - $\circ~$ Residential Recommended Interim Action Screening Level for TCE in indoor air is 2 $\mu g/m^3.$
- State: Proposed revisions to the Michigan cleanup programs under Part 111, Hazardous Waste Management, Part 201, Environmental Remediation of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended:
 - \circ The residential soil criterion for PCE in soil is 5 µg/kg (i.e. detection limit).
 - $\circ~$ The residential soil criterion for TCE in soil is 5 $\mu g/kg$ (i.e. detection limit).
 - $\circ~$ The soil volatilization to indoor air criterion for PCE is 1,400 $\mu g/m^3.$
 - $\circ~$ The soil volatilization to indoor air criterion for TCE is 67 $\mu g/m^3.$
- Guidelines for the Groundwater Classification under the EPA Groundwater Protection Strategy [EPA Number: 813R-880001]
 - Describes procedures and information needed to classify groundwater.
 - Groundwater underlying this Site is classified as a potential drinking water source under this federal classification system.
- Draft Guidance for Evaluating VI to Indoor Air Pathways from Groundwater and Soils (Subsurface VI Guidance [EPA 530-D-02-004]
 - Guidance for assessing and mitigating VI risk.
- Technical Guide for Assessing and Mitigating the VI Pathway from Subsurface Vapor Sources to Indoor Air [OSWER Publication 9200.2-154]
 - EPA recommendations for how to identify and consider key factors when assessing VI in both residential and non-residential buildings, making risk management decisions, and implementing mitigation.
- Controls of Air Emissions from Air Strippers at Superfund Groundwater Sites [OSWER Directive 9355.0]
 - This policy guides the requirements for additional controls on air strippers at Superfund Sites.
- Conceptual Model Scenarios for the VI Pathway (EPA 530-R-10-003]

G. SUMMARY OF REMEDIAL ALTERNATIVES

Interim remedial action alternatives for OU2 are presented below. They are numbered to correspond with the FFS.

The alternatives were developed by combining general response actions, technology types, and process options retained from a screening process conducted in the FFS. In-situ chemical treatment is a component of Alternatives 4 and 6. While there are different in-situ treatment methods, In-situ Chemical Oxidation (ISCO) was used for remedy development and cost estimation purposes. Treatability studies would need to be performed prior to and/or during the design of a remedy that includes in-situ treatment. The results of the treatability studies may lead EPA to use a different in-situ treatment method instead of ISCO.

Alternative 1: No Further Action

The No Action alternative is required to be evaluated under the NCP (EPA 1994) as a baseline against which all other alternatives are compared. Under this alternative, no remedial actions would take place to reduce the levels of PCE or TCE in soil, groundwater, soil gas, sub-slab vapors, or indoor air. Additionally, this alternative would not include continued operation of vapor mitigation systems, ICs, or groundwater monitoring. There are no costs associated with Alternative 1.

Alternative 2: Institutional Controls and Vapor Mitigation

Alternative 2 consists of ICs to prevent receptors from unacceptable exposures in groundwater, soil, and soil vapor, and vapor mitigation for all structures containing sub-slab vapor concentrations exceeding PRGs.

Vapor mitigation systems would be installed on six additional properties. These systems, in addition to the 16 existing systems, would be maintained and operated until confirmatory sampling demonstrated that VI posed no risk at these properties.

ICs would be expanded from the current restrictions on groundwater to include several deed restrictions for properties in Areas A, B, and C containing elevated concentrations of PCE and/or TCE in soil and/or soil gas, and for one property in Area D due to VI risks. An area adjacent to structure ST-001 would be an area of restricted access to prevent direct contact with shallow impacted soil. The remaining properties containing bulk soil concentrations greater than the PRGs would require deed restrictions to prevent intrusive activities and residential property uses. The soil-gas property restrictions would apply to the construction worker should work be proposed in areas where soil gas concentrations exceed the PRGs. Requirements to evaluate the potential for VI, and to implement mitigation and/or remediation, prior to development/structural modifications on these properties would also be included in property deed restrictions.

