Iowa Army Ammunition Plant
Proposed Plan for Installation Restoration Program IAAP-020G_Inert Disposal Area Groundwater
Operable Unit 4

Introduction

This Proposed Plan identifies the Preferred Remedial Alternative for the Installation Restoration Program (IRP) site IAAP-020G_Inert Disposal Area (IDA) Groundwater (Headquarters Army Environmental System [HQAES] identification number 19105.1026) at the Iowa Army Ammunition Plant (IAAAP) in Middletown, Iowa. This site is in the west-central portion of the IAAAP (**Figure 1**) and is collectively referred to as Operable Unit 4 (OU-4).

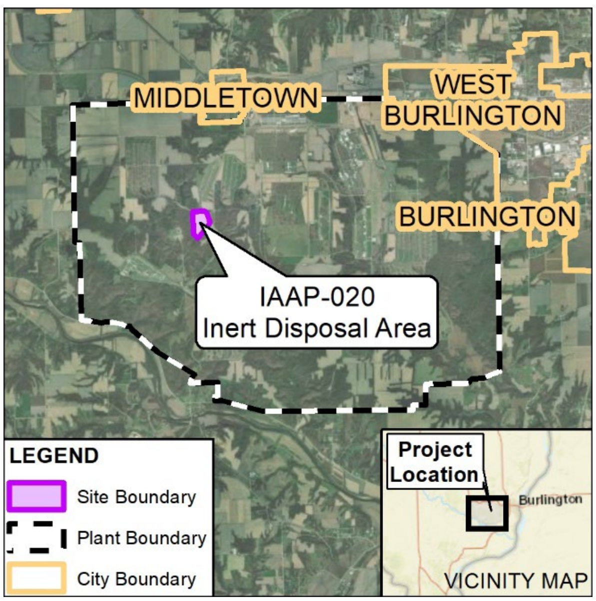

Figure 1 – Location of IAAP-020G_IDA Groundwater Site

This work is being conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the IAAAP Federal Facility Agreement (FFA).

This document is issued by the U.S. Army (Army), the IAAAP facility, and the U.S. Environmental Protection Agency (USEPA). The IAAAP is a Government-Owned Contractor-Operated facility. This active U.S. Joint Munitions Command facility is operated by the civilian contractor American Ordnance, LLC. The State of Iowa is not a signatory to the IAAAP FFA. The Army is the lead agency for environmental response actions and USEPA is the primary regulatory agency.

The Army and USEPA are issuing this Proposed Plan to facilitate public involvement in the remedy selection process, as part of the public participation responsibilities under CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

Dates to Remember:

A) Public Comment Period

July 15 to August 14, 2024

B) Public Meeting

10:00 am, July 16, 2024

The Army and USEPA will accept written comments on the Proposed Plan during a 30-day public comment period. The Army will hold a public meeting to explain the Proposed Plan and the Preferred Alternative. Oral and written comments will also be accepted at the meeting. The meeting will be held at the West Burlington City Hall, 122 Broadway Street, West Burlington, Iowa.

For more information, refer to the Administrative Record File, which is located online at https://iaaaprestoration.com/adminrecord/, Operable Unit 4. A printed copy is housed in the IAAAP Restoration Repository at 17571 DMC Highway 79, Middletown, Iowa 52638-5000.

The Burlington Public Library has computers available to the public for those interested in viewing the electronic version of the Administrative Record.

This Proposed Plan summarizes information that is detailed in the OU-4 Remedial Investigation (RI) report (Leidos and Jacobs, 2022), the OU-4 Feasibility Study (FS) (Jacobs, 2023), and other documents in the IAAAP Administrative Record File (refer to the earlier link). The Administrative Record is a compilation of the information that was considered in developing this Proposed Plan and provides a comprehensive description of the site investigation and proposed remediation activities.

This Proposed Plan presents the four alternatives that were evaluated for OU-4 and the rationale for the Preferred Alternative. The four alternatives were (1) no action, (2) monitored natural attenuation (MNA) with land use controls (LUCs), (3) groundwater extraction and treatment with MNA and LUCs, and (4) permeable reactive barrier (PRB) with MNA and LUCs. These alternatives are described in the *Summary of Remedial Alternatives* section of this Proposed Plan (p. 8). The Preferred Alternative for IDA Groundwater (IAAP-020G; HQAES19105.1026) is Alternative 2, MNA with LUCs. The rationale for this recommendation is included in the *Preferred Alternative* section (p. 15).

The Preferred Alternative presented in this Proposed Plan may be modified based on new information or public comments. Therefore, the public is encouraged to review and comment on all alternatives presented here.

IAAAP Site Background

Site IAAP-020G is part of the IAAAP, an active U.S. Joint Munitions Command facility. The IAAAP comprises 19,011 acres near Middletown in Des Moines County, Iowa. It is currently divided into 11 active OUs. OU-4 has been designated as the IDA.

Production of munitions began at the IAAAP in 1941. Currently, the IAAAP primarily loads, assembles, and packs ammunition items. USEPA added the IAAAP to the National Priorities List of Superfund Sites on August 30, 1990. The IAAAP is now part of the U.S. Department of Defense's IRP, which follows the CERCLA process.

OU-4 Site Background and Characteristics

This Proposed Plan focuses on groundwater contamination at the IDA, which falls under IRP site IAAP-020G_IDA Groundwater (HQAES 19105.1026). This Proposed Plan does not evaluate remedial actions (RAs) for soil and waste at the IDA. Decisions for the IRP site IAAP-020 _IDA for soil and waste were made independently from the groundwater RAs and are documented in the OU-4 Interim Record of Decision (IROD) (Tetra Tech, 2008). Decisions for the IRP site IAAP-020G_IDA associated with groundwater will be documented in a forthcoming ROD.

Figure 2 shows the IDA, which comprises approximately 55 acres in the western portion of the IAAAP.

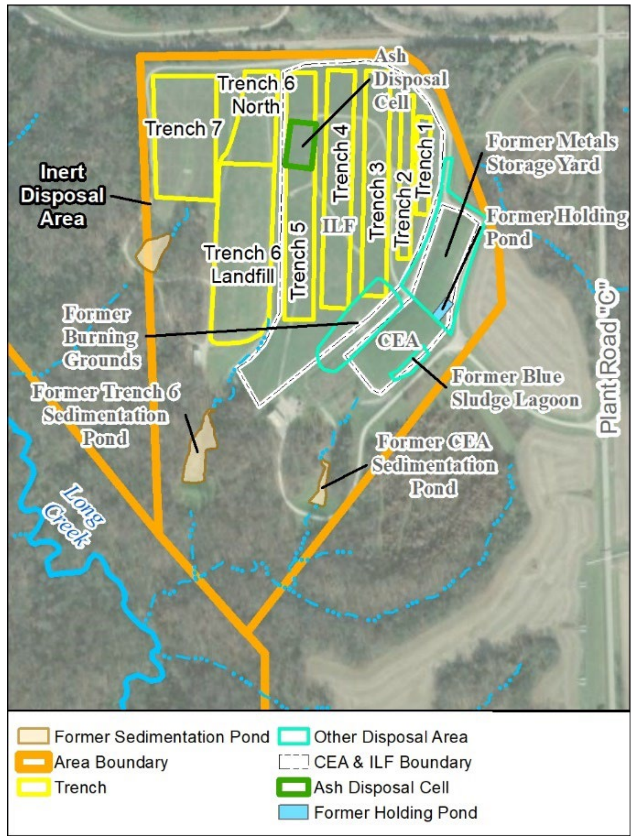

Figure 2 – Layout of Site IAAP-020G

The IDA is surrounded by vegetation and trees. There is no residential or commercial land use near the IDA (USACE, 2007), except for the active railroad tracks north of the IDA. The workers use an office located at the IDA for maintenance purposes.

