FINAL
DECISION DOCUMENT

Former LO-58
Nike Missile Battery Launch Site

Caribou, ME

FUDS Project Number D01ME007702

February 2019

Prepared for:
U.S. Army Corps of Engineers – New England District

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Acronyms and Abbreviations

µg/L	microgram per liter
AFNS	Acid Fueling/Neutralization Station
AMAC	Adult Multiple Alternatives Center
AMSL	above mean sea level
ARAR	applicable or relevant and appropriate requirement

AST	aboveground storage tank
BERA	baseline ecological risk assessment
Bgs	below ground surface
CENAE	New England District Corps of Engineers
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	contaminant of potential concern
COPEC	contaminant of potential ecological concern
CVOC	chlorinated volatile organic compounds
DD	Decision Document
DERP	Defense Environmental Restoration Program
DoD	Department of Defense
DRO	diesel range organics
EO	executive order
FS	Feasibility Study
FUDS	Formerly Used Defense Site
GAC	granular activated carbon
GPR	ground penetrating radar
GRO	gasoline range organics
HHRA	human health risk assessment
HI	hazard index
HPL	hydrophysical logging
HQ	hazard quotient
IC	institutional controls
INPR	inventory project report
LTM	long term monitoring
MCL	Maximum Contaminant Level
MEDEP	Maine Department of Environmental Protection
MEG	Maximum Exposure Guidelines
mg/kg	milligrams/kilogram
MNA	monitored natural attenuation
NCP	National Contingency Plan
NPL	National Priorities List
PAH	polynuclear aromatic hydrocarbons
PCB	polychlorinated biphenyls
POE	point of entry
PP	Proposed Plan
PRG	preliminary remediation goals
PSI	preliminary site investigation
RAGs	MEDEP Remedial Action Guidelines
RAO	remedial action objective
RI	Remedial Investigation

RL	reporting limits
ROD	Record of Decision
SLERA	screening-level ecological risk assessment
TBC	To-Be-Considered
TCE	trichloroethylene
TPH	total petroleum hydrocarbon
UECA	Uniform Environmental Covenant Act
USACE	U.S. Army Corps of Engineers
USAF	U.S. Air Force
USC	United States Code
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
VI	vapor intrusion
VOC	volatile organic compound
WSP	wire-line straddle packer

1. PART 1: DECLARATION

1.1 SITE NAME AND LOCATION

The Former LO-58 Nike Battery Launch Site (the Site) is a 17-acre land parcel located at 253 Van Buren Road (Route 1) in Caribou, Aroostook County, Maine. The Site is owned currently by the Lister-Knowlton Veterans of Foreign Wars (VFW) Post 9389 and is identified by the City of Caribou Assessor's Office as Map 14, Lot 50. The LO-58 Nike Battery Launch Site was a part of the LO-58 Site facility, which also included a control area and housing area located approximately 2 miles east of the launch area. At the time of its closure, the LO-58 Launch Site consisted of the former Nike Missile Launcher Area, the former Generator Building, the former Test Building, the Acid Fueling/Neutralization Station (AFNS), the former Warhead Building, and the former Barracks Building.

1.2 STATEMENT OF BASIS AND PURPOSE

This Decision Document (DD) is being presented by the U. S. Army Corps of Engineers (USACE) to describe the selected remedy for the LO-58 Site. The USACE's Formerly Used Defense Site (FUDS) program is conducting response activities in accordance with the Defense Environmental Restoration Program (DERP) statute (10 U.S. Code [USC] § 2701 et seq.), the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 USC § 9620 et seq.), Executive Orders (EOs) 12580 and 13016, and the National Oil and Hazardous Substances Pollution Contingency Plan, more commonly known as the National Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] Part 300).

The U.S. Army is the lead agency and USACE has mission execution authority under CERCLA for the USACE FUDS Program. The USACE executes the FUDS Program on behalf of the Army, including drafting DDs and implementing selected remedial actions. The support agency is the Maine Department of Environmental Protection (MEDEP).

Site investigation and remediation activities must follow CERCLA and NCP. The MEDEP has participated by providing regulatory oversight of the FUDS investigation. Pursuant to CERCLA/NCP, USACE seeks the involvement of the state.

The LO-58 Nike Battery Launch Site is a non-National Priorities List (NPL) site. USACE has adopted the term "Decision Document" for the documentation of remedial action decisions at non-NPL installations. This DD was developed following the *Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents* (USEPA, 1999). A DD is similar to a Record of Decision (ROD) prepared to document the CERCLA remedy selection process for an NPL site. The information supporting the decision on this selected remedial action is contained in the Administrative Record. This Decision Document presents the Selected Remedy for the Site in accordance with CERCLA and the NCP. This decision is based on the Administrative Record file for this site. The state of Maine concurs with the Selected Remedy.

1.3 DESCRIPTION OF THE SELECTED REMEDY

The selected remedy for the Site for groundwater is alternative GW2, continued point of entry (POE) treatment of drinking water from on-site drinking water well DW-1, institutional controls (annual notifications to landowner), monitored natural attenuation (MNA) and long-term monitoring (LTM).

MNA/LTM as part of GW2 will require that up to four bedrock groundwater monitoring wells be installed in the northwestern and southern portions of the Site to monitor possible off-site migration of contaminated groundwater toward abutting residences. Long-term monitoring will be conducted at a frequency sufficient to maintain the treatment systems and to assess changes in groundwater chemistry.