A long-term monitoring plan would be developed to continue to monitor groundwater quality on a routine basis. For cost estimating purposes, the monitoring program is assumed to include 20 monitoring wells to be sampled on an initial quarterly basis, decreasing to semiannually after one year, and annually for the remainder of the first five-year cycle and beyond. The costs include sample analysis for field parameters and EPA Method 8260B for VOCs.

The estimated timeframe for construction completion is 6 months. The timeframe that ICs would be necessary was estimated based on groundwater modeling of plume migration at the Charlevoix Municipal Well Site with no other active groundwater remedies implemented. The groundwater modeling estimates that the untreated groundwater plume will continue to pose risk for approximately 525 years. For the purposes of cost estimating, the vapor mitigation systems are assumed to operate for the entire 525 years. However, vapor mitigation associated with soil impacts in Area A, B, and C would be required to operate beyond the 525 years because soil attenuation occurs at a slower rate than groundwater and is unlikely to achieve the soil PRGs. The estimated capital cost associated with Alternative 2 is \$541,000 and the annual O&M cost is \$174,140. The total present worth cost of Alternative 2 is \$3,273,000.

Alternative 3: Soil Excavation, Institutional Controls, and Vapor Mitigation

Alternative 3 consists of the following elements: soil excavation to address soil contaminant concentrations above the PRGs; ICs to prevent receptors from unacceptable exposures in groundwater; and vapor mitigation for all structures containing sub-slab vapor concentrations exceeding PRGs until soil removal is complete and groundwater achieves RAOs.

Soil excavation would target soil contamination above 100 ppb in Areas A, B, and C as these areas serve as ongoing sources to groundwater impacts. Models indicate soil in Area D is not currently a source to groundwater impacts. In order to access impacted soils, the four structures identified as ST-001, 003, 005, and 021 would be demolished and the surrounding contaminated soils would be excavated for offsite disposal. Note that building demolition and removal of soil are contingent on the government obtaining access to the properties for these activities. An additional area around a fifth structure, ST-011, would also be excavated for offsite disposal, with the building remaining undisturbed. The extent of contaminated soils around each structure are shown in Figures 6, 7, and 8 in Appendix A. More detailed measurements and volumes of these areas are given in the table below. In the event that building demolition and soil removal are not possible the timeframe for this alternative will extend beyond 150 years.

Area	Structures		Structures Perimeter (ft) Max Depth (ft)		Volume (yd ³)
	001		383.56	16	
А	003/005	Area 1	228.99	10	1 400
		Area 2	59.84	15	1,400
		Area 3	59.77	13.7	
В	011*				11
С	021		300.54	22	3,600

Estimated Extent of Source Zone Around Select Structures

* Not proposed for demolition

Vapor mitigation under Alternative 3 would include the O&M of existing vapor mitigation systems and the installation of systems in the six additional properties. These systems would operate until Site-specific sampling determined that the risk for VI was remediated. This includes the soil gas monitoring planned for post-excavation, and the collection of air samples (sub-slab, indoor, etc.) from the properties also post-excavation. The four structures proposed for demolition (ST-001, ST-003, ST-005, and ST-021) would be removed and therefore would not require further vapor mitigation. The vapor mitigation system required in Area D (ST-118)

would also continue to operate. ICs preventing the use of groundwater would be maintained as part of this alternative.

Alternative 3 includes no groundwater treatment, would not achieve groundwater ARARs, and ICs and vapor mitigation would be required while groundwater continues to pose risks. For cost purposes, the timeframe that these components must be implemented was evaluated in the FFS. Groundwater models were constructed by removing the Areas A and C soil sources and progressing through the plume migration models. The resulting output predicts that the remedial timeframe will extend approximately 100 years. Groundwater monitoring would be required throughout this period. In the event that soil removal is not possible, the timeframe for this alternative would extend beyond 150 years.