From 1941 to 2011, the IAAAP used the IDA for disposing of residential and industrial wastes, including waste from other site operations at the IAAAP, which were landfilled within the IDA trenches. The storage, handling, and disposal of these wastes have caused the current groundwater contamination at the IDA. A brief summary of notable contaminated waste storage and disposal history at the IDA is as follows:

- The Ash Disposal Cell located within Trench 5 handled hazardous wastes including ash from explosives burning, which are regulated by the Resource Conservation and Recovery Act (RCRA).
- Trench 6 Landfill, Trench 7, and the Cap Extension Area (CEA) were exclusively used for the disposal of contaminated soils from OU-1 remedial excavation activities under CERCLA (OU-1 comprises 21 contaminated soil sites within the IAAAP).
- Trench 7 was specifically designated as a Corrective Action Management Unit (CAMU) used to store highly contaminated soils. The soils went through treatment before final disposal.
- The Former Blue Sludge Lagoon at the IAAAP was used as storage area for chromium hydroxide sludge from metal-cleaning operations.

Figure 2 shows the locations of these notable disposal areas. Many of the areas have undergone remediation, as described in the following subsection.

Summary of Previous Remedial Actions

The Army conducted various RAs at the IDA between 1984 and 2016. Most of the previous RAs relate directly to soil and waste; however, by removing soil and waste, contaminant mass that could have been a source to groundwater was likely removed. In addition, the soil and waste RAs have required groundwater monitoring to assess the effectiveness of those actions.

All historical RAs conducted at OU-4 are in the Administrative Record: https://iaaaprestoration.com/adminrecord/. A summary of actions conducted under RCRA and CERCLA is provided in the following subsections.

RCRA Actions

The Ash Disposal Cell located within Trench 5 was closed with a soil cover in compliance with RCRA Subtitle C requirements in 1989. This area falls under the IAAAP RCRA Permit. The post-closure requirements for Trench 5 include maintaining the integrity and effectiveness of soil cover and groundwater monitoring.

Since 1994, Trench 5 has undergone 49 rounds of post-closure groundwater monitoring. This includes assessing groundwater detection, groundwater compliance with a 70-year period starting from closure, and groundwater corrective action. If the groundwater protection standard is not exceeded for 3 consecutive years, the Army can request to end corrective action measures (USEPA, 2018).

Trench 5 remains subject to conditions of the RCRA Permit until the forthcoming ROD is finalized and approved by USEPA and a Permit Modification Request is prepared by the Army and approved by USEPA to remove Trench 5 from the RCRA Permit (USEPA, 2018). Until then, the IDA will continue with annual inspections, routine maintenance, and groundwater monitoring as required in the RCRA Hazardous Waste Management Permit (USEPA, 2018).

CERCLA Actions

A summary of RAs at the IDA conducted under CERCLA and their influence on the groundwater conceptual site model is as follows:

- Trenches 1 through 5 were assigned as the Inert Landfill and capped with a synthetic cover system (CDM, 1997). By restricting infiltration into the trenches, this action would also reduce leaching of contaminants into groundwater.
- Trench 6 (including the Trench 6 Landfill and Trench 6 North) was closed in 2012 with a RCRA Subtitle C-style cap (Tetra Tech, 2012). Note, this trench does not fall under the IAAAP RCRA Permit. By restricting infiltration into the trench, this action would also reduce leaching of contaminants into groundwater.
- Trench 7 was closed in 2011. Treated soils and the liner were moved to the Trench 6 landfill prior to its closure (Tetra Tech, 2012). This action would have removed contamination from this area that could leach into groundwater.
- The CEA was closed in 2011 with a RCRA Subtitle C-style cap (Tetra Tech, 2011). Note, this area does not fall under the IAAAP RCRA Permit. By restricting infiltration into the trench, this action would also reduce leaching of contaminants into groundwater.

- Media from the Former Blue Sludge Lagoon, Sludge Drying Bed/Holding Pond, and contaminated soil at the Former Burning Grounds were removed in the late 1990s (ECC, 2001). This action would have removed contamination from these areas that could leach into groundwater.

Summary of Previous Investigations for Groundwater

The Army conducted several environmental investigations at the IDA between 1981 and 2020 under CERCLA. These investigations were conducted to delineate the nature and extent of contaminants.

Figure 3 shows the groundwater monitoring well network for the IDA. Twenty-four groundwater monitoring wells are located at the IDA: 18 wells are screened in the overburden (glacial till or glacial outwash) from 16 to 26 feet below ground surface (bgs); 2 wells are screened across the overburden/bedrock interface from 112 to 116 feet bgs; and 4 wells are screened in bedrock underlying the till from 128.5 to 155.5 feet bgs. The RI groundwater sampling events were conducted between 2019 and 2020.

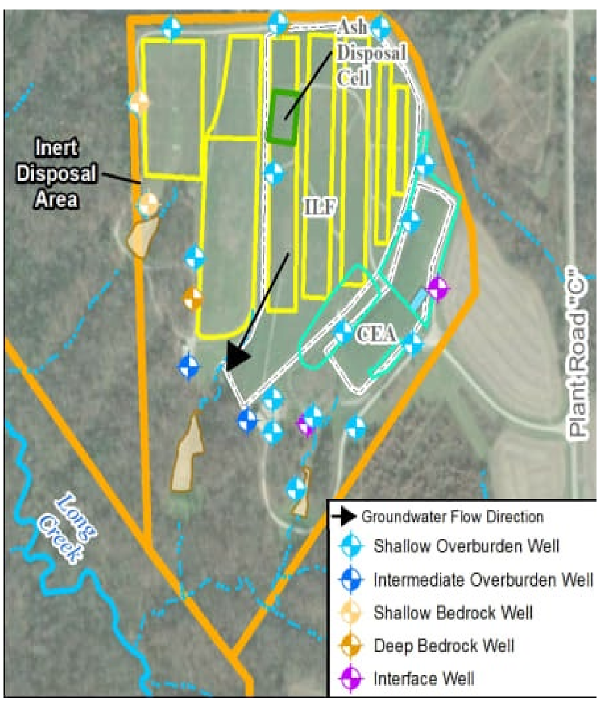

Figure 3 – Layout of Site IAAP-020G Existing Monitoring Wells

Groundwater has been analyzed for explosives, metals, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), radionuclides, and gross alpha/beta activity as part of the RI and RCRA long-term monitoring (LTM) programs. Additional analyses of dioxins and furans were conducted at specific wells because of potential degradation products linked to pentachlorophenol (PCP). MNA parameters were assessed in specific wells to determine the efficacy of natural attenuation in areas historically showing concentrations of PCP and chlorinated solvents exceeding maximum contaminant levels (MCLs).

During the OU-4 RI, analytical data were compared against site characterization project action limits (PALs). PALs are equivalent to federal MCLs, or if unavailable, the lifetime Health Advisory Level or USEPA Regional Screening Level for tap water was selected. PALs were used to assess the distribution and nature of chemicals, while more conservative screening values were used for risk assessment. During the RI sampling events, explosives, metals, VOCs, SVOCs, radionuclides, and dioxins and furans were detected above their site characterization PALs.

Explosives in Groundwater

During the RI sampling events, two explosives compounds (2,4-dintrotoluene [2,4-DNT] and Royal Demolition Explosive [RDX]) were detected at concentrations above their site characterization PALs. The 2,4-DNT exceedance was observed at monitoring well ET-3, located in Trench 5. The RDX exceedance occurred at monitoring well CAMU-99-3S, located at the northwest corner of the IDA, north of Trench 7 (**Figure 2**).

Metals in Groundwater

During the RI sampling events, three metals (arsenic, iron, and manganese) were detected at concentrations exceeding their respective site characterization PALs. Arsenic exceedances occurred at two different locations—in Trench 5 (monitoring well ET-3) and on the southeast portion of the IDA (monitoring well JAW-27), south of the CEA (**Figure 2**). Iron exceeded its PAL and background threshold at one location—inside Trench 5 (monitoring well ET-3). Manganese, which is frequently found naturally occurring in groundwater at the IDA, exceeded its PAL and background threshold value at three locations—inside Trench 5 (monitoring well ET-3); north of Trench 5 (monitoring well T-6); and south of Trench 7 (monitoring well CAMU-99-1D) (**Figure 2**).

