Final PROPOSED PLAN

HAA-01 FORMER FIRE TRAINING AREA AND DAACG CHLORINATED SOLVENTS AREA

SAVANNAH, GEORGIA

HUNTER ARMY AIRFIELD, GEORGIA

IMA

3d Inf Div (Mech)

Date: To Be Determined (TBD)

Hunter Army Airfield Proposed Plan

This **Proposed Plan** identifies and provides the rationale for the Preferred Alternative for remediating contaminated soil and groundwater impacts at the Hunter Army Airfield (HAAF) Former Fire Training Area (FTA) and Departure/Arrival Airfield Control Group (DAACG) Chlorinated Solvents Area. Due to their proximity and history, the FTA and DAACG Area have been collectively identified as HAA-01 for investigation and remediation purposes. Alternative remedies that were evaluated for this site are also provided. This document is issued by HAAF, the responsible party for site activities, and the Georgia Environmental Protection Division (GAEPD), which oversees regulatory actions for this site. HAAF, in consultation with GAEPD, will select a final remedy after reviewing and considering all information submitted during the 30-day public comment period. HAAF, in consultation with GAEPD, may modify the Preferred Alternative or select another response action presented in this Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives in this Proposed Plan. Please note body text shown in **bold** that does not represent a section heading is defined in the glossary.

HAAF is issuing this Proposed Plan as part of its public participation responsibilities under Section 117 of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** of 1980, as amended, 42 United States Code § 9617, as amended by the Superfund Amendments and Reauthorization Act, and Section 300.430(f)(ii) of the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R.§ 300.430(f)(ii)**. This Proposed Plan summarizes information that can be found in greater detail in the **Remedial Investigation/Feasibility Study (RI/FS)** Report (Arcadis, 2018) and other documents contained in the **Administrative Record** file for this site. HAAF and the GAEPD encourage the public to review these provided documents to gain a more comprehensive understanding of the site, as well as remedial activities that have been conducted at the site.

DATES TO REMEMBER

PUBLIC COMMENT PERIOD:

Date: TBD

HAAF will accept written comments on the Proposed Plan during the 30-day public comment period.

PUBLIC MEETING:

Date: TBD

6:00 p.m. – 8:00 p.m.

HAAF will hold a public meeting to clarify any questions regarding the Proposed Plan and all remedial alternatives presented in the Feasibility Study. Oral and written comments will be accepted at the meeting. The meeting will be held at the Southwest Chatham Library, located at: 14097 Abercorn Street, Savannah, GA 31419 at 6:00 p.m.

For more information, see the Administrative Record for the site at the following locations:

Fort Stewart
DPW Prevention & Compliance Branch
1550 Veterans Parkway Building 1137,
Fort Stewart, Georgia 31314
(912)315-5144 or (912)767-2010
Hours: Mon. – Fri. 8:00 a.m. – 4:00 p.m.

Website:
https://home.army.mil/stewart/index.php/about/Garrison/DPW/environmental/prevention-and-compliance/adminrecord

This Proposed Plan includes the following sections:

- SITE BACKGROUND
- HAA-01 AREAS OF INVESTIGATION
- SITE CHARACTERISTICS
- SCOPE AND ROLE OF ACTION
- SUMMARY OF SITE RISKS
- REMEDIAL ACTION OBJECTIVES
- SUMMARY OF REMEDIAL ALTERNATIVES
- EVALUATION OF REMEDIAL ALTERNATIVES
- SUMMARY OF PREFERRED ALTERNATIVE
- COMMUNITY PARTICIPATION
- GLOSSARY OF TERMS
- REFERENCES

SITE BACKGROUND

HAAF is an active military installation located in Savannah, Georgia, with areas of industrial, commercial, and temporary residential property occupied by a variety of administrative, maintenance, and barracks facilities, as well as an active airfield. HAA-01 is located in the northwestern portion of HAAF, west of the flight line. A site map depicting the HAA-01 area is included as **Figure 1**. Facility locations with **constituents of potential concern (COPCs)** currently and formerly located in the investigation areas are described below.

HAA-01 AREAS OF INVESTIGATION

Former FTA

The former FTA consisted of a gravel covered concrete fire training pad (approximately 6,400 square foot area enclosed within a concrete curb), a steel structure utilized as a mock aircraft, a 17,000-gallon aboveground storage tank (AST) used to store fuel, a 1,100-gallon AST used to contain fuel and solvent-contaminated water and associated underground piping. Typical fire training activities included spraying water contaminated fuels (#4 Jet Propulsion Fuel and diesel fuel) on the mock aircraft, igniting the coated structure, and subsequently extinguishing the aircraft. In 1987, the United States Army Environmental Hygiene Agency (USAEHA) conducted a preliminary assessment of soils near the former fire training pad, during which metals, polycyclic aromatic hydrocarbons (PAHs), and phthalates were detected in soil samples.

Subsequent investigations in 1990 and 1992 detected the presence of metals and petroleum-based **volatile organic compounds (VOCs)** and **semi-volatile organic compounds (SVOCs)** in soil and groundwater. Fire training activities were discontinued at the site in 1991 and all components of the former FTA were removed in 1998 as part of soil remediation activities conducted following prior investigation activities.

DAACG Area

While conducting subsequent field investigations at the former FTA in 2000, **chlorinated VOCs (CVOCs)** cis-1,2-dichloroethene (cis-1,2-DCE) and trans-1,2-dichloroethene (trans-1,2-DCE) were detected in a monitoring well located north of the former FTA. This area was subsequently designated as the DAACG Area. Additional investigations in this area, as well as historical record searches, have been unsuccessful in identifying potential sources for these CVOCs.

SITE CHARACTERISTICS

HAAF conducted multiple field investigations from 1987 to 2012 to investigate the extent and source of potential metals, SVOC, and VOC impacts to soil and groundwater at HAA-01. A supplemental investigation was conducted in December 2014. In addition, surface water and sediment samples have been collected from two drainage ditches adjacent to the former FTA to evaluate potential groundwater discharge to surface water.