The estimated timeframe for construction completion is 1 year and the timeframe for remedial completion was estimated as 100 years. The estimated capital cost associated with Alternative 3 is \$4,593,000 and the annual O&M cost is \$82,460. The total present worth cost of Alternative 3 is \$6,298,000.

Alternative 4: Soil Excavation, Groundwater Chemical Treatment, Institutional Controls, and Vapor Mitigation

This alternative would include all of the components described for Alternative 3 and would be expanded to include ISCO or other in-situ treatment for the groundwater plume. Specifically, Alternative 4 would consist of the following elements: soil excavation to address soil contamination; ICs to prevent receptors from unacceptable exposures in groundwater; vapor mitigation for all structures containing sub-slab vapor concentrations exceeding PRGs; and ISCO or other in-situ treatment of the groundwater.

The treatment area for Alternative 4 includes 8 shallow-zone injection wells in and downgradient of the Area A source. The targeted area and depth of ISCO or other in-situ application is the PCE concentrations above 15 μ g/L in the shallow flow zone of the upper aquifer (i.e., 10 to 15 feet below the water table). In addition, 36 intermediate zone injection wells are planned in the remainder of the plume. These wells would be placed to generally target groundwater concentrations exceeding a concentration of 5 μ g/L. The FFS provides further details including well locations and modeled dosing rates (EPA 2019b).

To estimate the timeframe for implementation of these remedial components, the FFS used groundwater modeling. The model predicts a period of approximately 65 years to reach the risk-based PRG for PCE. Groundwater monitoring would be required throughout this time period. In the event that soil excavation is not possible, the timeframe to achieve RAOs would extend beyond 100 years.

The estimated timeframe for construction completion is 2 years and the timeframe for remedial completion was estimated as 65 years. The estimated capital cost associated with Alternative 4 is \$24,057,000 and the annual O&M cost is \$145,600. The total present worth cost of Alternative 4 is \$26,751,000.

Alternative 5: Soil Excavation, Air Sparing/Soil Vapor Extraction, Institutional Controls, and Vapor Mitigation

This alternative would include all of the components described for Alternative 3 and would be expanded to include AS/SVE treatment for saturated soil and the groundwater plume. Specifically, Alternative 5 would consist of the following elements: soil excavation to address unsaturated soil contamination; ICs to prevent receptors from unacceptable exposures in groundwater and/or vapor intrusion; vapor mitigation for all structures containing sub-slab vapor concentrations exceeding PRGs; AS/SVE treatment of saturated soil and groundwater in the Area A source zone; and AS/SVE curtains to treat migrating dissolved-phase contaminants and surrounding impacted aquifer sediments.

The FFS used groundwater modeling to estimate the timeframe for remedial completion. The model output resulted in a 40-year timeframe to achieve the groundwater PRGs (vapor-intrusion threshold concentrations of 2.2 μ g/L for PCE and 0.11 μ g/L TCE). Groundwater monitoring would be required throughout this period. This timeframe should be adjusted based on pilot test results of actual sparging efficiencies. Groundwater and vapor intrusion ICs would be removed upon achievement of this RAO. Note that the time to achieve RAOs in the event that soil excavation is not possible could extend to greater than 75 years.

The estimated timeframe for construction completion is 2 years and for the timeframe for remedial completion was estimated as 40 years. The estimated capital cost associated with Alternative 5 is \$7,860,000 and the annual O&M cost is \$341,000. The total present worth cost of Alternative 5 is \$12,643,000.