VOCs in Groundwater

During the RI sampling events, four VOCs (1,1-dichloroethane [1,1-DCA], 1,1-dichloroethene [1,1-DCE], 1,2-dichloroethane [1,2-DCA], and trichloroethene [TCE]) were detected at concentrations that exceeded their respective site characterization PALs. All four VOCs exceeded their PALs at one monitoring well, C-00-1, located southwest and downgradient of the CEA (**Figure 2**). Two VOCs (1,1-DCA and 1,1-DCE) were detected at concentrations that exceeded the PALs in the monitoring well, MW-20-1, located downgradient (south) of this area.

SVOCs in Groundwater

During the RI sampling events, two SVOCs (2-methyl-4,6-dinitrophenol and PCP) exceeded their site characterization PALs. The exceedances occurred in a Trench 5 monitoring well, ET-3 (**Figure 2**).

Dioxins and Furans in Groundwater

During the RI sampling events, groundwater concentrations of total 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (TCDD) toxic equivalent (TEQ) exceeded the site characterization PAL at three wells (C-00-3, ET-3, and IDA-MW1). The wells with exceedances are located inside Trench 5 and west of trench 6 landfill (**Figure 2**).

Radionuclides in Groundwater

Radium-226 and radium-228 were the only parameters with established site characterization PALs. During the RI sampling events, none of the groundwater concentrations exceeded their PALs. However, other radiological parameters without site characterization PALs (i.e., lead-212 and potassium-40) were detected in groundwater.

Previous Public Participation

Previous public meetings have been held for OU-4, including several ones for RCRA (most recently on September 26, 2023, for Class II Permit modification to change GW detection to GW compliance monitoring), and for CERCLA on June 6, 2007, during the preparation of the interim ROD (IROD) for Trench 6 & 7, and the CAP extension Area of the IDA.

When applicable, OU-4 is discussed during public Remedial Advisory Board (RAB) meetings, which are typically held on a quarterly basis every year. Meeting minutes from the RAB meetings are also available at the Administrative Record File.

Remedial Investigation Findings

The IAAP-020G_IDA, addressed in the 2022 groundwater RI (Leidos and Jacobs, 2022), focused on identifying groundwater chemicals of concern (COCs), including VOCs, SVOCs, explosives, radionuclides, metals, and dioxins and furans. The most recent RI conducted in 2019 included a field investigation with surface water and groundwater sampling to analyze target analytes related to past site operations.

Groundwater samples were collected in April 2019 from 23 existing monitoring wells, along with the installation of a new well in December 2020. The RI report includes a Human Health Risk Assessment (HHRA) to define the final site-specific COCs. Of note, the RI describes the fate and transport mechanisms of COCs at the IDA. In general, COCs migration at the IDA is limited in groundwater by the synthetic cover placed on the trenches and organic-rich soils that help bind to COCs.

Documents detailing these investigations and studies are available in the Administrative Record (https://iaaaprestoration.com/adminrecord/, Operable Unit 4).

Scope and Role of Response Action

This Proposed Plan outlines the proposed response actions for the IRP site IAAP-020G_Inert Disposal Area Groundwater under OU-4 at IAAAP. The actions selected will be the final CERCLA response actions for the media and COCs identified herein.

The overall cleanup strategy is to address environmental contamination when there is an unacceptable risk to human health or the environment. An alternative that allows for unlimited use and unrestricted exposure was not considered for groundwater at the IDA. This is because contamination still exists, and there is ongoing interim RA for soil and waste (IAAP-020_Inert Disposal Area; 19105.1025), including containment (landfill) and LUCs. As previously mentioned, LUCs at the IDA include access and construction restrictions, lease and property transfer restrictions, and potable well/groundwater use restrictions.

Environmental contamination at IAAP-020G consists of multiple groundwater radionuclides of concern (ROCs) and COCs, including VOCs, SVOCs, explosives, metals, and dioxins and furans. The remedial alternatives for IAAP-020G presented in this Proposed Plan were developed to mitigate potential unacceptable risks to human health and the environment.

Per- and polyfluoroalkyl substances (PFAS) are not identified as COCs in groundwater at OU-4 and are outside the scope of this RA; however, a preliminary assessment for PFAS at the IAAAP flagged the IDA as an area of potential interest because of the disposal of soil from the fire training pit at the Trench 6 Landfill. If PFAS are identified as COCs in the future, then further investigation and any potential response action will be prepared in accordance with CERCLA.

Summary of Site Risks

Potentially unacceptable risks or hazards from exposure to contaminants in site groundwater at the OU-4 IDA site were evaluated in the HHRA. A Screening-Level Ecological Risk Assessment was not warranted for site IAAP-020G_Inert Disposal Area Groundwater because there are no complete exposure pathways to ecological receptors (Leidos and Jacobs, 2022). The HHRA evaluation is summarized in the following subsections.

Human Health Risk Evaluation

The baseline risk assessment estimates what risks the site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the baseline risk assessment for this site.

The risk characterization followed a four-step process. Step 1 considered the total combined risks and hazards from site-related chemicals of potential concern (COPCs) and naturally occurring chemicals. Step 2 presented the risks and hazards from naturally occurring chemicals. Step 3 calculated receptor-specific excess lifetime cancer risks (ELCRs) and hazard indices (HIs) for site-related COPCs and ROPCs. Step 4 identified COPCs and ROPCs.

The following potential human receptors and exposure pathway scenarios listed in Table 1 were identified in the HHRA for IDA groundwater for COPCs and ROPCs.

Table 1– Potential Human Receptors and Exposure Pathway Scenarios

Current Site Worker	**Vapor intrusion** COPCs—inhalation of volatiles in indoor air
Future Site Worker	**Vapor intrusion** COPCs—inhalation of volatiles in indoor air **Tap water** COPCs—ingestion and dermal contact ROPCs—ingestion, external radiation (immersion)
Future Construction /Utility Worker	**Trench, 0 to 10 feet bgs** COPCs—ingestion, dermal contact, and inhalation of volatiles ROPCs—ingestion and external
Future Hypothetical Resident Adult and Child **(ages 0 to 6 years)**	**Vapor intrusion** COPCs—inhalation of volatiles in indoor air **Tap water** COPCs— ingestion, dermal contact, and inhalation of volatiles in household air ROPCs—ingestion, external radiation (immersion), and inhalation (radium-226 and decay progeny, including radon-222)

Final COCs and ROCs

Final COCs or ROCs were identified for a groundwater-related exposure medium/pathway (i.e., tap water, household air from volatilization of chemicals during tap water usage, or indoor air via vapor intrusion) if the pathway was estimated to have a cumulative ELCR exceeding the USEPA target limit of one-in-10,000 chance of developing cancer (i.e., an ELCR of 10^{-4}) or a cumulative noncancer HI exceeding the EPA threshold level where noncancer effects are not expected to occur (i.e., a HI of 1). Where the target limit for ELCR or threshold for HI are exceeded, the exposure medium is considered an "exposure medium of concern" based on the generally acceptable risks under CERCLA; National Contingency Plan (NCP) §300.430(e)(2)(i)(A)(1) & (2).

The final COCs/ROCs were those IDA-related contaminants that individually contribute an ELCR greater than one-in-a-million ($1x10^{-6}$) to groundwater-related exposure pathways or that contribute a hazard quotient greater than 0.1 to a target organ-specific HI above 1. Whether or not a IDA-related contaminant exceeded available drinking water standards (MCLs) or other criteria evaluated in the risk characterization step of the baseline risk assessment was also considered when identifying final COCs/ROCs.

Using the process described above, the final COCs and ROCs for groundwater at the IDA were identified for current/future site workers (industrial land use) and hypothetical future residents (residential land use). Final COCs and ROCs were not identified for future construction/utility workers because the baseline risk assessment determined there are no unacceptable risks or hazards associated with the future construction/utility workers exposure pathways. Final COCs and ROCs are presented in **Table 2**.