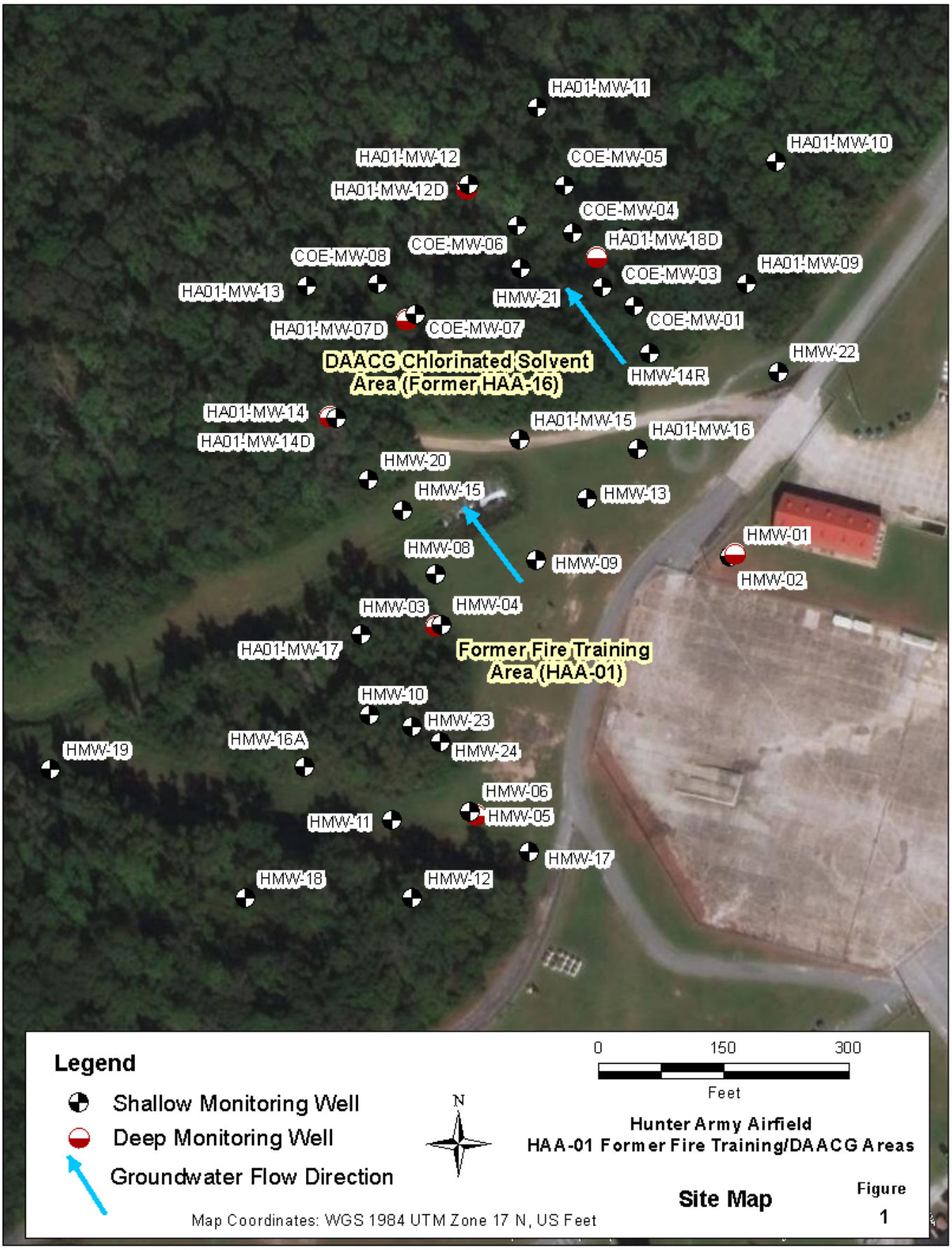
The results of the site investigations indicate that the former FTA appears to be the primary source of petroleum hydrocarbon impacts in the investigation area. The CVOCs are primarily located in the DAACG area, although historical record searches and investigations have been unsuccessful in identifying potential sources.

Petroleum-related impacts above applicable screening levels (e.g., USEPA **Regional Screening Levels [RSLs]; USEPA 2020**) have been observed in subsurface soils at the former FTA to a depth of 10.4 feet below ground surface (ft bgs), with the highest concentrations distributed between the northern and southern portions of the former fire training pad footprint.

Petroleum-related impacts in groundwater have been observed above applicable screening levels (e.g., USEPA **maximum contaminant levels [MCLs]; USEPA 2020**) in the shallow surficial aquifer zone at depths up to 15 ft bgs. The highest petroleum-related concentrations in groundwater are in the northern portion of the FTA, with lower concentrations in the southern portion.

CVOC impacts in groundwater, primarily cis-1,2-DCE and vinyl chloride (VC), have been observed in the shallow surficial aquifer zone beneath the DAACG Area at depths up to 20 ft bgs. CVOC impacts are most elevated near the center of the DAACG Area, and impacts are fully contained within the DAACG Area.

Based on monitoring data collected to date, the primary **constituents of concern (COCs)** in groundwater are cis-1,2-DCE, VC, and benzene, while the target COC in soil has been identified as the PAH benzo(a)pyrene. Groundwater concentration plume maps for cis-1,2-DCE and benzene are shown on *Figures 2 and 3*, respectively. These figures are adequate representations of the areal coverage of CVOCs and petroleum-related impacts, respectively. A full list of COCs at the site is provided on Page 5.