GW2 was chosen due to its already demonstrated protectiveness of human health and the environment, compliance with Applicable or Relevant and Appropriate Requirements (ARARs), already demonstrated effectiveness in both the short- and long-terms, lack of additional risks to

the community or workers, satisfaction of the government's preference for treatment, lack of significant implementation barriers, and overall cost-effectiveness.

The preferred alternative for vapor intrusion is VI3 which includes active sub-slab vapor mitigation, institutional controls, and LTM. A sub-slab vapor mitigation system will be used to vent contaminated vapors into the atmosphere. This system will utilize horizontal vapor extraction wells installed under the Adult Multiple Alternatives Center (AMAC) Building (former generator building). Institutional controls in the form of landowner notifications specifying that new or existing structures cannot be used for residential purposes unless a vapor management system is in-place and functioning will be used to prevent future human health risks. Annual sub-slab and indoor air monitoring of the AMAC building will be performed to verify that the alternative remains protective.

If a new building is constructed within the restricted zone of the property, the property owner will be responsible for installation of an appropriate vapor mitigation system. Indoor air testing will be performed by the USACE to verify that no vapor intrusion issues are occurring. If vapor intrusion issues exist and pose an unacceptable risk due to site contaminants, USACE will evaluate the need to conduct further investigation.

The recommended alternative adds an increased measure of protectiveness through annual notice letters to owners of property where contaminants of concern could potentially be present in groundwater and/or indoor air . DERP Manual, DoDM 4715.20, Encl. 3, p.48, provides "The DoD Component shall provide notice of potential vapor intrusion risks to non-DoD property owners in writing and, as appropriate, include such notice in DDs and transfer documents" (DoD, 2012). The Land Use Control Zone includes locations where groundwater contaminants of concern exceed ARARs. This area may be modified, if necessary, based upon future data from the Groundwater Monitoring Program.

Land use controls will include annual notice letters to current or future property owners to ensure that they are aware of the potential for contaminated groundwater under their property; and to indicate that the Corps is willing to test any new drinking water well for COC's, and to install and

maintain granular activated carbon (GAC) filters on a drinking water well, if maximum contaminant levels (MCLs) are exceeded, or if concentrations are trending toward an MCL exceedance. The notice letters will be sent by the Corps to property owners. The Town tax records will be checked each year by the Corps to ensure that the current owners of the property receive the notice.

1.4 STATUTORY DETERMINATIONS

The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The selected remedy has been shown to be successful over the past several years and under current conditions the site remains protective.

Because this remedy will result in hazardous substance, pollutants or contaminants remaining on -site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted every five years after initiation of remedial action per 40 CFR 300.430(f) (4) (ii) to ensure that the remedy is, or will be, protective of human health and the environment.

1.5 AUTHORIZING SIGNATURES

This DD presents the final decision for the selected response action for groundwater and indoor air at the LO-58 Former Nike Missile Launch Site. The Department of Defense is the lead agency under the Defense Environmental Restoration Program (DERP) at the Former LO-58 Formerly Used Defense Site, and the U.S. Army Corps of Engineers has developed this DD for DOD. This DD is consistent with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This document will be incorporated into the larger Administrative Record file for the Former LO-58 Nike Missile Launch Site, which is available for public view at U.S. Army Corps of Engineers, New England District, 696 Virginia Road, Concord, MA 01742.

The selected remedy, with a total estimated present worth of $992,000 is approved by the undersigned, pursuant to the delegated authority in the ASA (IE&E) memorandum dated 24 June 2016, subject: Assignment of Mission Execution Functions Associated with Department of Defense Lead Agent Responsibilities for the Formerly Used Defense Sites Program, and subsequent 9 Feb 2017 Memo Interim Guidance Document (IGD) for the Formerly Used Defense Sites (FUDS) Decision Document (DD) Staffing and Approval.

Signature:

Name: JEFFERY L. MILHORN
Major General, USA
Commanding

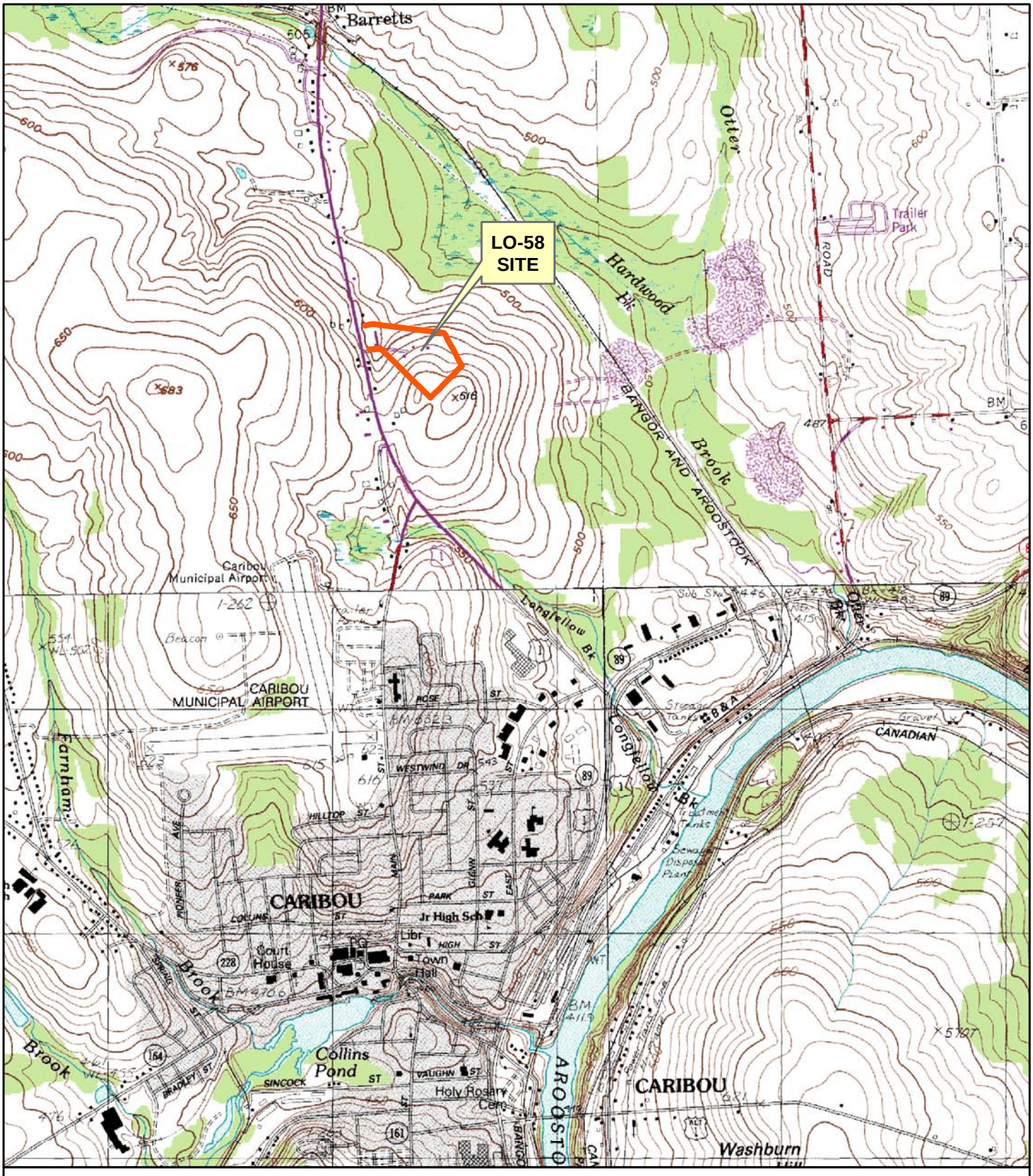
2. PART 2: DECISION SUMMARY

2.1 PROJECT NAME, LOCATION, AND DESCRIPTION

The Former LO-58 Site is a 17-acre land parcel located at 253 Van Buren Road (Route 1) in Caribou, Aroostook County, Maine (see Figure 2-1). The Site is owned currently by the Lister-Knowlton VFW Post 9389 and is identified by the City of Caribou Assessor's Office as Map 14, Lot 50 (USACE, 2011a). The entrance to the LO-58 Site from Van Buren Road is located at latitude 46º 52′ 55″ North and longitude 68º 0′ 38″ West (USFWS, 2008). Consistent with the typical location of Nike Missile Batteries, the LO-58 Site is located on a topographic high, east of Van Buren Road. Elevations at the LO-58 Site vary by approximately 60 ft, from approximately 540 ft above mean sea level (amsl) at the former Barracks Building, which is located at the bottom of the hill near Van Buren Road, to approximately 600 ft amsl at the former Launcher Area, which is situated near the topographic high for the property (USACE, 2011a).

The LO-58 Nike Missile Launch Battery was a part of the LO-58 Site facility which also included a control area and housing area located approximately 2 miles east of the launch area. At the time of its closure, the LO-58 Site consisted of the former Nike Missile Launcher Area, the former Generator Building, the former Test Building, the AFNS, the former Warhead Building, and the

former Barracks Building. Additionally, the LO-58 Site consisted of smaller areas including the former Sentry Station, the former Canine Kennel and Exercise Area, the former Ajax Transfer Rack, and the former Acid Storage Shed, all of which have been reduced to concrete pads and footings (USACE, 2011a). See Figure 2-2.



Source: U.S. Geological Survey (USGS) 7.5 Min. Series, Caribou, Goodwin, Fort Fairfield NW, and New Sweden 1:24,000 scale quadrangles,

Department of the Army
New England District
Corps of Engineers

FIGURE 2-1
SITE LOCUS MAP

Legend

- Monitoring Wells
- Water Supply Wells
- Fence
- Building Outline
- Paved
- Topography
- Overhead Electric Line
- Tree Line

Exposure Units

- AMAC Building Area
- Background Area
- Laucher Area

Notes:
- Information shown is from a Corps of Engineer's Survey dated May 2006. Reference Field Book "M 186"
- Horizontal Datum - State Plane Maine (East) NAD83 feet.
- Vertical - NAVD88 - Topographic Contour Interval 1-ft.

AVATAR ENVIRONMENTAL

CONCRETE PAD (FORMER CANINE KENNELS AND EXERCISE AREA)
CONCRETE PAD (FORMER ACID STORAGE SHED)
FORMER ACID FUELING STATION
CONCRETE PAD (FORMER FUELING PLATFORM)
MW-01
EXISTING 6' CHAINLINK FENCE
FORMER WARHEAD BUILDING SLAB
MW-02
Launcher Area EU
TRANSFER RACK FOOTINGS (FORMER AJAX TRANSFER RACK)
MW-05
CONC. FUEL TANK CRADLE
NATURAL TOPOGRAPHICAL LOW
AMAC STORAGE BUILDING
CONCRETE BLOCK SHED
MW-06
CONCRETE PAD/ GUARD SHACK (FORMER SENTRY STATION)
FORMER LAUNCHER AREA
DW-01
MW-04
WOODEN SHED
CINDER BLOCK GARAGE (FORMER MISSILE ASSEMBLY AND TEST BUILDING)
TOP OF LEDGE
AMAC Building Area EU
DUMPSTER PAD
SHED
3' STEEL GUARDRAIL AROUND PROPANE TANK
FORMER BARRACKS BUILDING (VFW POST HEADQUARTERS)
SEPTIC TANK COVER
CINDER BLOCK SHED (FORMER OPERATIONS SHELTER)
APPROXIMATE LOCATION OF SEPTIC SYSTEM
ADULT MULTIPLE ALTERNATIVE CENTER (FORMER GENERATOR BUILDING)
MW-03
APPROXIMATE LOCATION OF SEPTIC SYSTEM
Background Area EU
PARKING LOT
DW-02
VAN BUREN ROAD