Alternative 6: Soil Excavation, Groundwater Chemical Treatment, Air Sparging/Soil Vapor Extraction, Institutional Controls, and Vapor Mitigation

This alternative includes all of the components described for Alternative 5, except source-area AS/SVE is replaced by targeted ISCO or other in-situ treatment for saturated soil and groundwater. Specifically, Alternative 6 consists of the following elements: soil excavation to address soil contamination; ICs to prevent receptors from unacceptable exposures in groundwater and potential vapor intrusion; vapor mitigation for all structures containing sub-slab vapor concentrations exceeding PRGs; ISCO or other in-situ treatment of the PCE groundwater plume exceeding 15 μ g/L in the shallow zone; and AS/SVE treatment of saturated soil and groundwater (sparge curtains).

The ISCO or other in-situ treatment is generally coincident with the shallow-zone source-area treatment used in Alternative 4. The treatment area for Alternative 4 includes 8 shallow-zone injection wells near and downgradient of Area A soil sources. The targeted area and depth of ISCO or other in-situ application are the PCE concentrations above 15 μ g/L in the shallow flow zone of the upper aquifer (i.e., 10 to 15 feet below the water table).

The groundwater modeling in the FFS resulted in a 35-year timeframe to achieve the groundwater PRGs (vapor-intrusion threshold concentration). Groundwater and vapor intrusion ICs would be removed upon achievement of this RAO. Note that the remedial timeframe for this alternative could extend to greater than 75 years in the event that soil excavation is not possible.

The estimated timeframe for construction completion is 3 years and the timeframe for remedial completion was estimated as 35 years. The estimated capital cost associated with Alternative 6 is \$11,359,000 and the annual O&M cost is \$298,886. The total present worth cost of Alternative 6 is \$15,447,000.

H. EVALUATION OF REMEDIAL ALTERNATIVES

The EPA used nine CERCLA criteria, discussed below, to evaluate the alternatives and select an interim remedial action. This section summarizes the relative performance of each alternative against the nine criteria and how each alternative compares to the other alternatives under consideration. A detailed analysis of alternatives is provided in the FFS (EPA 2019b).

The nine criteria consist of two threshold criteria, five balancing criteria, and two modifying criteria. The threshold criteria include overall protectiveness of human health and the environment and compliance with ARARs. These two criteria must be met by any remedial alternative for it to be considered a viable remedial action.

The five balancing criteria include the following: long-term effectiveness and permanence; shortterm effectiveness; reduction of toxicity, mobility, and volume through treatment; implementability; and cost. These are the primary criteria upon which the detailed analysis was based.

The remaining two criteria include state acceptance and community acceptance. These modifying criteria are typically evaluated following a public comment period on the Proposed Plan and will be documented in the ROD.

CERCLA Evaluation Criteria for Remedial Alternatives

Overall Protectiveness of Human Health and the Environment determines whether an alternative eliminates, reduces, or controls threats to human health and the environment through ICs, engineering controls, or treatment.

Compliance with ARARs evaluates whether the alternative meets cleanup criteria, standards of control, or requirements of other environmental laws and regulations that pertain to the contamination, or whether a waiver is justified.

Long-Term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Short-Term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

CERCLA Evaluation Criteria for Remedial Alternatives

Cost includes estimated capital and annual O&M costs, and present-worth cost. Present-worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

State/Support Agency Acceptance considers whether the state agrees with the EPA's analyses and recommendations, as described in the RI/FFS and Proposed Plan.

Community Acceptance considers whether the local community agrees with the EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

Based on the individual analysis of alternatives in the FFS, Alternatives 2, 3, and 4 were eliminated from consideration on the basis of not achieving the threshold criteria. Alternatives 2, 3, and 4 were all rated as not being protective of human health and not complying with ARARs. Further analysis of these alternatives is described in FFS sections 4.2.2 through 4.2.4. Because Alternatives 2, 3, and 4 do not meet the threshold criteria, they were eliminated from consideration and are not included in the following comparison of alternatives.