Table 2 – Final COCs and ROCs

Industrial Land Use	Residential Land Use
Site Workers	1,2-DCA
2-Methyl-4,6-dinitrophenol	2,4-Dichlorophenol
Naphthalene	2,4-DNT
PCP	2,6-DNT
Total 2,3,7,8-TCDD (TEQ)	2-Amino-4,6-dinitrotoluene
Trichloroethene	2-Methyl-4,6-dinitrophenol
Vinyl chloride	Benzene
Lead-212	Lead-212
Potassium-40	Manganese
	Naphthalene
Construction/Utility Workers:	Nitrobenzene
No COCs or ROCs identified/present	PCP
	Potassium-40
	Radium-226
	Total 2,3,7,8-TCDD (TEQ)
	TCE
	Vinyl chloride

Remedial Action Objectives

Remedial Action Objectives (RAOs) describe what the proposed cleanup alternative is expected to accomplish. They form the foundation for developing and assessing the selected remedial alternatives, identifying applicable or relevant and appropriate requirements (ARARs) and to-be-considered criteria, and presenting preliminary remediation goals (PRGs). Because COCs may pose a risk to future industrial workers and future hypothetical residents, PRGs for groundwater were established for both future industrial workers and residents.

The RAOs developed for the IDA are:

- Prevent exposure of future human receptors (residents and industrial workers) to impacted groundwater until COC concentrations meet remediation goals (RGs).
- Prevent or minimize further migration of the contaminated groundwater plume at OU-4.
- Reduce COC concentrations in groundwater to RGs.

PRGs were developed in the FS (Jacobs, 2023) for groundwater COCs that contribute to unacceptable risk to human health under the residential and industrial land use scenarios (**Table 3**).

To meet the RAOs, residential PRGs will need to be met. However, the interim remedy for soil and waste under IRP site IAAP-020_IDA includes LUCs that will need to be maintained indefinitely. Therefore, more aggressive groundwater treatment is proposed for areas that show risk to industrial receptors. The industrial PRGs are used to help identify those areas for active treatment.

Figure 4 shows the COC plumes based on the residential PRGs.

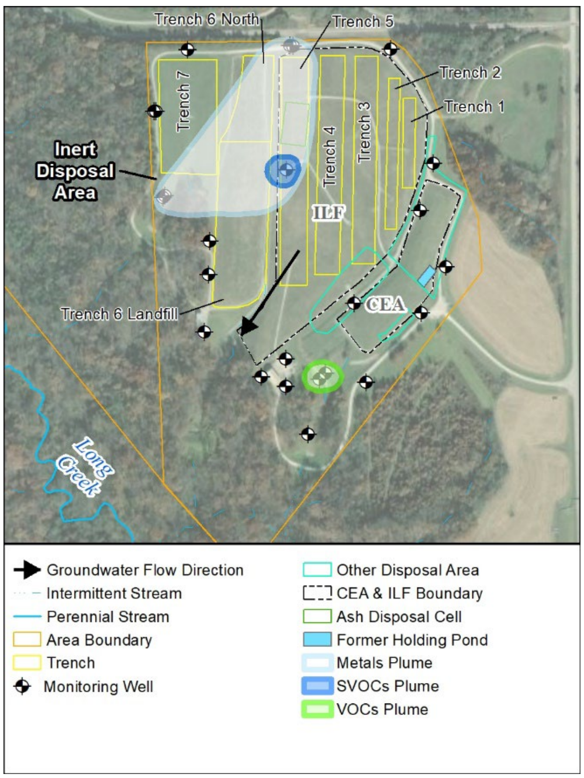

Figure 4 – Site-Specific COC Plumes Based on Residential PRGs

Table 3 – Proposed Residential and Industrial PRGs

COC	Residential PRG (µg/L)[a]	Industrial PRG (µg/L)[b]
2-methyl-4,6-dinitrophenol	1.5	7.41
1,2-DCA	5	N/A
2,4-Dichlorophenol	20	N/A
2,4-DNT	5	N/A
2,6-DNT	5.1	N/A
2-Amino-4,6-dinitrotoluene	1.9	N/A
Benzene	5	N/A
Nitrobenzene	70	N/A
Naphthalene	100	100
PCP	1	1
Total 2,3,7,8-TCDD (TEQ)	3.0×10^{-5}	3.0×10^{-5}
TCE	5	5
Vinyl chloride	2	2
Manganese	30	N/A
Lead-212	2.02[c]	6.18[c]
Potassium-40	2.12[c]	6.48[c]
Radium-226	0.136[c]	N/A

[a] The basis for the residential PRG is provided in the FS (Jacobs, 2023).
[b] The basis for the industrial PRG is provided in the FS (Jacobs, 2023).
[c] Units for radium-226, lead-212, and potassium-40 are picocuries per liter.

µg/L = microgram(s) per liter

N/A = not applicable; the chemical was only identified as a residential COC and is not an industrial COC.

Summary of Remedial Alternatives

Screening of technologies and process options were chosen based on professional experience, published sources, and relevant documentation. Technologies and process options considered infeasible based on effectiveness, implementability, and costs were not carried forward. **Table 4** shows a description of the evaluation criteria. **Table 5** presents a summary of the estimated cost of each alternative.

The following remedial alternatives were developed to address COCs and ROPCs in groundwater at IAAP-020G in the FS:

- Alternative 1—No Action
- Alternative 2—MNA with LUCs
- Alternative 3—Groundwater extraction and treatment with MNA and LUCs
- Alternative 4—PRB with MNA and LUCs

The No Action alternative (Alternative 1) is required by the NCP for baseline comparison purposes (*Code of Federal Regulations* Title 40, Part 300.430[e][6]). Alternatives 2, 3, and 4 provide protection of human health and the environment and would be expected to comply with ARARs, while Alternative 1 would fail to comply with ARARs. The alternatives would rely on LUCs to help maintain protectiveness until COC concentrations meet RGs.

In accordance with the 2008 IROD for OU-4 soil, LUCs restricting residential use are in place at the IDA (Tetra Tech, 2014). As a result, the industrial PRGs were used to guide the conceptual designs for each of the remedial alternatives. The alternatives are described in the subsequent sections, along with estimated capital, operations and maintenance (O&M), and present-worth costs.

Alternatives

Alternative 1—No Action

Total Present-Worth Cost: $0

This alternative is required and serves as a baseline for comparing other alternatives. Under this alternative, the site would remain in its present condition and no RA would be taken. There would be no institutional controls, containment, removal, treatment, or other mitigating actions implemented to control exposure to COCs.

Alternative 2— MNA with LUCs

Total Present-Worth Cost: $1,306,000[1]

This alternative includes MNA and LUCs to address site-related COCs in groundwater at the IDA. Natural attenuation includes a variety of physical, chemical, and biological processes that act without human intervention to reduce contaminant mass; toxicity, mobility, or volume (TMV); or concentrations.

Biodegradation is the most important destructive attenuation mechanism, although some compounds can be destroyed through abiotic processes. Other nondestructive attenuation mechanisms include sorption, dispersion, dilution from recharge, and volatilization (USEPA, 1998). Regular monitoring of contaminant concentrations would be conducted to assess the effectiveness of the natural attenuation processes.

The MNA RA would include installing new monitoring wells to expand the existent monitoring well network, groundwater sampling, and sitewide gauging. Data collected in the first year will establish a baseline for the MNA RA and offer an understanding of subsurface geochemical conditions influencing natural attenuation processes (**Figure 5**). Samples would be analyzed for site residential and industrial land use COCs and analytical parameters consistent with the 2018 RCRA Permit (USEPA, 2018), the Class I and II RCRA Permit Modifications, and any future permit modifications until the ROD is finalized. Select monitoring wells would also be sampled for geochemical parameters to assess oxygen conditions in the subsurface at the IDA and determine the degradation process.

Groundwater sampling would occur over the life of the remedy to monitor COC concentrations and plume stability (i.e., confirm that COCs are not

[1] Cost is the total present-worth value; cost accuracy ranges from −30% to +50%.

migrating offsite), evaluating the effectiveness of natural attenuation processes in achieving the RAOs. The LTM plan would be reviewed periodically and optimized during remedy implementation and each 5-year review, reflecting any changes in site conditions and the fate and transport of the COCs at the site. Annual monitoring would focus on industrial COCs, while 5-year review monitoring would also assess residential COCs. For cost-estimating purposes, the FS assumed that monitoring would occur for 30 years.