HA01-MW-11
HA01-MW-12
HA01-MW-12D
COE-MW-05
HA01-MW-10
COE-MW-04
COE-MW-06
HA01-MW-18D
COE-MW-08
HA01-MW-09
COE-MW-03
HA01-MW-13
HMW-21
COE-MW-01
HA01-MW-07D
COE-MW-07
DAACG Chlorinated Solvent Area (Former HAA-16)
HMW-14R
HMW-22
HA01-MW-14
HA01-MW-14D
HA01-MW-15
HA01-MW-16
HMW-20
HMW-15
HMW-13
HMW-01
HMW-08
HMW-09
HMW-02
HMW-03
HMW-04
HA01-MW-17
Former Fire Training Area (HAA-01)
HMW-10
HMW-23
HMW-16A
HMW-19
HMW-24
HMW-06
HMW-11
HMW-05
HMW-17
HMW-18
HMW-12
Legend
Shallow Monitoring Well
Deep Monitoring Well
Groundwater Flow Direction
N
0
150
300
Feet
Hunter Army Airfield
HAA-01 Former Fire Training/DAACG Areas
Site Map
Figure
1
Map Coordinates: WGS 1984 UTM Zone 17 N, US Feet

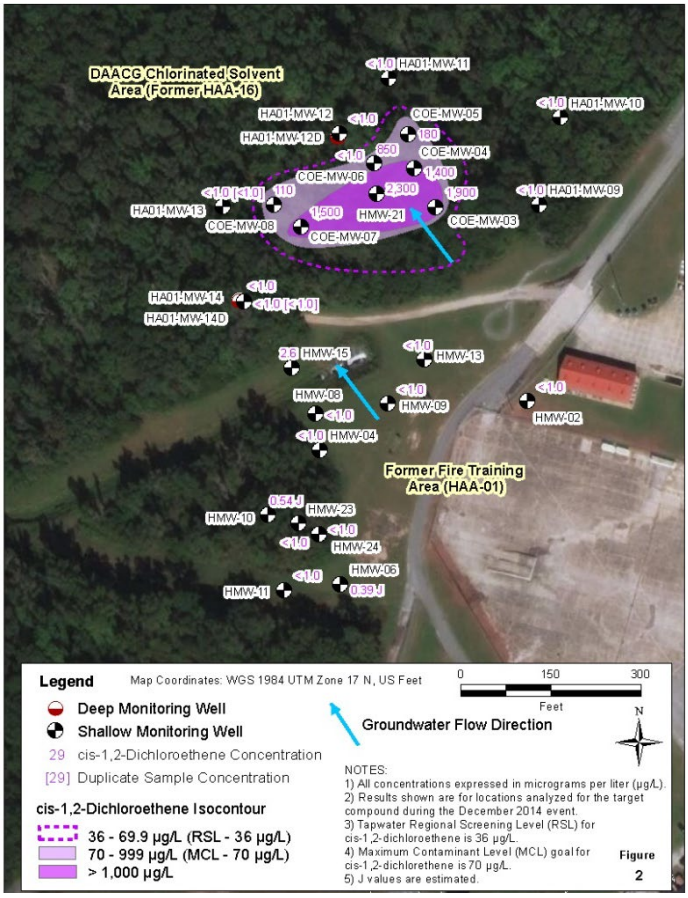


Figure 2. cis-1,2-DCE Concentrations in Groundwater (December 2014)

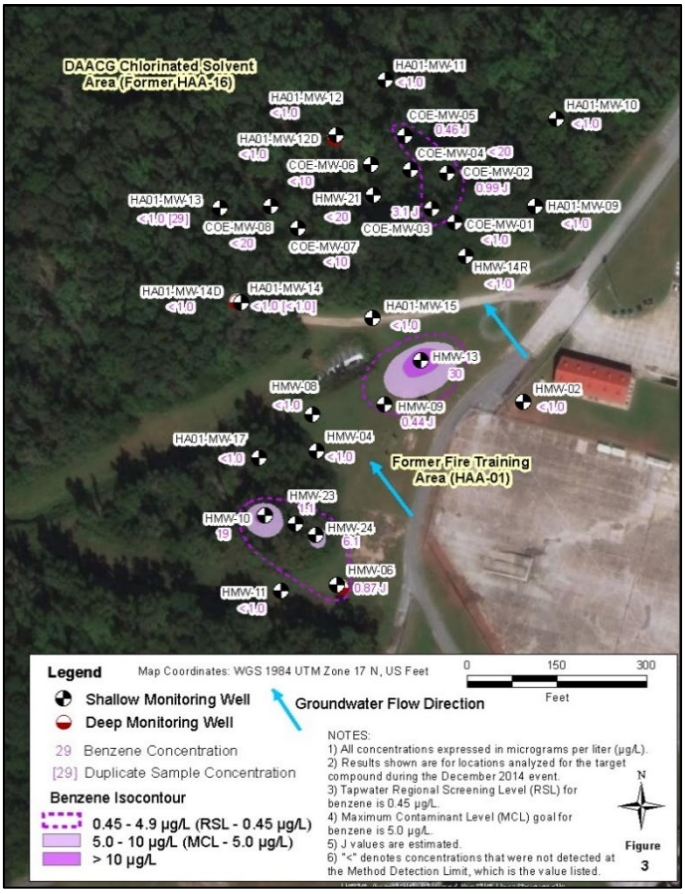


Figure 3. Benzene Concentrations in Groundwater (December 2014)

SCOPE AND ROLE OF ACTION

This proposed action as described in the following sections, will be the final action for this site. The **Remedial Action Objectives (RAOs)** for HAA-01 are to prevent exposure of potential receptors to contaminants through soil, groundwater, surface water, and sediment by the utilization of treatment through the alternative solutions provided in this Proposed Plan. Response actions are focused on groundwater which presents the primary risk at the site. This will result in the permanent reduction of toxicity, mobility, and volume of source contaminants at HAA-01.

SUMMARY OF SITE RISKS

As part of the RI/FS, HAAF conducted a baseline risk assessment to determine the current and hypothetical future risks from contaminants on human health and the environment. Regarding the potential threat to human health, under current conditions construction and site workers could contact contaminated soil or shallow groundwater.

Currently, there are no residential, industrial, or administrative buildings at the site and there are no plans to redevelop HAA-01 for residential purposes. However, land use could change sometime in the future; therefore, both commercial exposure scenarios and residential exposure scenarios for hypothetical future residential land use were evaluated in the Human Health Risk Assessment (HHRA). It is HAAF's current judgement 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, construction, and site workers' health or the environment from actual or potential risks from contaminants at the site.