Similarly, Alternative 1 (No Action) is not discussed further in this Proposed Plan because it does not meet either of the threshold criteria. Alternative 1 is not protective of human health because it does not address impacted soil or groundwater or include ICs to prevent adverse exposures to these impacted media. VI would continue to occur with no mitigation or remediation under Alternative 1. Alternative 1 also does not comply with ARARs because it would not achieve the ARAR-based PRGs or other ARARs identified for the remedial action.

1. Overall Protection of Human Health and the Environment

Alternatives 5 and 6 both achieve the same RAOs and pose no long-term risks (meaning for the indefinite period following the completion of remedial actions). Alternative 6 ranks slightly better than Alternative 5 on the basis of the reduction of toxicity, mobility, or volume through treatment; short term effectiveness; and implementability. Alternative 6 out-performs Alternative 5 by achieving the RAOs in the shortest period of time (35 years) and reducing the risks posed to the community by implementing a combination of technologies.

2. Compliance with ARARs

Once RAOs have been achieved, Alternatives 5 and 6 equally comply with ARARs for soil and groundwater concentrations. In addition, several TBCs and risk-based criteria would be employed to ensure the remedial action is protective of human health and the environment. These criteria are established in the selection of PRGs for the remedies, which are consistent across Alternatives 5 and 6.

3. Long-Term Effectiveness and Permanence

Once remedial objectives have been achieved, the long-term effectiveness and permanence of Alternatives 5 and 6 are equivalent. Since both alternatives have the same PRGs, the

achievement of remedial objectives would result in the reduction in soil, soil gas, and groundwater concentrations to within levels protective of human health and the environment. Vapor intrusion risks would be reduced under both alternatives to below levels that are considered unacceptable.

4. Reduction of Toxicology, Mobility, and/or Volume Through Treatment

Alternative 6 achieves a greater reduction in the toxicity, mobility, or volume of contaminants through treatment of the PCE in groundwater via two technologies. Alternative 5 achieves a slightly less efficient outcome with groundwater treatment AS/SVE curtains.

5. Short-Term Effectiveness

The short-term effectiveness is greatest for Alternative 6 relative to Alternative 5. The time until RAOs are achieved is slightly shorter for Alternative 6 and the application of combined in-situ groundwater treatment technologies reduces the risk to the community during implementation.

No environmental impacts are expected for Alternatives 5 or 6.

6. Implementability

Alternative 6 ranks higher in implementability over Alternative 5 based on several factors. Both Alternatives 5 and 6 are readily administratively implementable based on the timeframe required for the application of ICs. While both alternatives include significant construction activities, the application of two technologies for saturated zone treatment improve the implementability of both technologies. The implementation of ISCO or other in-situ treatment and AS/SVE becomes increasingly complex with the increased footprint of the application. The complexity of ISCO or other in-situ treatment and AS/SVE applications will be reduced with the completion of treatability studies.

Alternatives 5 and 6 include the demolition of four structures, and the excavation of 5,011 (insitu) cubic yards of impacted soil with depths of up to 22 feet below the ground surface. While these activities will require significant planning and coordination, the remedial actions are highly reliable, and the required equipment and geotechnical specialists are readily available. A landfill qualified to accept the soil excavated from the Site is located in Belleville, Michigan, approximately 275 miles from the City of Charlevoix.

7. Cost

Alternative 6 has a larger present value cost than Alternative 5 (\$15.4M vs \$12.6M). The capital costs for Alternative 6 account for a large portion of this total and result in a larger present value cost. The O&M costs associated with Alternative 5 are larger than the O&M costs associated with Alternative 6.

8. State/Support Agency Acceptance

State/support agency acceptance of the Preferred Alternative will be evaluated after the public comment period ends and will be described in the ROD.

9. Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD.