The existing LUCs for soil at the IDA can also prevent exposure of future human receptors to groundwater COCs and meet the RAOs for the IAAP-020G_Inert Disposal Area Groundwater site. The OU-4 Land Use Control Implementation Plan (LUCIP) (Tetra Tech, 2014) includes both engineering (physical) and institutional (administrative, legal) controls to restrict access, prohibit unauthorized intrusive activities, and ban the use of groundwater as a drinking water supply within the landfill boundary.

The LUCs have specific performance objectives, including the prohibition of the development and use of property for residential housing, elementary and secondary schools, childcare facilities, and playgrounds. This LUCIP would be modified once the final ROD has been issued for OU-4 to incorporate the IAAP-020G_IDA Groundwater site, AR-200-10, and IAAAP master planning requirements. Regular 5-year reviews would also be conducted as part of this alternative, ensuring the ongoing effectiveness of the remedy in protecting human health and the environment.

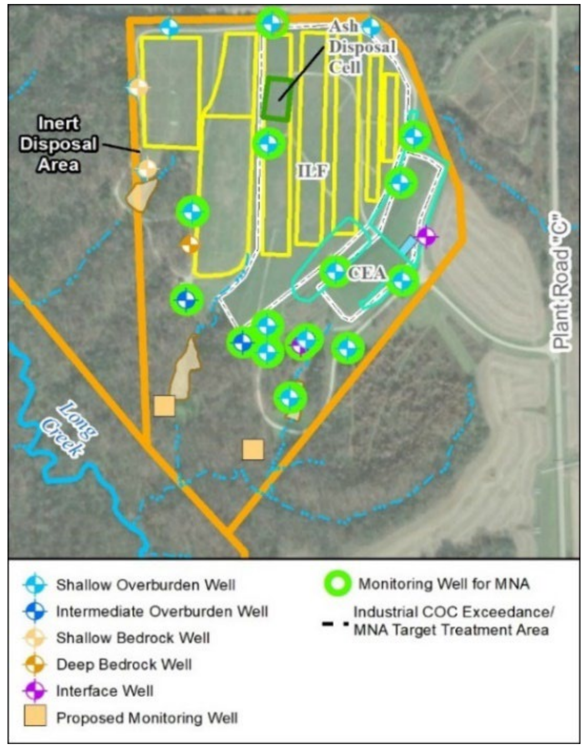

Figure 5 – Alternative 2 MNA Monitoring Well Locations

Alternative 3 — Groundwater Extraction and Treatment with MNA and LUCs

Total Present-Worth Cost: $5,891,000[2]

This alternative involves a pre-design investigation (PDI), installation of extraction wells and a conveyance system, an update to the existing groundwater treatment system, performance monitoring, and implementation of LUCs.

To optimize system performance, a PDI would be conducted to refine the horizontal and vertical extent of the plume to finalize the configuration of the system design. The PDI data would also be used to evaluate different granular activated carbon (GAC) for media treatment and obtain hydraulic properties of the aquifer that could impact groundwater extraction. The PDI would include well installation, a GAC column test, and an extraction system pilot test. The GAC test would provide information regarding the performance of the different GAC media and the duration before media replacement is needed. The pilot test would

[2] Cost is the total present-worth value; cost accuracy ranges from -30% to +50%.

include slug testing and aquifer pump testing and be used to identify the final pumping rates, extraction well locations and spacing, and conveyance piping sizing.

Upon completion of the remedial design, groundwater extraction wells, an aboveground conveyance system and air conduit, and pump station would be constructed. The extraction well system would be located in the southwestern portion of the IDA, perpendicular to groundwater flow, to capture contaminated groundwater downgradient of Trenches 1 through 7 (**Figure 6**). The extracted groundwater would be conveyed and treated in an aboveground treatment system.

The pump station would transport extracted groundwater to the existing treatment building. This pump station would consist of a pre-engineered structure, centrifugal pump, equalization tank with secondary containment, and necessary controls to convey the water to the treatment building. Air compressor systems at the pump stations would supply air for the extraction well pumps.

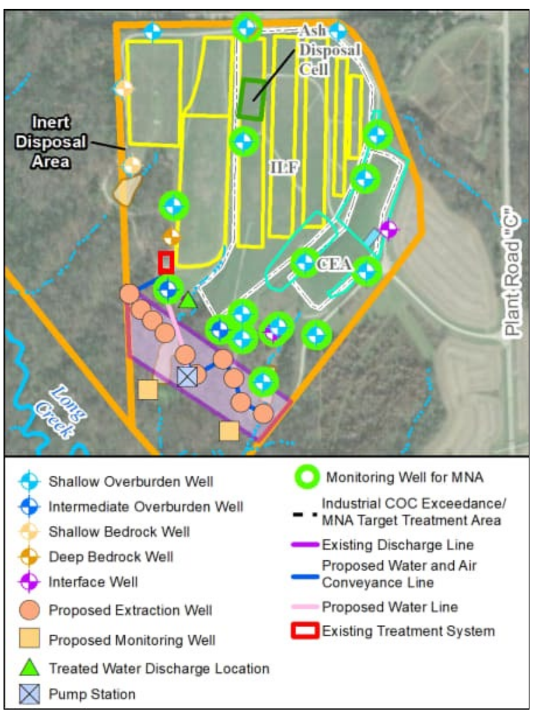

Figure 6 – Alternative 3 Groundwater Extraction and Treatment Layout

The existing groundwater treatment system at the IDA, originally designed to treat leachate from the Trench 6 Landfill, would be repurposed for the treatment of the extracted groundwater for this alternative. The system would be modified and replace the existing carbon treatment vessels to address the volume and concentrations of contaminants captured by the extraction system. The treated water would then be discharged to a batch tank.

Activities for O&M in this alternative would include operation of the extraction wells and the water treatment operations. Carbon would not be disposed of but would be sent back to the vendor for reactivation.

Performance monitoring and MNA would include groundwater sampling as described for Alternative 2. In addition, samples from effluent treatment would be collected to ensure compliance with discharge requirements and to decide when change-out of the lead carbon vessel is required. For cost-estimating purposes, the FS assumed that monitoring would occur for 30 years.

Similar to Alternative 2, Alternative 3 would also conduct 5-year reviews to ensure the remedy continues to protect human health and the environment.

Alternative 4 — PRB with MNA and LUCs

Total Present-Worth Cost: $6,584,000[3]

This alternative involves a PDI, the construction of a PRB to naturally intercept contaminated groundwater, performance monitoring, and the implementation of LUCs. A PRB is an in situ permeable treatment zone designed to passively intercept and remediate a contaminant plume. Groundwater and target chemicals would flow through the PRB hydraulically without mechanical assistance; contaminants would be degraded, destroyed, and immobilized once in contact with the media; and treated water would exit the other side of the PRB.

To obtain data for the remedial design, a PDI would be conducted to establish the current plume extent and obtain injection design data. The PDI would include well installation, geotechnical data

[3] Cost is the total present-worth value; cost accuracy ranges from −30% to +50%.

collection, and an injection pilot study. Following the remedial design, a PRB consisting of lines of injection wells would be constructed.

The PRB would be located in the southwestern portion of the IDA, perpendicular to groundwater flow, to treat contaminated groundwater downgradient of Trenches 1 through 7 (**Figure 7**). The PRB injection wells would be evenly distributed across approximately 850 feet to target the COCs and consider topography and site features in the final alignment. To cover the entire vertical zone of contamination, nested well pairs can be used. The reactive reagents used in the PRB would include liquid activated carbon and sulfidated zero-valent iron (ZVI). The injectable carbon would coat the aquifer materials, removing the contaminants from the dissolved phase onto the surface of the carbon.