N W E S

100 0 100 200
Scale in Feet

US Army Corps of Engineers
New England District

FIGURE 2-2

SITE PLAN

DRAWN BY:	JC	APPROVED BY:
PROJECT: LO-58		

2.2 PROJECT HISTORY AND REGULATORY REQUIREMENTS

The LO-58 Site was acquired from the Town of Caribou in 1955 by the U.S. Department of Defense (DOD) for the construction of a Nike missile launching facility. This Site was one of four Nike Ajax sites placed around Loring Air Force Base for the protection of the United States Air Force (USAF) Strategic Air Command B-52 Stratofortress as well as northeastern approaches to the United States. These sites remained operational until the LO-58 Site was deactivated by the DOD in 1966. Following its decommissioning as a military facility in 1969, the Site was conveyed to the City of Caribou and used for storage of municipal property. In 1970, the property was purchased by the current owner, the Lister-Knowlton VFW Post 9389.

Between 1955 and 1957, the LO-58 Launch Site was constructed as part of the LO-58 Site facility. The Launch Area originally consisted of the former Nike missile launcher area, the former Generator Building, the former Test Building, the AFNS, and the former Barracks Building. The LO-58 Site began operations in 1957. The launcher facility was originally designed to carry and deploy the Ajax-type guided missile. The Ajax missile used a blend of jet petroleum-4 (JP-4), inhibited red fuming nitric acid, and approximately one pint of unsymmetrical dimethylhydrazine to make the mixture hyperbolic, and hence capable of spontaneous ignition without the need for an additional ignition source. Reportedly, the missiles were periodically de-fueled at the AFNS so the maintenance checks could be performed. There were reportedly 10 Ajax missiles within each of the three missile silos.

In 1960, the LO-58 Site operations converted to the Hercules missile. Several changes occurred at Nike missile launching sites as a result of the conversion from Nike Ajax to Nike Hercules missiles. These changes included the construction of the Warhead Building within the AFNS area, the construction of a larger Test Building, and an upgrade to the launchers, missile elevators, motors, and related power elements associated with the three on-site missile silos. After conversion, each silo contained six Hercules missiles.

Several components of the former launch Site have since been deconstructed, including the subsurface portion of the former Nike Missile Launcher Area, which was closed in 1994, and the

aboveground portion of the former Warhead Building which was demolished in spring 2007 (following a fire during the summer of 2006), leaving only the concrete foundation slab in place. The only other activity at the LO-58 Site since the decommissioning of the Nike Missile Battery Launch facility was a small farm machinery repair shop that operated for less than a year in the former Test Building (USACE, 2011a).

The VFW currently uses the former Barracks Building as its headquarters for meetings and social functions, and leases the former Generator Building to the AMAC. Since 1994, the former generator building (AMAC Building) has had 2 or 3 additions built by AMAC over the life of their lease. The only other original buildings that remain standing are the former sentry station and the former Missile Assembly and Test Building. An empty 500-gallon fuel oil above ground storage tank (AST) is located behind the former Test Building. AMAC had a new storage building constructed west of the Test Building at the location of a block shed which was removed. The septic system serving AMAC was improved, and the drain field was relocated across the driveway/road from the AMAC Building. The only other portion of the LO-58 Site utilized is the southern portion of the former Launcher Area, which served as a shooting range for the City of Caribou Police Department and Customs and Border Patrol. This was discontinued in 2014.

2.2.1 Prior Investigations and Studies

Various environmental investigations have been conducted at the LO-58 Site by various parties for the purpose of identifying environmental concerns, risk, and/or hazards associated with the former defense site. The investigations are summarized below.

2.2.1.1 Summary of Pre-1996 Investigations

According to available documents, including an Inventory Project Report (INPR; CENAE, 1993) for the LO-58 Site, at least three site visits had been performed between the mid-1980s and 1993 for the purpose of identifying environmental hazards associated with the former defense site. The inspections identified documents indicating that three fuel storage tanks were historically used at the facility, which included a 2,000-gallon underground storage tank (UST) associated with the former Barracks Building, a 500-gallon fuel oil AST located outside the former Missile Assembly

& Test Building (Test Building), and a 4,000-gallon fuel UST located adjacent to the southwest corner of the former Generator & Frequency Changer Building (Generator Building). According to available records the former Generator Building had been expanded and an AST had been installed to fuel the building's heating system.

Records reviewed indicated that the 2,000-gallon UST had been removed and the 500-gallon AST had been utilized by a previous tenant at the property; and therefore, was not eligible for removal under the DERP. Representatives from CENAE did not find any indication that the 4,000-gallon UST was still present at the property and assumed that it had been removed, although no specific documents confirming the removal were found. Based on these findings, CENAE recommended that no further Federal action be taken regarding the remaining 500-gallon AST (USACE, 2011a).