Human Health Risks

HAAF performed a HHRA to evaluate potential exposure to constituents in soil, groundwater, sediment, and surface water at HAA-01. The available soil, groundwater, sediment, and surface water data were evaluated and compared to applicable screening levels, and COPCs that exceeded screening levels were identified. The use of groundwater as a potable water source drives the risk assessment. The risks from exposure to impacted media not used as a potable water supply were within the USEPA target risk range and the non-cancer hazards were less than the benchmark of 1.

Ecological Risks

The Ecological Risk Assessment performed as part of this RI/FS presents the results through Step 3a of a Baseline Ecological Risk Assessment for **ecological receptors** at the site based on evaluation of available habitat, areal extent of the constituents of potential ecological concern (COPECs), and direct contact and food-chain **hazard quotients (HQs)**. Potential risks were characterized for ecological receptors at the site by considering direct contact with COPECs in surface soil (0 to 1 ft bgs), subsurface soil (0 to 4 ft bgs) and through ingestion of prey tissue via food web modeling.

Overall, the potential ecological risks are considered negligible for exposure to site surface soil and sediment. Most COPECs have HQs below 1. While the HQs for exposure to high molecular weight PAHs and dieldrin in soil are above 1, population-level effects for terrestrial receptors are not expected because COPECs are present in areas with limited areal extent (*de minimis*) and in areas with low quality habitat. Based on this assessment, potential ecological risks at the site are considered negligible, and no further evaluation is required at HAA-01.

REMEDIAL ACTION OBJECTIVES

The RAOs for the remediation of groundwater at the site include the following:

1. Reduce potential cancer risk and potential non-cancer health hazards for people (i.e., site workers and construction workers) exposed to cis-1,2-DCE and VC in contaminated groundwater by reducing the concentrations of or controlling exposure to these COCs in groundwater;
2. Reduce potential exposure of ecological receptors to COCs in groundwater; and
3. Prevent potential for migration of unacceptable levels (RSLs and MCLs discussed in **SITE CHARACTERISTICS**) of cis-1,2-DCE and VC to off-site locations.

Constituents of Potential Concern

HAA-01 Former FTA and DAACG Chlorinated Solvents Area

HAAF and GAEPD have identified the following compounds as the COPCs at HAA-01 that are driving potential risks at the site.

The following COPC in soil and sediment has been identified as posing the greatest potential risk to human health at this site:

Benzo(a)pyrene: Formed during the burning of solid waste, oil, coal, and other organic materials, once derived, it can be used as a laboratory reagent. Benzo(a)pyrene exposure can cause darkening of the skin, rash, and eye irritation, benzo(a)pyrene has been identified as a carcinogen.

The following COPCs in groundwater have been identified as posing the greatest potential risk to human health at this site:

Benzene: Benzene has been detected in the shallow surficial aquifer zone at concentrations ranging from 0.26 micrograms per liter (µg/L) to 1,200 µg/L during investigations conducted between 1990 and 2014. Benzene concentrations have decreased significantly since investigations began at HAA-01; for instance, the highest concentration detected in 2014 was 30 µg/L. Benzene is a natural constituent of crude oil and is one of the most utilized chemical compounds to date. Physiological effects of benzene include neurological and immunological damage. Benzene is classified as a known human carcinogen.

cis-1,2-DCE: Cis-1,2-DCE detections in groundwater ranged from 14 µg/L to 9,000 µg/L during investigations conducted from 1990 to 2014. Cis- 1,2-DCE impacts are entirely contained within the DAACG Area, as shown on *Figure 2*. Cis-1,2-DCE is commonly used in chemical mixtures, to produce solvents, and is a daughter product of Trichloroethylene (TCE). Cis-1,2-DCE has been identified to cause physiological effects including liver and kidney damage, drowsiness, nausea, and cardiovascular complications, and is reasonably projected to be a human carcinogen.

VC: VC detections in groundwater ranged from 0.13 µg/L to 1,230 µg/L during investigations conducted from 1990 to 2014. VC impacts are entirely contained within the DAACG Area. VC is used to manufacture polyvinyl chloride, and is a daughter product of TCE. Adverse health effects of VC include central nervous system depression, ataxia, tingling of extremities, visual disturbances, coma, and death. VC can aggravate the eyes, mucous membranes, and the respiratory tract. VC is a known human carcinogen.

The RAO for the remediation of soil at the site is to reduce potential exposure of construction and site workers to soil in the FTA area.

This proposed action will reduce the risk associated with exposure to contaminated groundwater above **Preliminary Remediation Goals (PRGs)**. For site groundwater, HAAF has established the following PRGs in accordance with calculated Health Based Goals and USEPA MCLs:

- Groundwater:

VOCs
- Benzene – 5 µg/L
- Chloroform – 80 µg/L
- cis-1,2-DCE – 70 µg/L
- 1,2-dichloropropane – 5 µg/L
- 1,1,2,2-tetrachloroethane – 0.335 µg/L
- 1,1,2-trichloroethane – 5 µg/L
- VC – 2 µg/L

SVOCs
- 4-Chlorobenzenamine – 1.63 µg/L

PAHs
- Naphthalene – 0.721 µg/L

Pesticides
- Aldrin – 0.397 µg/L
- Gamma-chlordane – 0.771 µg/L
- Dieldrin – 0.018 µg/L
- Heptachlor epoxide – 0.20 µg/L
- Alpha-hexachlorocyclohexane – 0.0493 µg/L

Inorganics
- Arsenic – 10 µg/L
- Chromium (total) – 100 µg/L
- Iron – 81,700 µg/L

For site soil, HAAF has established the following PRGs based on calculated Health Based Goals:

- Soil:

PAHs
- Benzo(a)pyrene – 2.11 milligrams per kilogram (mg/kg)

SUMMARY OF REMEDIAL ALTERNATIVES

Remedial alternatives for the HAA-01 site are presented below. The alternatives are in consecutive order to correspond with their order in the RI/FS Report. Process options are screened based on effectiveness, implementability, and cost to determine which process options should be used in the development of remedial alternatives.