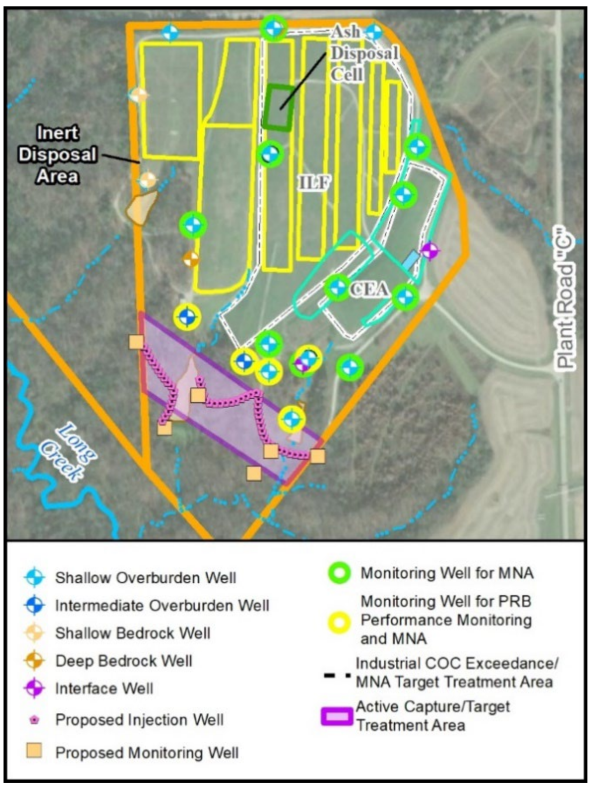

Figure 7 – Alternative 4 PRB Layout

The ZVI would reduce contaminants susceptible to abiotic degradation and facilitate the reduction of dissolved VOCs to nontoxic end products. Additional injections would replenish the reactive materials in the PRB as needed. If warranted, a bioaugmentation culture could also be injected to enhance biodegradation of VOCs. MNA would include groundwater sampling as described for Alternative 2. Performance monitoring for the PRB would be conducted on a more frequent basis for the first 2 years but would be optimized similar to the MNA LTM plan. For cost-estimating purposes, the FS assumed that monitoring would occur for 30 years.

LUCs would be implemented as discussed for Alternative 2. 5-year reviews would also be conducted as part of this alternative to ensure the remedy continues to protect human health and the environment.

Evaluation of Alternatives

In accordance with CERCLA and the NCP, the Army and USEPA considered the nine Evaluation Criteria (refer to **Table 4**) to determine the best alternative for IAAP-020G_Inert Disposal Area Groundwater (HQAES 19105.1026). The NCP includes these nine criteria to enable the detailed analysis of the remedial alternatives.

Table 4 – CERCLA Evaluation Criteria for Remedial Alternatives

Evaluation Criteria
Threshold Criteria
1) Overall Protection of Human Health and the Environment: Each alternative was assessed to evaluate whether it can adequately protect human health and the environment, in both the short- and long-term, from unacceptable risks posed by contaminants at the site by eliminating, reducing, or controlling exposures to levels established during development of the remedial goals. Overall protection of human health and the environment draws on the assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs.
2) Compliance with ARARs: Remedial alternatives are required to achieve ARARs unless specifically waived. ARARs include substantive provisions of any promulgated federal or more stringent state environmental or facility siting standards, requirements, criteria, or limitations that are determined to be legally ARARs for a CERCLA site.

Table 4 – CERCLA Evaluation Criteria for Remedial Alternatives

Evaluation Criteria
Balancing Criteria
3) Long-Term Effectiveness and Permanence: Each alternative was assessed for the long-term effectiveness and permanence it provides in maintaining protection of human health and the environment after the response objectives have been met.
4) Reduction of TMV of Contaminants through Treatment: Each alternative was assessed against this criterion to evaluate the performance of alternative-specific treatment technologies. More specifically, this criterion 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.
5) Short-Term Effectiveness: The short-term effectiveness of each alternative was assessed considering the short-term risks that might be posed to the community during implementation of the alternative; potential environmental impacts of the RA and the effectiveness and reliability of measures taken to mitigate impacts during implementation; and length of time needed until protection is achieved.
6) Implementability: The ease or difficulty of implementing each alternative was assessed by considering the following types of factors (as appropriate): (1) technical feasibility, including technical difficulties and unknowns associated with the construction and operation of a technology, the reliability of a technology, the ease of undertaking additional remedial actions, and the ability to monitor the effectiveness of the remedy; (2) administrative feasibility, including activities needed to coordinate with other offices and agencies, and the ability and time required to obtain any necessary approvals and permits from other agencies; and (3) availability of services and materials, including the availability of necessary equipment and specialists.
7) Cost: The types of cost that were assessed included capital costs, both direct and indirect; annual O&M; and net present-worth of capital and O&M costs. The present-worth of each alternative provides the basis for the cost comparison.
Modifying Criteria
8) State/Support Agency Acceptance: The assessment reflects the State of Iowa's (and support agency's) apparent preferences among, or concerns about, alternatives.
9) Community Acceptance: The assessment includes determining which components of the alternatives interested parties in the community support, have reservations about, or categorically reject.

The following sections summarize the findings from the evaluation of the alternatives developed for IAAP-020G using the nine CERCLA criteria, as presented in the FS report.

Threshold Criteria

Overall Protection of Human Health and the Environment

Alternative 1 (No Action) does not protect human health and the environment.

Alternative 2 (MNA with LUCs) protects human health and the environment by preventing exposure and access to contaminated groundwater and monitoring that risks are being controlled.

Alternative 3 (Groundwater extraction and treatment with MNA and LUCs) protects human health and the environment by containing impacted groundwater, treating extracted groundwater, and preventing exposure and access to contaminated groundwater.

Alternative 4 (PRB with MNA and LUCs) protects human health and the environment by containing the plume within situ treatment and preventing exposure and access to contaminated groundwater.

Alternatives 2, 3, and 4 provide protection of human health and the environment and would be expected to comply with ARARs. The alternatives would rely on LUCs to help maintain protectiveness until COC concentrations meet RGs.

Compliance with ARARs

Alternative 1 (No Action) does not meet ARARs, because no action would be taken.

Alternative 2 (MNA with LUCs) complies with ARARs once natural attenuation processes have reduced COC concentrations.

Alternative 3 (Groundwater extraction and treatment with MNA and LUCs) complies with ARARs after ex situ treatment process and natural attenuation processes have reduced COC concentrations.

Alternative 4 (PRB with MNA and LUCs) complies with ARARs after in situ treatment process and natural attenuation processes have reduced COC concentration.

Alternative 2 would rely solely on natural attenuation to meet RAOs, whereas Alternatives 3 and 4 would implement active treatment technologies to reduce contaminant mass and prevent migration of the contaminant plumes. Alternative 3 provides hydraulic containment of groundwater and ex situ treatment, and Alternative 4 provides in situ treatment through the use of a PRB.

Long-Term Effectiveness and Permanence

Alternative 1 (No Action) provides no controls or long-term management measures.

Alternative 2 (MNA with LUCs) provides gradual reduction of risk or containment mobility and thus provides long-term effectiveness and permanence.

Alternative 3 (Groundwater extraction and treatment with MNA and LUCs) provides long-term effectiveness and permanence; gradual reduction is achieved by MNA while groundwater extraction would provide immediate residual risk reduction.

Alternative 4 (PRB with MNA and LUCs) provides long-term effectiveness and permanence; gradual reduction is achieved by MNA while in situ treatment would quickly remove residual risks within the treatment area.

Alternatives 2, 3, and 4 would have the same level of residual risks because no active treatment process would be used to reduce COC concentrations within landfill areas where concentrations exceed industrial or residential PRGs.

Alternatives 2, 3, and 4 would be adequate and reliable in preventing direct contact with exposure to untreated groundwater through LUCs until cleanup goals are achieved.

Reduction of TMV of Contaminants through Treatment

Alternative 1 (No Action) any reduction in TMV is not monitored.

Alternative 2 (MNA with LUCs) does not significantly reduce TMV from active treatment. Passive reduction in TMV may occur from natural processes.

Alternative 3 (Groundwater extraction and treatment with MNA and LUCs) provides reduction in TMV of COCs through removal and ex situ treatment. Regeneration or offsite disposal of the GAC would be required.

Alternative 4 (PRB with MNA and LUCs) provides reduction in TMV of COCs through in situ treatment.