In addition to identifying former fuel storage tanks, the pre-1996 CENAE inspections also indicated that the acid neutralization pit and refueling area were still in place, but concluded that they posed no threat to the environment and, therefore, required no further action. The only recommendation for action at the LO-58 Site made as a result of the inspections was regarding the three former missile magazines (silos). The VFW indicated that they had no beneficial use of the magazines, and therefore, the inspections recommended that the hydraulic fluid be drained and the magazines sealed (USACE, 2011a).

2.2.1.2 Site Closure Activities

Closure activities associated with the three silos at the LO-58 Site were performed by Mason and Maine Environmental Engineering Company between August 1994 and October 1994. The closure of each silo included: the collection of samples of infiltrated water within each for laboratory analysis for polychlorinated biphenyls (PCBs) and flashpoint; removal and disposal of the water; removal and disposal of hydraulic systems; and capping the three silos with concrete planks. Aboveground closure demolition work was also conducted, which consisted of the removal of several vent pipes, manholes, and bulkhead doors (USACE, 2011a).

2.2.1.3 1996 Groundwater Investigation

In fall 1996, MEDEP responded to a complaint made by the current owner, concerning water odors from DW-01, which serves the AMAC Building. Two rounds of groundwater sampling and analysis (EPA Method 8260) performed by MEDEP documented and confirmed the presence of trichloroethylene (TCE) contamination. The first round of sampling was performed on 8 October 1996. The analytical results of this sample indicated the presence of TCE at a concentration of 8.6 µg/L, which was above the applicable Maine Maximum Exposure Guideline (MEG) of 5 µg/L. The results of the second round of sampling, performed on 21 October 1996, indicated the presence of TCE at 8.8 µg/L. MEDEP immediately installed a dual, granular-activated carbon filtration point of entry (POE) treatment system and initiated a monitoring program. Since 1996, TCE has consistently been detected in samples of untreated water collected as part of this monitoring program, with concentrations remaining fairly steady over time. Since the Corps took over operation, maintenance and monitoring of the DW-1 treatment system in 2009, the post-treatment drinking water samples have not contained detectable concentrations of TCE.

2.2.1.4 1998 Maine Department of Environmental Protection Geophysical Investigation

During a Site visit on 21 May 1998, MEDEP staff investigated an area located southwest of the former Generator Building (AMAC Building), where the 4,000-gallon fuel UST was located during the time the LO-58 Site was operated by the military. Although this tank had reportedly been removed, a magnetometer survey of the area detected a significant anomaly approximately 3 ft east and 9 ft south of the southwest corner of the building. This magnetometer "hit" suggested that a large metal object may still exist in this portion of the property.

2.2.1.5 Expanded Water Supply Monitoring

Following the 21 May 1998 site visit, DW-02, which serves the former Barracks Building, was added to the ongoing quarterly monitoring program. Because this well is located topographically downhill from DW-01, where TCE had been identified in groundwater, it was added to the program as a precautionary measure to determine if the former Barracks Building drinking water

well also had been impacted. The well was sampled seven times between 17 August 1998 and 2 February 2000 for volatile organic compounds (VOCs) by EPA Method 8260. No VOCs were detected in the samples which had reporting limits (RL) between 1 and 5 µg/L with a single exception. The sample collected on 8 July 1998, contained 1 µg/L of dichloromethane which was below its 48 µg/L MEG.

2.2.1.6 1998 Site Inspection

In October 1998, representatives of USACE and MEDEP performed a walkover of the LO-58 Site to identify potential areas of concern regarding the release of hazardous substances to the subsurface. During the site walk, several areas of the LO-58 Site were identified as potential sources of contamination including the former Launcher Area, the former AFNS, and the former Test Building. At the former Launcher Area, ten catch basins were located on the concrete pad adjacent to the missile silos. The catch basins were connected to drainage pipes that carried runoff away from the pad and into drainage swales along the northwestern and northeastern corners of the former Launcher Area. Because historical information pertaining to the use and maintenance of the missiles suggested that they were periodically cleaned with a TCE-based solution, it was hypothesized that runoff of this solution could have entered the catch basins where it would have migrated to the drainage swales in the grassy areas surrounding the pad. One of the drainage swales was observed to be between the former Launcher Area and the former Generator Building (currently operated as the AMAC) in the approximate location where the bedrock water supply well for the AMAC facility was installed. This suggested that the TCE concentrations detected in the water supply could be due to historical use of TCE at the LO-58 Site.

Additional areas of concern identified during the site walk included two additional drainage pipe outfalls and drainage swales located adjacent to the former AFNS, the former Test Building and associated missile transfer rack (due to the unclear nature of “tests” that were performed at this location), the former Acid Storage Shed, and former Generator Building UST and septic system (USACE, 2011a).

2.2.1.7 1999 Preliminary Site Investigation (PSI)

A PSI was performed at the property in the summer of 1999 to evaluate subsurface conditions at the LO-58 Site by performing geophysical and passive soil vapor surveys, as well as a Geoprobe® soil boring and soil sampling program. The objective was to assess if the source of the TCE contamination detected in the on-site bedrock water supply well was due to former activities of the DOD during its operation of the property, and to assess if additional investigations were warranted.

A geophysical survey was performed near the former Generator Building on 23 June 1999. The geophysical survey consisted of two phases of investigation; a preliminary metal detection survey to identify the location of medium to large buried metal objects, and a more sensitive GPR survey to identify physical characteristics of those objects. The results of the GPR survey indicated that the metallic response observed during the magnetometer survey by representatives of MEDEP was not due to the presence of a UST in the area. The GPR profiles in this area showed strong but narrow hyperbolic reflectors that are indicative of a small-diameter metal pipe extending outwards from the corner of the former Generator Building.