COCs in Groundwater

Groundwater Remedial Alternatives

Groundwater Alternative 1: No Action

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $0

Under this alternative, HAAF would take no action at the site to prevent exposure to groundwater contamination. The No Action technology, by definition, involves no remedial action at the site and, therefore, has no technological barriers. The potential risks to human health and the environment identified in the risk assessment would not be mitigated by this response. This alternative was retained as required by USEPA guidance.

Groundwater Alternative 2: Long Term Monitoring and Land Use Controls

Estimated Capital Cost: $30,000
Estimated Present Worth Cost: $320,616
Estimated Construction Timeframe: Not Required
Estimated Time to Achieve RAOs: >100 years

A statistical analysis of historical groundwater analytical data conducted as part of the RI/FS indicated that groundwater COC concentrations are declining in some areas over time and do not represent a risk to receptors under the current site conditions. However, calculations of trends in CVOC concentrations in the DAACG area indicate an extended timeframe to achieve PRGs. Groundwater Alternative 2 will utilize **monitored natural attenuation (MNA)** via a long-term monitoring program to demonstrate continued reduction in COC concentrations. In addition, land use controls (LUCs) will be implemented to maintain protection of human health and the environment.

Implementation of the groundwater monitoring program involves continued monitoring of COC concentrations to quantify attenuation rates and demonstrate transformation of the COCs. The infrastructure required to implement monitoring is an adequate monitoring network, which is already in place at the site, translating to relatively low capital costs and moderate operations and maintenance (O&M) costs for sampling, analysis, and monitoring. Because the site is characterized, groundwater monitoring would be relatively infrequent (i.e., semi-annually).

SUMMARY OF REMEDIAL ALTERNATIVES HAA-01 Former FTA and DAACG Chlorinated Solvents Area		
Media	**RI/FS Designation**	**Description**
Groundwater	Alternative 1	No Action
	Alternative 2	Long-term monitoring and land-use controls
	Alternative 3	Enhanced Reductive Dechlorination, MNA, and LUCs
	Alternative 4	In situ chemical oxidation via injection wells; monitoring; land use controls
Soil	Alternative 1	No Action
	Alternative 2	Capping with vegetative cover
	Alternative 3	Excavation and disposal

Applicable LUCs would entail prohibition of potable water well installation and groundwater consumption. Although the shallow nature and low hydraulic conductivity of the aquifer makes it unsuitable for potable water wells, restrictions would be applied to provide assurances that future potable use of groundwater does not occur. Finally, the remedy will include CERCLA five-year reviews. Under CERCLA 121c, any remedial action that results in contaminants remaining onsite at concentrations greater than those allowing unrestricted use must be reviewed as least once every 5 years. Restrictions would remain in place until site groundwater contaminant concentrations are at levels that allow unrestricted use and unlimited exposure.

Groundwater Alternative 3: Enhanced Reductive Dechlorination, MNA, and LUCs

Estimated Capital Cost: $150,456
Estimated Present Worth Cost: $702,242
Estimated Construction Timeframe: 1 year
Estimated Time to Achieve RAOs: 5 years

Groundwater Alternative 3 will implement an **enhanced reductive dechlorination (ERD)** system in the DAACG Area to enhance the mass removal associated with the CVOC (e.g., cis-1,2-DCE and VC) impacted groundwater in the DAACG area. Alternative 3 involves injections of **emulsified vegetable oil (EVO)** via a network of injection wells installed in transects. The goal of EVO injections is to establish a long-lived source of organic carbon to promote degradation of CVOCs.

The injections will target the area with elevated CVOC concentrations (1,000 µg/L of DCE, 10-100 µg/L of VC), while MNA would be relied upon to treat residual COCs in the other areas to achieve RAOs. Exact quantity and location of injection wells are pending the results of baseline sampling. Continued monitoring in the form of performance sampling events and long term MNA monitoring for VOCs will be conducted for several years after injections. These groundwater monitoring programs will track progress of remediation, ensure that conditions remain favorable for continued natural attenuation, and determine when the RAOs have been achieved.

Similar to Groundwater Alternative 2, Groundwater Alternative 3 includes LUCs to prohibit installation of water wells within or downgradient of the source area.

Groundwater Alternative 3 will mitigate risks at the site via carbon substrate injection and subsequent ERD of COCs. Long-term monitoring would be implemented to control the remaining risk/hazards associated with COCs that remain in excess of unrestricted use.

Finally, the remedy will include CERCLA five-year reviews. Under CERCLA 121c, any remedial action that results in contaminants remaining onsite at concentrations greater than those allowing unrestricted use must be reviewed as least once every 5 years. Until RAOs are achieved through natural attenuation of the residual mass, concentrations of COCs in groundwater will remain that preclude the unrestricted use of the site under this alternative. During 5-year site reviews, an assessment is made of whether the implemented remedy continues to be protective of human health and the environment or whether the implementation of additional remedial action is appropriate.

Groundwater Alternative 4: In Situ Chemical Oxidation, MNA, and LUCs

Estimated Capital Cost: $183,431
Estimated Present Worth Cost: $771,510
Estimated Construction Timeframe: 1 year
Estimated Time to Achieve RAOs: 5 years

Groundwater Alternative 4 includes implementation of **in situ chemical oxidation (ISCO)** in the DAACG Area via a network of 11 permanent injection wells installed in three transects. ISCO introduces oxidizing compounds to the aquifer for the purpose of chemically destroying contaminants. ISCO would be deployed for remediation of the area with highest CVOC impacts (1,000 µg/L) (approximately 22,000 square feet). MNA would be relied upon to treat residual COCs in the other areas to achieve RAOs. The oxidizing chemistry that would most likely be optimal is sodium persulfate (oxidizer) and an activator such as sodium hydroxide. The injection program will include two biennial injections of approximately 4,500 gallons of 60 grams per liter (g/L) sodium persulfate and 40 g/L sodium hydroxide.