Alternatives 2, 3, and 4 would also gradually reduce risks and TMV of contaminants as a result of passive natural attenuation processes.

However, only Alternatives 3 and 4 would meet the NCP preference for active treatment and result in a faster reduction of TMV via groundwater extraction and in situ PRB treatment.

Alternative 4 would not generate any treatment residuals, while Alternative 3 would require disposal of GAC at the end of the treatment period.

Short-Term Effectiveness

Alternative 1 (No Action) does not pose additional risks to the community, the workers, or the environment.

Alternative 2 (MNA with LUCs) poses low to moderate risk of exposure to personnel involved in installation of monitoring wells and in monitoring field activities. Risk to surrounding community is minimal during well construction activities. Low environmental impacts are expected. LTM and LUCs will increase the length of time that the action needs to be implemented.

Alternative 3 (Groundwater extraction and treatment with MNA and LUCs) poses low to moderate risk of exposure to personnel involved in installing monitoring and extraction wells, while there is moderate to high risk of exposure to personnel involved in constructing the treatment system.

There is a low risk of exposure to personnel involved in monitoring field activities. The risk to the surrounding community would be minimal during construction activities. This alternative would result in high environmental impacts. LTM and LUCs would increase the length of time that the action needs to be implemented.

Alternative 4 (PRB with MNA and LUCs) poses low to moderate risk of exposure to personnel involved in installing monitoring and injection wells; there would be moderate risk to personnel involved in injections.

There is a low risk of exposure to personnel involved in monitoring field activities. The risk to surrounding community would be minimal during construction activities. This alternative would result in moderate to high environmental impacts. LTM and LUCs would increase the length of time that the action needs to be implemented.

Alternative 2 would provide the greatest short-term effectiveness and least environmental impacts because it would require the least amount of construction and maintenance of the three alternatives.

The remediation timeframe is assumed to be greater than 30 years for all three alternatives because they all rely on natural attenuation processes within the higher-concentration landfill area. For cost-estimating purposes, **Table 5** shows estimated costs for each alternative assuming that monitoring would occur for 30 years.

Implementability

Alternative 1 (No Action) is implementable, as no action is needed.

Alternative 2 (MNA with LUCs) is relatively simple to implement; installation of two monitoring wells, initiating a routine groundwater sampling program and implementing LUCs are all well-accepted and conventional actions that have been successfully implemented at numerous sites across the country. The level of work required for these actions is much less than required for Alternatives 3 and 4.

Alternative 3 (Groundwater extraction and treatment with MNA and LUCs) requires conventional heavy machinery and equipment that is commercially available; however, construction may result in schedule delays. Operation of groundwater extraction and treatment system are considered moderately complex. There are uncertainties with the management and disposal of extracted water.

Alternative 4 (PRB with MNA and LUCs) requires conventional heavy machinery, equipment, and injection reagents that are commercially available; however, construction and injections may result in schedule delays. PRB re-injections would be easy to implement.

Alternative 2 has the greatest implementability because it requires the least amount of construction and maintenance of the three alternatives. However, all alternatives could be implemented reliably onsite.

The active treatment components of Alternatives 3 and 4 would require that a greater number of subcontractors be involved and therefore would have a higher likelihood of schedule delays.

Cost

There are no projected costs associated with Alternative 1. The costs for implementation of Alternatives 2, 3, and 4 vary based on the level of effort to achieve the RGs. **Table 5** lists the estimated present-day cost for each alternative, as presented in the FS.

Table 5 – Cost

Alternative	Estimated Cost[a] (Assuming a 30-year timeframe)
Alternative 1—No Action	No cost
Alternative 2—MNA with LUCs	$1,306,000
Alternative 3—Groundwater extraction and treatment with MNA and LUCs	$5,891,000
Alternative 4—PRB with MNA and LUCs	$6,584,000

[a] Cost is the total present-worth value; cost accuracy ranges from −30% to +50%.

Alternative 2 would be the lowest-cost alternative, while Alternative 4 would have the highest associated costs.

Modifying Criteria

The Iowa Department of Natural Resources and USEPA have accepted the assessment and concur with the Preferred Alternative. The Community Acceptance modifying criteria will be evaluated in the ROD, following public comments on this Proposed Plan.

Preferred Alternative

Alternative 2— MNA with LUCs

Based on the comparative analysis, the Preferred Alternative to address risk associated with groundwater at the IDA (IAAP-020G_Inert Disposal Area Groundwater [HQAES 19105.1026]) is Alternative 2, MNA with LUCs.

Alternative 2 includes LTM of natural attenuation processes and LUCs to meet the RAOs. This alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria.

Alternative 2 provides the greatest short-term effectiveness, the least environmental impacts, and the highest implementability. It also is the most cost effective over the long term. While Alternatives 3 and 4 include active treatment, they may not shorten the remediation timeframe, because MNA will still be relied on to reduce COCs to their residential RGs. However, the inclusion of active treatment would result in greater short-term risks, lower implementability, and higher costs.

The Army, USEPA, and Iowa Department of Natural Resources support Alternative 2 as the Preferred Remedial Alternative when evaluating it against the evaluation criteria. The Army and USEPA expect the Preferred Remedial Alternative to satisfy the following statutory requirements of CERCLA Section 121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; and (4) use permanent solutions and alternative treatment technologies to the maximum extent practicable.

Community Participation

Detailed information regarding this proposed action is available in the Administrative Record File, which is located online at https://iaaaprestoration.com/adminrecord/. A hard copy is located at the IAAAP Restoration Repository. The Burlington Public Library has computers available to the public for those interested in viewing the electronic version of the Administrative Record. An announcement of the availability of this Proposed Plan was published in the Hawk Eye newspaper during week of July 8, in accordance with CERCLA.

The Army is seeking comments on the action recommended in this Proposed Plan. A public comment period running from July 1 to July 31, 2024, is open during which comments will be accepted and considered before a final decision on the IAAP-020G IDA Groundwater (HQAES 19105.1026) site. In addition, a public meeting will be held at the West Burlington City Hall, 122 Broadway Street, West Burlington, Iowa, at 10:00 am on July 16, 2024, to explain this proposed action and to answer questions and accept comments. A comment form has been included at the end of this document to submit input on the Proposed Plan.

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Acronyms and Abbreviations

µg/L	microgram(s) per liter
1,1-DCA	1,1-dichloroethane
1,2-DCA	1,2-dichloroethane
1,1-DCE	1,1-dichloroethene
2,4-DNT	2,4-dinitrotoluene
ARAR	Applicable or Relevant and Appropriate Requirement
Army	U.S. Army
bgs	below ground surface
CAMU	Corrective Action Management Unit
CEA	Cap Extension Area
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
COPC	chemical of potential concern
ELCR	excess lifetime cancer risk
FFA	Federal Facility Agreement
FS	Feasibility Study
GAC	granular activated carbon
HI	hazard index
HHRA	Human Health Risk Assessment
HQAES	Headquarters Army Environmental System
IAAAP	Iowa Army Ammunition Plant
IDA	Inert Disposal Area
IROD	Interim Record of Decision
IRP	Installation Restoration Program
LTM	long-term monitoring
LUC	land use control
LUCIP	Land Use Control Implementation Plan
MCL	maximum contaminant level
MNA	monitored natural attenuation
MW	monitoring well
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	operations and maintenance
OU-4	Operable Unit 4

PAL	project action limit
PCP	pentachlorophenol
PDI	pre-design investigation
PFAS	per- and polyfluoroalkyl substances
PRB	permeable reactive barrier
PRG	preliminary remediation goal
RA	remedial action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RDX	Royal Demolition Explosive
RG	remediation goal
RI	Remedial Investigation
ROC	radionuclide of concern
ROD	Record of Decision
ROPC	radionuclide of potential concern
SVOC	semivolatile organic compound
TCDD	2,3,7,8-tetrachlorinated dibenzo-p-dioxin
TCE	trichloroethene
TEQ	toxic equivalent
TMV	toxicity, mobility, or volume
OU	operable unit
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
ZVI	zero-valent iron

Glossary of Terms

Abiotic Process – Chemical or physical changes that occur without the involvement of living organisms.