I. PREFERRED ALTERNATIVE

EPA has selected Alternative 6 as the Preferred Alternative from those presented in the FFS. Alternative 6 consists of the following elements: soil excavation to address soil contamination; ICs to prevent receptors from unacceptable exposures in groundwater; vapor mitigation for all structures containing sub-slab vapor concentrations exceeding PRGs; ISCO or other in-situ treatment of the PCE groundwater plume exceeding 15 μ g/L in the shallow zone; and AS/SVE treatment of saturated soil and groundwater (sparge curtains). This alternative is recommended because it provides the greatest reduction in toxicity, mobility, or volume through treatment, it achieves the RAOs in the shortest period of time, and it reduces the risks posed to the community by implementing a combination of technologies.

The costs and timeframes for this alternative are:

- Capital Cost: \$11,359,000
- Annual O&M Cost: \$298,886
- Present Worth Cost: \$15,447,000
- Timeframe for construction completion: 3 years
- Timeframe for remedial completion: 35 years

Based on the information available at this time, EPA believes the Preferred Alternative meets the threshold criteria and provides the best balance of tradeoffs among the alternatives evaluated with respect to the balancing and modifying criteria. EPA expects the Preferred Alternative to satisfy the following statutory requirements of CERCLA §121(b): (1) be protective of human health and the environment; (2) comply with ARARs (or justify a waiver); (3) be cost-effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element or explain why the preference for treatment will not be met. The Preferred Alternative can change in response to public comment or new information.

Support Agency Coordination

EGLE reviewed the FFS, concurred with the alternatives evaluated, and concurred with how the alternatives were screened and analyzed. EGLE will have an opportunity to review this interim action Proposed Plan and provide their support, or lack thereof, of the Preferred Alternative. EGLE's response will be documented in a Responsiveness Summary, which will be included in the ROD.

J. COMMUNITY PARTICIPATION

The RI report, FFS report, this interim action Proposed Plan, and all supporting documents are available online at <u>www.epa.gov/superfund/charlevoix-muni-wells</u> and have been placed in the Administrative Record for the Charlevoix Municipal Well Site. The public is encouraged to review and comment on all the alternatives presented in the interim action Proposed Plan. The public comment period for the interim action Proposed Plan begins November 18, 2019 and ends December 18, 2019.

A public availability session will be held on December 10, 2019, at the Charlevoix Public Library, 220 W Clinton Street, Meeting Room B, beginning with a poster session at 5:00 p.m. The presentation will start at 5:30 p.m. A court recorder will be available to record verbal comments after the presentation. Written comments may be provided that evening or mailed before the close of the comment period to the address below:

Charles Rodriguez U.S. Environmental Protection Agency 77 W. Jackson Blvd., SR-6J Chicago, IL 60604-3590 rodriguez.charles@epa.gov

The Preferred Alternative may change in response to public comment or new information acquired during the designated public comment period. Responses to comments received will be provided in the ROD, which will identify the selected interim remedial action to be implemented.

Comparative Analysis of Alternatives for Remedial Action at Charlevoix Municipal Well Site – OU2

							st	50	Costs		
Alternative	Protection of Human Health and the Environment	Compliance with ARARs	Short-Term Effectiveness	Long-Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume Throug Treatment	Implementability	Present Worth Co	Overall Ranking	Capital	Annual O&M	Present Worth
Alternative 1: No Further Action	Not Protective	NA	0	0	0	•	•	0	\$0	\$0	\$0
Alternative 2: Institutional Controls and Vapor Mitigation,	Not Protective	Does Not Meet ARARs	0	0	0	0	0	0	\$541,000	\$174,140	\$3,273,000
Alternative 3: Soil Excavation, Institutional Controls, and Vapor Mitigation	Not Protective	Does Not Meet ARARs	0	0	0	0		0	\$4,593,000	\$82,460	\$6,298,000
Alternative 4: Soil Excavation, Groundwater Chemical Treatment, Institutional Controls, and Vapor Mitigation,	Not Protective	Does Not Meet ARARs	0	0	0	O	O	О	\$24,057,000	\$145,600	\$26,751,000
Alternative 5: Soil Excavation, AS/SVE Curtains, Institutional Controls, and Vapor Mitigation	Protective	Meets ARARs	O	•		lacksquare	Ð	O	\$7,860,000	\$341,000	\$12,643,000
Alternative 6: Soil Excavation, Groundwater Chemical Treatment, AS/SVE Curtains, Institutional Controls, and Vapor Mitigation	Protective	Meets ARARs	٢	•	•		Ð	●	\$11,359,000	\$298,886	\$15,447,000
Legend: ARARs—applicable or relevant and appropriate requirements Not Acceptable Poor Marginal				-							
GoodExcellent											