Quarterly (4 wells), semi-annual (5 wells), and annual (18 wells) performance sampling events will be conducted for two years after injections. Once the injection and initial performance monitoring events are complete, 5 years of semi-annual MNA monitoring of 18 wells for VOCs will be implemented. Finally, 25 years of annual MNA monitoring of 18 wells for VOCs will be implemented. These groundwater monitoring programs will track progress of remediation, to ensure that conditions remain favorable for continued natural attenuation, and to determine when the RAOs have been achieved.

Similar to Groundwater Alternative 3, Groundwater Alternative 4 will include CERCLA five-year reviews until RAOs are achieved to assess whether the implemented remedy continues to be protective of human health and the environment or whether the implementation of additional remedial action is appropriate. Groundwater Alternative 4 will also include LUCs to prohibit installation of water wells within or downgradient of the source area.

Benzo(a)pyrene in Soil

Soil Remedial Alternatives

Soil Alternative 1: No Action

Estimated Capital Cost: $0 Estimated Annual O&M Cost: $0 Estimated Present Worth Cost: $0

Under this alternative, HAAF would take no action at the site to prevent exposure to the soil and groundwater contamination. The No Action technology, by definition, involves no remedial action at the site and, therefore, has no technological barriers. The potential risks to human health and the environment identified in the risk assessment would not be mitigated by this response. This alternative was retained as required by USEPA guidance.

Soil Alternative 2: Capping – Vegetative Cover

Estimated Capital Cost: $15,265
Estimated Present Worth Cost: $40,193
Estimated Construction Timeframe: 1 year
Estimated Time to Achieve RAOs: 10 years

Soil Alternative 2 includes a vegetative cover as a containment technology for limiting contact with impacted soils. Installation of a vegetative cover is a proven and effective method of providing an exposure barrier, erosion control, and some long-term enhancement of ecological habitat. Vegetative covers minimize infiltration of rain water and subsequent dissolution of contaminants and are commonly used, easy to construct, and relatively inexpensive.

The vegetative cover will feature a minimum of 1.5 feet of compacted soil and 6 inches of top soil to eliminate potential direct contact with impacted soils. Implementation of the vegetative cover would be relatively simple at HAA-01, as the former FTA is grassy and level and, as such, would require minimal to no installation of a new vegetative cover. O&M costs associated with this alternative would include annual inspection of the vegetative cover to ensure its integrity.

In addition, LUCs will be implemented to ensure the site will not be used for residential purposes. The remedy will include CERCLA five-year reviews, any remedial action that results in contaminants remaining onsite at concentrations greater than those allowing unrestricted use must be reviewed as least once every 5 years. These restrictions would remain in place until it could be demonstrated that soil concentrations have declined below applicable PRGs.

Soil Alternative 3: Excavation and Disposal

Estimated Capital Cost: $880,044
Estimated Present Worth Cost: $956,812
Estimated Construction Timeframe: 1 year
Estimated Time to Achieve RAOs: 1 year

Soil Alternative 3 will include excavation and off-site disposal of impacted soil at an approved landfill. This will include the physical removal of impacted soil using typical construction equipment such as backhoes, drag lines, clamshells, vacuum trucks, and front-end loaders.

Materials handling is a concern that affects the implementability of excavation. Staging areas would be used to prepare wastes for disposal or treatment; the staging areas would be graded to reduce ponding, lined to prevent groundwater contamination, and bermed to

prevent runoff. The offsite transportation of wastes resulting from excavation must meet Federal and the State of Georgia shipping and manifesting regulations. Characterization of the material would be required to ensure proper disposal, treatment requirements, and to ensure compliance of material left in place. Backfilling with clean soil, grading, and revegetation after excavation are necessary to prevent large open areas that would collect rainwater. Sampling would be performed to ensure the attainment of RAOs and the removal of constituents as defined in scope.

Excavation and removal of impacted soil eliminates the environmental and health concerns associated with direct contact of contaminated soil. However, consideration must be given to the health and safety of remedial workers. On- site air monitoring and dust and vapor control provisions would be necessary during excavation operations.

Excavation activities can result in the release of fugitive dusts and runoff from disturbed soil. Dust controls could include water sprays or application of chemical dust suppressants. Surface water controls may also be required.

EVALUATION OF REMEDIAL ALTERNATIVES

Section 300.430(e)(9) of the NCP lists nine criteria against which each remedial alternative must be assessed. The acceptability or performance of each alternative against the criteria is evaluated individually so that relative strengths and weaknesses may be identified.

The first two threshold criteria (must be met by each alternative) are:

- Protection of human health and the environment; and
- Compliance with **applicable or relevant and appropriate requirements (ARARs)**.

The next five primary balancing criteria provide the basis for analysis:

- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, volume, or mass through treatment;
- Short-term effectiveness;
- Implementability; and
- Cost.

The final two criteria, state acceptance and community acceptance, are analyzed following comments on the Proposed Plan.

EVALUATION CRITERIA FOR REMEDIAL ALTERNATIVES
Overall Protectiveness of Human Health and the Environment determines whether alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.
Compliance with ARARs evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the site, 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 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.
Cost includes estimated capital and annual operations and maintenance costs, as well as 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 HAAF's analyses and recommendations, as described in the RI/FS and Proposed Plan.
Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

1. Protection of Human Health and the Environment

Each remedial alternative except the "no action" alternative would provide adequate protection of human health and the environment by eliminating, reducing, or controlling risk through treatment, engineering controls, and/or institutional controls.

Groundwater Alternative 2 would implement an MNA program to quantify attenuation rates and demonstrate continued degradation of site COCs in groundwater.

Groundwater Alternative 3 would provide ERD of impacted groundwater and would enhance natural biological degradation by stimulating naturally-occurring bacterial populations that can break down CVOCs. The in situ reactive zone created by EVO injections further enhances the protection of human health and environment by degrading COCs that exceed the PRGs within the mass flux portion of the contaminant plume. **Groundwater Alternative 4** would degrade CVOCs through introduction of an oxidizer and activator solution into the aqueous environment. ISCO further enhances the protection of human health and environment by oxidizing COCs that exceed the PRGs within the mass flux portion of the contamination plume.