Administrative Record File – A compilation of documents that serve as the basis for the decision in selecting a response action to be taken at a site.

Applicable or Relevant and Appropriate Requirements (ARARs) – The federal and state environmental laws that a selected remedy will meet. These requirements may vary among sites and alternatives.

Aquifer – A geological formation containing water, typically underground and capable of supplying wells or springs.

Bedrock – The solid, unweathered rock layer underlying soil and superficial materials on the Earth's surface.

Biodegradation – The breakdown or transformation of contaminants by microorganisms into simpler, less harmful substances.

Bioaugmentation Culture – Introduction of microorganisms to enhance biological processes, such as the biodegradation of contaminants.

Chlorinated Solvents – Organic solvents, often used in industrial processes.

Chemicals of Concern (COCs) – Substances that are potentially harmful or pose risks to human health or the environment.

Chemicals of Potential Concern (COPCs) – Substances that may pose risks and require further assessment due to their potential impact on the environment.

Comprehensive Environmental Response Compensation, and Liability Act (CERCLA) – The federal law that addresses problems resulting from releases of hazardous substances to the environment.

Conveyance System – Infrastructure for transporting extracted groundwater to treatment facilities.

Dilution – The process of reducing the concentration of contaminants by mixing them with a larger volume of uncontaminated material.

Dispersion – The spreading or distribution of contaminants in a medium, often soil or groundwater.

Dioxins and Furans – A group of highly toxic and persistent organic pollutants.

Ecological Receptors – Living organisms or ecological components that may be impacted by environmental contamination.

Ex Situ Treatment – Treatment of contaminants outside their original location, often involving removal.

Feasibility Study (FS) – This CERCLA document develops and evaluates options for remedial action. The FS emphasizes data analysis and is generally performed concurrently in an interactive fashion with the RI, using data gathered during the RI.

Glacial Till – Unsorted and unstratified sediment deposited directly by glacial ice.

Glacial Outwash – Sediment deposited by meltwater from a glacier, often sorted and stratified.

Groundwater – Water located below the ground surface in the saturation zone.

Groundwater Extraction and Treatment – Involves removing contaminated groundwater, treating it, and then returning it to the environment.

Groundwater Flow – The movement of water through underground soil and rock layers.

Groundwater Monitoring – Systematic observation and measurement of groundwater quality and levels over time.

Groundwater Monitoring Well Network – A system of wells designed to measure and observe the quality and levels of groundwater over time.

Groundwater Monitoring Well Screen – Refers to the sections of the wells through which groundwater enters for sampling.

Groundwater Sampling – Collection and analysis of groundwater samples to monitor contaminant levels.

In Situ – Refers to processes or treatment that occurs in its original location without being removed.

Land Use Controls (LUCs) – Physical, legal, or administrative mechanisms that restrict the use of, or limit access to, contaminated property to reduce risk to human health and the environment. Physical mechanisms encompass a variety of engineered remedies to contain or reduce contamination and physical barriers to limit access to property, such as fences or signs. The legal mechanisms are imposed to ensure the continued effectiveness of land use restrictions imposed as part of a remedial decision. Legal mechanisms include restrictive covenants, negative easements, equitable servitudes, and deed notices. Administrative mechanisms include notices, adopted local land use plans and ordinances, construction permitting, or other existing land use management systems that may be used to ensure compliance with use restrictions.

Leachate – A liquid that has percolated through a solid and extracted dissolved or suspended matter.

Maximum Contaminant Levels (MCLs) – The highest concentration of a contaminant allowed in drinking water, set by regulatory standards.

Monitoring – The process of regularly checking and observing a site or system for changes or potential issues.

Monitored Natural Attenuation (MNA) – To rely on natural attenuation processes, with a carefully-controlled and monitored cleanup approach to achieve site-specific remedial objectives within a timeframe that is reasonable.

National Priorities List (NPL) – USEPA's list of uncontrolled or abandoned waste sites that present the greatest potential threat to human health or the environment.

Natural Attenuation – The process by which contaminants in the environment are reduced or eliminated through natural processes.

Naturally Occurring Chemicals – Chemicals that exist in the environment without human influence or contamination.

Operable Unit – A portion of a site separately considered for remedial or corrective action.

Operations and Maintenance (O&M) – Measures required to operate and maintain remedial systems to ensure the effectiveness of the response action.

Overburden – The layer of soil and rock above a bedrock formation.

Project Action Limit (PAL) – A specific limit set for certain chemicals or parameters based on project requirements.

Permeable Reactive Barrier (PRB) – A barrier designed to treat contaminants as they pass through it, often using reactive materials.

Per- and Polyfluoroalkyl Substances (PFAS) – A group of human-made chemicals used in various industrial applications and consumer products.

Plume – A concentrated area of contaminants spreading in a specific direction within a medium, such as groundwater.

Preferred Remedial Alternative – The remedial alternative selected by the Army and USEPA, based on a comparison of various remedial alternatives using specific evaluation criteria.

Present-Worth – The amount of money that would need to be invested in the current year, at a particular discount rate, to sufficiently evaluation criteria.

Proposed Plan – CERCLA document that summarizes evidence to support the selection of a Preferred Remedial Alternative at a CERCLA site. The document is intended for public distribution to solicit comments on the proposed action(s).

Radionuclide of Concern (ROC) – A radioactive form of an element identified as potentially harmful or posing risks.

Record of Decision (ROD) – The CERCLA decision document that presents the cleanup remedy selected by the Army and USEPA.

Remedial Action Objectives (RAOs) – Site-specific goals to protect human health and the environment.

Remedial Investigation (RI) – A process under CERCLA to determine the nature and extent of the problem presented by a contaminant release. The RI includes sampling, monitoring, and gathering of sufficient information to determine the necessity for remedial action.

Remediation Goals (RGs) – Contaminant concentrations used to identify the soil requiring excavation, treatment, and disposal to meet the RAOs and provide protection for human health and the environment.

Saturation Zone – The area below the ground surface where all available spaces are filled with water.

Sludge Lagoon – A containment area designed for the storage and treatment of sludge, which is a semi-solid residue produced during various industrial and wastewater treatment processes. In the context of the provided text, it refers to the historical feature related to waste management operations.

Slug Testing – A method to measure hydraulic conductivity and storage properties of an aquifer using a sudden change in water level.

Sorption – The process by which contaminants are adsorbed or taken up by soil particles.

Superfund – A federal program designed to fund and implement the cleanup of hazardous waste sites in the United States.

Target Risk Range – USEPA-established acceptable risk range for carcinogens of $1x10^{-4}$ to $1x10^{-6}$. Estimated excess cancer risks within this range are generally considered unlikely in the general population. If calculated risks fall within the risk range, risk managers must determine whether remedial action is warranted to reduce the risk. If the risks are less than $1x10^{-6}$ (less than 1 in 1 million), no remedial action is required. If the risks are greater than $1x10^{-4}$ (1 in 10 thousand), remedial action is generally required.

Toxicity, Mobility, or Volume (TMV) – Characteristics of contaminated media (soil, groundwater etc.) that are monitored over time to assess and track the reduction of contamination.

Zero-Valent Iron (ZVI) – A form of iron that lacks an electrical charge, used to facilitate reduction reactions in the remediation of contaminants.

Use this Space to Write your Comments

Your input to the Proposed Plan process for the IRP site IAAP-020G_Inert Disposal Area Groundwater (HQAES 19105.1026) is important to the Army. The comments that the Army receives are vital to select the cleanup remedy for the site. Changes to the Preferred Remedial Alternative can be made based on comments made by the public.

Please use the space below to submit your comments on the Proposed Plan for the IDA Groundwater site. If you need more space for your comments, attach additional pages. After you have completed the form, mail to the following address: Iowa Army Ammunition Plant, Attn: Jennifer Busard (JMIA-OSR), Iowa Army Ammunition Plant, 17571 Highway 79, Middletown, Iowa, 52638-5000.

Comments must be postmarked by TBD.

If you have any questions about the comment period, please contact Jennifer Busard at (319) 753-7339.