A passive soil vapor survey was initiated at the LO-58 Site on 22 June 1999. A total of 75 EMFLUX® soil vapor probes were installed at locations AS-01 to AS-10, FP-01 to FP-12, GB-01 to GB-09, LP-01 to LP-22, MA-01 to MA-03, PR-01 to PR-08, and WB-01 to WB-04, in the vicinity of former Generator Building and surroundings; the former Test Building and surroundings; the former Acid Storage Shed and surroundings; the former AFNS area and surroundings; the former Launcher Area; and the drainage system outfalls and associated drainage swales located around the perimeter of the operations area. All but 16 of the soil vapor samplers were removed on 12 July 1999 (the 16 remaining soil vapor probes could not be located), and shipped for laboratory analysis of VOCs by EPA Method 8260B. The analytical results of the soil vapor survey indicated that low levels of benzene, toluene, ethylbenzene, and xylene (BTEX) compounds, TCE, tetrachloroethane, naphthalene, chloromethane, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene may exist in the subsurface.

In October 1999, a Geoprobe® soil boring and soil sampling investigation was performed to characterize the Site soils, determine the depth of the overburden groundwater table (if present), explore the depth to bedrock at the property, and sample potentially contaminated soil zones identified by the passive soil vapor survey. A total of 40 soil borings, identified as SB-01 to SB-40, were advanced in the overburden at the LO-58 Site. The borings were advanced to the top of the bedrock surface at each location, which was encountered at depths ranging between approximately 1 and 19 ft below ground surface (bgs). Soil samples were collected from the 0- to 4-ft depth interval from 15 of the 40 soil boring locations and submitted to ESS Laboratory for laboratory analysis of VOCs by EPA Method 8260B, gasoline-range organics (GRO) by Maine HETL Method 4.2.17, and diesel-range organics (DRO) by Maine HETL Method 4.1.25.

The analytical results of the soil samples collected indicated the presence of acetone in 16 of the 17 samples collected at concentrations ranging from approximately 0.0068 to 0.0551 milligrams per kilogram (mg/kg). TCE was detected in two soil samples, SB-13 and SB-34, at concentrations of 0.0011 and 0.009 mg/kg, respectively. Neither of these substances were detected above their respective MEDEP Remedial Action Guidelines (RAG). No other VOCs were detected in the soil samples collected from the LO-58 Site. DRO was detected in soil samples SB-04, SB-09, and SB-13 at concentrations of 4, 10, and 36 mg/kg, respectively. The MEDEP Remediation Standard for DRO is 10 mg/kg. There were no other detections of DRO, and no detections of GRO in the 17 soil samples collected from the LO-58 Site. Appendix A.1 includes a summary of the soil sample results.

Based on the results of the soil vapor survey and Geoprobe® soil boring investigation, it was concluded that low levels of VOCs and/or DRO may exist in bedrock groundwater beneath the LO-58 Site. In addition, two soil samples collected from the property were found to contain concentrations of DRO in exceedance of the MEDEP Remediation Standard; therefore, the installation and sampling of bedrock monitoring wells at the property was recommended.

2.2.1.8 2001 Supplemental Site Investigation

A supplemental site investigation was performed at the LO-58 Site between October 2000 and May 2001, to supplement the information obtained during the PSI performed in 1999. In addition to the information obtained during the PSI, MEDEP performed an investigation at the property in the spring of 2000 that indicated the presence of fuel-impacted soils in the vicinity of a former UST which was reportedly removed in 1994.

The objectives of the supplemental site investigation activities at the LO-58 Site were to further evaluate the source of TCE in the on-site drinking water well, to obtain further information regarding hydrogeologic conditions in bedrock, and to fill data gaps caused by the loss of 16 soil vapor probes during the PSI. The additional site investigation activities included a Geoprobe® soil boring and soil sampling program; the installation of five bedrock groundwater monitoring wells; and the collection of soil, groundwater, and drinking water samples for laboratory analysis of VOCs, DRO, and GRO.

The Geoprobe® investigation was performed to address concerns expressed by MEDEP regarding soil quality at the LO-58 Site. In particular, evaluations of soil in the vicinity of the former Launcher Pad and the AMAC were conducted. Additional areas of the property that were included in the investigation were the former Test Building and surroundings, the former Warhead Building and surroundings, and the grassy area located to the southwest of the AMAC Building. A total of 16 soil borings, identified as SB-41 to SB-56, were advanced in the overburden at the LO-58 Site. The analytical results of soil samples collected during the investigation indicated the presence of DRO at three boring locations, SB-45, SB-54, and SB-55, at concentrations of 11, 24, and 133 mg/kg, respectively; concentrations in excess of MEDEP RAGs.

The bedrock monitoring well installations were performed using air-hammer drilling techniques. The wells, identified as MW-01 to MW-05, were installed at the LO-58 Site to evaluate the nature and extent of groundwater contamination as well as determine the direction of groundwater flow in the local bedrock water-bearing zone. Groundwater samples were collected from the bedrock monitoring wells in October 2000 and in May 2001 and submitted for laboratory analysis of VOCs,

DRO, and GRO. The analytical results of the sampling indicated the presence of VOCs, DRO, and GRO in the samples. No VOCs were detected at concentrations above MEGs, but DRO and GRO were each detected in MW-05 during both rounds at a concentration in excess of their respective MEGs. GRO was also detected in MW-03 during the May 2001 sampling event at a concentration that exceeded its MEG. Drinking water samples were also collected from the two on-site bedrock wells, DW-01 and DW-02. The analytical results of samples of untreated water collected from DW-01 indicated the presence of TCE and cis-1, 2-dichloroethylene (cis-1,2-DCE) at concentrations below the MEDEP MEG. There were no detections of DRO in the samples of untreated water collected from DW-01, and no detections of VOCs or DRO in the untreated water samples collected from DW-02.