Soil Alternative 2 would implement a vegetative cover to prevent direct exposure with impacted soil.

Soil Alternative 3 would include physical removal and off- site disposal of impacted soil. While this remedy would preclude direct exposure with impacted soil, consideration must be given to the health and safety of remedial workers including the need for mitigating dust and vapor impacts.

LUCs instituted as part of the soil and groundwater alternatives will further protect human health and the environment by limiting the types of construction that can occur at the site (e.g., no water supply wells, restrictions of residential buildings)

2. Compliance with ARARs

With the exception of the two "no action" alternatives, all soil and groundwater alternatives would meet their respective ARARs from applicable Federal and State laws.

3. Long-term Effectiveness and Permanence

All Groundwater and Soil Alternatives would achieve long-term effectiveness and permanence of maintaining protection to human health and the environment. Under Groundwater Alternative 2, long-term monitoring will ensure COC concentrations continue to decline, though RAOs may not be achieved in an acceptable timeframe. Under Groundwater Alternatives 3 and 4, in situ technologies (ERD and ISCO, respectively) would target the elevated CVOC concentration zones through up to 2 injections, while natural attenuation will reduce concentrations in areas of lower concentrations. For Soil Alternative 2, the vegetative cap is an existing permanent cap. For Soil Alternative 3, excavation and removal of impacted soil would achieve long-term effectiveness and permanence.

4. Reduction of Toxicity, Mobility, Volume, and Mass

Reduction of the mobility, toxicity, volume, and mass of COCs in groundwater would be confirmed through regular groundwater monitoring for each proposed groundwater alternative. In addition, Groundwater Alternatives 3 and 4 would utilize in situ technologies to accelerate the reduction in volume and mass of the elevated CVOC concentration zones.

Soil Alternative 2 would reduce the mobility of COCs through a well-maintained vegetative cover, while the toxicity, volume, and mass would be reduced through natural attenuation. Soil Alternative 3 would eliminate toxicity, mobility, volume, and mass by removing impacted soil from the site.

5. Short-Term Effectiveness

Groundwater Alternative 2 would result in minimal risks to the community, site workers, and the environment through LUCs and long-term monitoring. Groundwater Alternative 3 would result in minimal risks to the community, workers, and the environment. Degradable carbon that would be used to create the in situ reactive zone would be in the form of molasses, corn syrup, whey, or other similar products that would not result in additional risks to the community, workers, and the environment. Groundwater Alternative 4 requires the use of strong oxidizers and would result in moderate risks to the community, site workers, and the environment. Groundwater Alternatives 2, 3, and 4 would handle purge water from monitoring well sampling using approved methods.

Under Soil Alternative 2, an existing vegetative cover currently provides protection and implementation with LUCs would result in minimal risks to the community, site workers, and the environment. Soil Alternative 3 would provide short-term effectiveness by removing impacted soil from the site.

6. Implementability

Groundwater Alternatives 2, 3, and 4 are technically and administratively feasible. A site-wide groundwater monitoring network currently exists. Groundwater

Alternatives 3 and 4 would require installation of permanent injection wells to implement ERD and ISCO, respectively. Injection points would be installed using standard direct push technology or drilling methods and materials. These services are readily available, as are the services and materials necessary for the collection and analysis of groundwater samples.

Soil Alternatives 2 is both technically and administratively feasible as the vegetative cover currently exists and only requires routine lawn maintenance. Soil Alternative 3 is readily implementable but may result in temporary air quality effects during excavation activities and hazards to the community and workers from excavation and transport of the impacted soil.

7. Cost

The estimated present worth cost of Groundwater Alternative 2 is less than Groundwater Alternatives 3 and 4. However, concentration trend data indicate that the time to achieve remedial goals could be extensive and could potentially increase.

The estimated present worth cost of Soil Alternative 2 is less than Soil Alternative 3, though Soil Alternative 3 is expected to achieve RAOs in a shorter time frame.

8. State/Support Agency Acceptance

The State of Georgia supports the Preferred Alternative without comment.

9. Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the Record of Decision for this.

SUMMARY OF THE PREFERRED ALTERNATIVE

The preferred alternatives selected for remediating the HAA- 01 Former FTA and DAACG Chlorinated Solvents Area is Groundwater Alternative 3 (ERD, MNA, and LUCs) and Soil Alternative 2 (vegetative cover). These alternatives are implementable, effective in meeting the RAOs, and reasonable with respect to present-worth cost. All of the groundwater alternatives are implementable, but Groundwater Alternative 3 was rated the most favorable. Groundwater Alternative 3 is more likely to meet the RAOs in an acceptable timeframe, is effective in mitigating and controlling risks at the site, and results in the reduction of the volume and mobility of onsite waste. Furthermore, Alternative 3 eliminates the risks and costs associated with handling hazardous chemicals (i.e., chemical oxidants). Monitoring will ensure continued degradation of the dilute plume, and LUCs will prohibit the installation of potable wells.

All of the soil alternatives are implementable, but Soil Alternative 2 was rated the most favorable. Due to the low risk factors, low level COC concentrations, the existing vegetative cover, and with LUCs precluding future residential use, Soil Alternative 2 will be effective in meeting RAOs, is implementable, and is reasonable with respect to present- worth cost.

Based on the information available at this time, HAAF and the State of Georgia believe the preferred alternatives would be protective of human health and the environment, comply with ARARs, be cost-effective, and utilize permanent solutions to the maximum extent practicable. The Preferred Alternative can change in response to public comment or new information.

COMMUNITY PARTICIPATION

HAAF and GAEPD provide information regarding the cleanup of the HAA-01 Former FTA and DAACG Chlorinated Solvents Area Site to the public through public meetings, the Administrative Record file for the site, and announcements published in the Savannah Morning News. HAAF and the State encourage the public to review these documents pertaining to investigative activities that have been conducted at the site to gain a more comprehensive understanding of HAA-01 and its activities. The dates for the public comment period, the date, location, and time of the public meeting, and the locations of the Administrative Record files, are provided on the front page of this Proposed Plan.