References

- EPA, 1984. Record of Decision: Charlevoix Municipal Well OU01.
- EPA, 1985a. Final Feasibility Study Report, Charlevoix Site, Charlevoix Michigan, W65253.A0. June 10.

EPA, 1985b. Record of Decision: Charlevoix Municipal Well OU 02.

EPA, 1985c. Remedial Investigation Report, Charlevoix Site, Charlevoix, Michigan.

U.S. EPA 1994. National Oil and Hazardous Substances Pollution Contingency Plan; Final Rule. 59 FR 47384. September.

EPA, 2016. Fourth Five-Year Review Report for Charlevoix Municipal Well Superfund Site.

EPA. 2019a. Remedial Investigation, Charlevoix Municipal Well Site.

EPA. 2019b. Focused Feasibility Study, Charlevoix Municipal Well Site.

Appendix A Figures



cument Path: K:\Charlevoix\GIS\ArcMap\2018\Genera\\171219 SiteLocationMap.mxd

Document Path: K:\Charlevoix\GIS\ArcMap\2019\PP\F2_SourceAreas.mxd



Legend Site Boundary Study Area Boundary Potential Source Area	E Green Ave	
	0	175 350 700
U.S. ARMY ENGINEER DISTRICT US Army Corps of Engineers Buffalo, NY Buffalo District	CONCEPTUAL SITE MODEL POTENTIAL SOURCE AREAS	
Document Name: F2_SourceAreas.mxd Drawn By: H5TDESPM Date Saved: 24 Sep 2019 Time Saved: 12:50:35 PM	CHARLEVOIX MUNICIPAL WELL SITE CHARLEVOIX, MICHIGAN	FIGURE 2









Legend O Shallow Monitoring Well O , □ < 5 ug/L □ Intermediate Monitoring Well • , □ 5 - 10 ug/L □ Extent of PCE in Groundwater (5 ug/L Isoconcentration Contour) • , □ 10 - 50 ug/L ○ Site Boundary			NOTES: 1) 5 ug/L represents the MDEQ MCL. 2) Shallow - Wells screened through or within 10 feet of the water table in the upper unconfined aquifer. 3) Intermediate - Wells screened between 10 and 35 feet below the water table in the upper unconfined aquifer.				
● , ■ 50 - 100 ug/L ● , ■ > 100 ug/L			0	200	400	800 Feet	
U.S. ARMY ENG US Army Corps CORPS OF ENG of Engineers BUFFALO, NY Buffalo District	NEER DISTRICT NEERS	PCE CONCENTRATIONS IN SHALLOW AN INTERMEDIATE GROUNDWATER - OCTOBER	D 2017				
Document Name: 180613_Oct17F Drawn By: H5TDESPM Date Saved: 13 Nov 2018 Time Saved: 2:56:10 PM	CE.mxd	CHARLEVOIX MUNICIPAL WELL SITE CHARLEVOIX, MICHIGAN			FIGURE 5		



60

Feet

U.S. ARMY ENGINEER DISTRICT US Army Corps of Engineers. Buffalo District	DE
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REMEDIAL DESIGN ETAILED SOIL EXCAVATION EXTENTS FOR AREA A

EVOIX MUNICIPAL WELL SITE HARLEVOIX, MICHIGAN

FIGURE 6