Based on the results of the PSI and the supplemental site investigation activities the following conclusions were reached:

- No source areas of the chlorinated solvents detected in the AMAC drinking water supply well were detected in overburden soils at the LO-58 Site;
- Several areas existed where DRO had been detected in overburden soils at concentrations that equaled or exceeded the MEDEP RAG of 10 mg/kg;
- DRO and GRO were detected in groundwater at the LO-58 Site at concentrations that exceeded MEDEP MEGs;
- VOCs were detected in groundwater at the LO-58 Site, but at concentrations below MEDEP MEGs;
- VOCs were detected in the AMAC drinking water supply well, but at concentrations below MEDEP MEGs; and
- The general direction of groundwater across the LO-58 Site is to the north and west.

It was recommended that no further action was warranted to locate source areas of VOC or total petroleum hydrocarbon (TPH) contamination in LO-58 Site overburden soils. It was also recommended that the monitoring of the five bedrock monitoring wells and two on-site drinking

water supply wells to evaluate the nature and extent of fuel-related substances within the bedrock water-bearing zone be continued.

2.2.1.9 Long-Term Monitoring Program (LTMP)

After completion of the site investigations, the LTMP for the Maine FUDS program was subsequently developed and included the LO-58 Site with four other Maine FUDS locations. The LTMP included monitoring of the five bedrock monitoring wells and the two drinking water supply wells at the LO-58 Site on a semiannual basis for a period of at least two years to assess whether or not a remedial action was required. In conjunction with the LTMP, groundwater sampling was performed at the monitoring and drinking water wells in December 2002, April 2003, September 2003, and May 2004 and samples were submitted for laboratory analysis of GRO, DRO, and VOCs. Laboratory analytical results for samples collected during these events indicated that concentrations of DRO and GRO remain above the applicable standards in samples collected from MW-05 at the northeast corner of the former Test Building. Laboratory analytical results for samples collected from the AMAC drinking water well indicated that concentrations of TCE consistently remained at or slightly above the applicable standard of 5.0 µg/L during each sampling event.

In 2004, MEDEP requested that CENAE re-evaluate the LTMP to ensure that it complied with recent guidance issued by EPA regarding the FUDS program. These requirements include the collection of supplemental site characterization data prior to the installation of additional groundwater monitoring wells. The characterization data required included site operational histories, the identification of potential downgradient receptors, and refinement of hydrogeologic conceptual site models (CSMs) to better understand the nature and direction of groundwater flow at each property.

In September 2004, representatives from CENAE and MEDEP met at MEDEP's Regional Office in Portland, Maine to discuss existing data gaps at each of the Maine FUDS and possible revision of the sampling program. During the 2-year semiannual program conducted between fall 2002 and spring 2004, results at several of the sampling locations indicated either no detection of suspected

site contaminants or displayed concentrations that were below MEDEP's action levels for continued monitoring. As such, MEDEP agreed that continued monitoring of several sampling points at the five DERP-FUDS could be, at least temporarily, discontinued while the additional site characterization work was conducted. As part of the agreement between MEDEP and CENAE, MW-01, MW-02, and MW-04 were discontinued from the sampling program. Following the spring 2006 sampling round, MW-03 was also discontinued from the sampling program due to four consecutive rounds exhibiting non-detect concentrations for all compounds analyzed. Per the request of MEDEP, MW-03 was restored to the monitoring program in the spring 2007 sampling round.

2.2.1.10 2008 Geophysical/Hydrophysical Investigation

Geologic, geophysical, and hydrophysical investigations were conducted at the LO-58 Site in May 2008. The purpose of the investigation was to gather additional site-specific hydrogeologic information to further refine the CSM for groundwater flow. The investigations relied heavily on the work of COLOG, which summarized the results of the geophysical and hydrophysical investigations in the *HydroPhysics™ and Geophysical Logging Results* report, (USACE, 2010).

The geologic investigation included background research among available geologic references; observation and characterization of exposed bedrock at the LO-58 Site; measurement of bedrock features, including bedding planes, fold axes, and fractures; and the measurement of water levels in five bedrock monitoring wells and two bedrock drinking water wells during geophysical and hydrophysical investigations. The geophysical investigation included downhole geophysical logging of five bedrock monitoring wells (MW-01 through MW-05) and the two drinking water wells (DW-01 the AMAC Well, and DW-02 the former Barracks Building Well) at the LO-58 Site.

The hydrophysical investigation included hydrophysical logging (HPL) of DW-01 and DW-02 at the LO-58 Site. The HPL included ambient flow characterization, pumping flow characterization, and wire-line straddle packer (WSP) testing techniques. Based on the results of the HPL investigation, the highest-producing zones in each well were targeted for WSP testing, with the

objective of distributing sampling points along the entire length of the borehole to the extent possible. WSP sampling at both of the drinking water wells was performed in May 2008. The zones targeted for WSP testing were first isolated and sampled utilizing low-flow methodology, and groundwater parameters were measured to confirm equilibrium conditions were achieved during low-flow sampling. After collecting the samples, each zone was tested for transmissivity and hydraulic conductivity.