For further information on the HAA-01 Former FTA and DAACG Chlorinated Solvents Area Site, please contact:

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The Administrative Record is also available online at:

https://home.army.mil/stewart/index.php/about/Garrison/DPW/environmental/prevention-and-compliance/adminrecord

GLOSSARY OF TERMS

Administrative Record - The collection of documents that is utilized and provides logic for the selection of a particular response at a site. Documents that are included are applicable documents that were relied upon in choosing the response action, as well as applicable documents that were considered, but were rejected after evaluation. This file is available for public review and a copy maintained near the site. The HAAF Administrative Record file is maintained online at:

https://home.army.mil/stewart/index.php/about/Garrison/DPW/environmental/prevention-and-compliance/adminrecord

Applicable or relevant and appropriate requirements (ARARs) - Applicable requirements mean those cleanup standards, standards of control, or other substantive environmental protection requirements, criteria, or limitations promulgated under Federal environmental or State environmental or facility siting law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at the subject site.

Relevant and appropriate requirements mean those cleanup standards that address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site. These requirements may vary among varying sites and alternatives.

Chlorinated Volatile Organic Compounds (CVOCs) – chemicals commonly used in various commercial products, as solvents, and agents for degreasing. These compounds can contaminate a wide-range of mediums, including soil, groundwater, surface water, sediment, and air.

Comprehensive Environmental Response, Compensation Liability Act (CERCLA) – Also known as “Superfund”, this act was passed in 1980 to respond directly to releases or threats of release of hazardous substances that may endanger public health or the environment.

Constituents of Concern (COC) - Pollutants that are identified through the site-specific risk assessment process as being the main chemicals of concern that may cause unacceptable human health and/or ecological risk.

Constituent of Potential Concern (COPC) - Any chemical that has proven to pose a potential risk to a site. COPCs are typically contaminants which may or may not have the likelihood to have adverse effects to surrounding plants or animals, and to human health.

Ecological Receptors – Plants and animals, apart from humans, that could be harmfully affected by constituents of potential concern or constituents of concern.

Emulsified Vegetable Oil (EVO) – Utilized as an energy provider for microbes that process and degrade the constituents of concern identified within an area identified to have environmental contamination.

Enhanced Reductive Dechlorination (ERD) – A variation of in situ bioremediation used to promote anaerobic organic dechlorination of volatile organic compounds within the subsurface by cometabolic and direct degradation processes.

Hazard Quotient (HQ) – The calculated potential exposure ratio to a material and the level at which no negative effects are anticipated.

In Situ Chemical Injection (ISCO) – Occurring at the site of contamination or pollution, an advanced oxidation process and design utilized to decrease the amount of targeted environmental contaminants.

Feasibility Study - A document that evaluates, assesses, and identifies in detail remediation options for a site. The Remedial Investigation is completed prior to drafting the Feasibility Study.

Maximum Contaminant Level (MCL) - Standards that are established by the USEPA for drinking water quality. This provides the permissible limit on the amount of a material that is allowed in public water systems under the Safe Drinking Water Act.

Monitored Natural Attenuation (MNA) - A variety of biological, chemical, or physical processes that enable the reduction of the mass, mobility, toxicity, volume, or concentration of contaminants in soil or groundwater without human interaction. MNA processes are enacted under favorable conditions.

National Oil and Hazardous Substances Pollution Contingency Plan, (NCP) or National Contingency Plan (40 Code of Federal Regulations [C.F.R.] Part 300) - Delivers an organized structure and procedure for responding to releases of oil and hazardous chemicals, pollutants, and contaminants into the environment.

Preliminary Remediation Goals (PRGs) - chemical-specific initial cleanup goal that (1) is protective of human health and the environment and (2) complies with ARARs. PRGs are

initially developed on the basis of available information, later modified to reflect the results of the baseline risk assessment. PRGs are also used during the analysis of remedial alternatives in the RI/FS.

Proposed Plan - A document released to the public in which the findings of the Remedial Investigation and Feasibility Study are summarized to identify the preferred cleanup plan for a site. The reasoning for the publication of the proposed plan is to provide the public with an opportunity to comment on the preferred cleanup plan, as well as alternative plans that are under consideration and to participate in the selection of the cleanup plan at a site.

Remedial Action Objective (RAO) - A goal that is site-specific with the intention of protecting the environment and human health. Remedial Action Objectives provide guidance for the development of options for cleanup and must be met by cleanup plans selected for a site. Remedial action objectives also provide assistance in attaining a satisfactory level of protection for human health and the environment.

Remedial Investigation – Conducted prior to a feasibility study; a detailed study designed to determine the location of contaminants and identify the amount of constituents of concern at an environmental contamination site. The remedial investigation establishes site cleanup criteria, as well.

Regional Screening Level (RSL) – USEPA standards established to identify acceptable and safe soil screening values for contaminants at environmental sites.

Semi-volatile Organic Compound (SVOC) – Organic chemicals that evaporate under normal temperature and pressure conditions found in the atmosphere. SVOCs are a subgroup of VOCs that typically have higher molecular weights and higher boiling points.

Volatile Organic Compound (VOC) - Organic chemicals that easily evaporate under normal temperature and pressure conditions found in the atmosphere. VOCs are usually found in petroleum products such as gasoline and cleaning solvents.

REFERENCES

Arcadis. 2018. HAA-01 (Former Fire Training Area and DAACG Chlorinated Solvents Area) Remedial Investigation / Feasibility Study, Hunter Army Airfield, Savannah, Georgia. November.

CERCLA. Comprehensive Environmental Response, Compensation, and Liability Act of 1980. 42 United States Code 9601 et seq.

USEPA. 2020. Regional Screening Level Summary Table. May 2020. Available at:

https://www.epa.gov/risk/regional-screening-levels-rsls-generic-tables.