The groundwater samples were submitted for analysis for VOCs by EPA Method 524.2, 1,2-ethylene dibromide, 1,2-dibromo-3-chloropropane, and 1,2,3-trichloropronane by EPA Method 504.1, GRO by the Maine HETL Method 4.1.17 and DRO by Maine HETL Method 4.1.25. The analytical results were validated according to EPA Region 1 functional guidelines and were found to be useable, as qualified. The analytical results for DW-01 were consistent with previous analytical results for this well. Laboratory analytical results from the WSP sampling of DW-01 indicated the presence of chloroform, cis-1,2-DCE, TCE, toluene, GRO, and DRO in one or more samples collected, and generally have identifiable trends. None of the VOCs were detected above their applicable Maine MEGs or EPA MCLs for drinking water. However, GRO or DRO concentrations in five samples exceeded their applicable 50 µg/L Maine MEG.

The analytical results for DW-02 were generally consistent with previous analytical results, with one anomaly. Laboratory analytical results from the WSP sampling of DW-02 indicated the presence of cis-1,2-DCE, toluene, and DRO in one or more samples collected. None of the VOCs were detected above their Maine MEGs or EPA MCLs for drinking water. However, GRO or DRO concentrations in five samples exceeded their applicable 50 µg/L Maine MEG.

2.2.1.11 2008 Through 2012 Groundwater Long-Term Monitoring Program

As part of the continuing semiannual groundwater monitoring performed at the LO-58 Site, in April and October 2008, May 2009, and October 2009, additional groundwater samples were collected from MW-03, MW-05, and DW-01 and DW-02, for analysis of GRO, DRO, and VOCs. During these events, the groundwater elevation and field parameters for these wells remained consistent with previous measurements. The groundwater analytical results indicate that the

concentrations of hazardous materials continued to decrease in each of these wells, with none of the GRO, DRO, and VOC results exceeding Maine MEGs during this period. Since April 2008, the concentrations of TCE detected in DW-01 have remained below the 5.0 µg/L Maine MEG, with the exception of the July 2010 sample, which at 6.6 µg/L exceeded the Maine MEG, and the most-recent sampling in October 2012 which contained TCE at 7.4 µg/L (JCI, 2010c). Sampling of the AMAC Building POE treatment system between the filters and after the second filter was initiated by the Corps in the fall 2009, and indicated no detectable VOCs in the between-the-filters or post-treatment water.

The results of the site investigations discussed above were summarized and presented in the Final Conceptual Site Model Report (USACE, 2011a).

2.2.1.12 Remedial Investigation/Feasibility Study (2011 - 2017)

A Remedial Investigation (RI) / Feasibility Study (FS) was conducted for the LO-58 Site from 2011 to 2017. The overall objectives of the RI/FS were: 1) to characterize the nature and extent of contamination; 2) to evaluate the environmental fate and transport of Site-related contamination; 3) to assess the potential risks to human health and the environment posed by contamination at the Site; and 4) to use this information in the FS to support the evaluation and development of potential remedial alternatives for the Site. The RI/FS Report was finalized in February 2017 (USACE, 2017).

2.2.1.13 Proposed Plan

A Proposed Plan (PP) was developed to summarize and document the RI, FS, and associated reports, as well as the Corps rationale for the selected remedy for groundwater and vapor intrusion (USACE, 2018). The PP was made available to the public on 22 June 2018 for a comment period that ended on 30 July 2018. A public meeting was held on 18 July 2018 to present the PP. The comments received during the public comment period and at the public meeting are summarized in the Responsiveness Summary, which is contained in Part 3.0 of this DD. The full transcript from the public meeting is contained in the Administrative Record.

2.2.2 Regulatory Background

The DoD has the responsibility to remediate former DoD facilities under the DERP for FUDS and, therefore, is responsible for site investigation and remediation activities at the former LO-58 Nike Battery Launch Site.. The Corps goal is to achieve regulatory closure for the Site. FUDS program policy requires USACE to:

- Comply with DERP, CERCLA, the NCP, and Army policies for the FUDS program;
- Coordinate with the lead regulator, which is MEDEP;
- Conduct a RI with a baseline risk assessment to evaluate the need for remediation; and
- Attain standards and meet requirements that are consistent with CERCLA and NCP processes and criteria.

Site investigation and remediation activities must follow federal laws, guidance, and methods. The MEDEP has participated by providing regulatory oversight of the FUDS investigations. The RI and FS were conducted under the DERP for FUDS**,** and performed in accordance with the CERCLA and NCP.

2.3 COMMUNITY PARTICIPATION

The scope of community participation activities performed was consistent with the USEPA CERCLA guidance for community involvement (USEPA, 2016), Section 300 of the NCP, and USACE guidance contained in Engineering Pamphlet 200-3-1 (USACE, 2011).

The Corps completed the following activities as part of its public outreach effort:

- Prepared a Public Involvement Plan for LO-58 finalized in February 2015 (USACE, 2015).
- Provided project reports including the final RI/FS Report to an information repository located at the Caribou Public Library in Caribou, ME.
- Solicited public comment on the PP (USACE, 2018). The PP was made available to the public at the following repository:

Administrative Record
Caribou Public Library
30 High Street
Caribou, ME 04736

- Conducted a public meeting for the PP at the Caribou City Hall on 18 July 2018.
- Updated the Administrative Record with additional documents.

A PP public comment period occurred from 22 June 2018 through 30 July 2018. The Corps published a public notice in the Aroostook Republican and News, a weekly newspaper, on 20 June 2018 announcing the PP public meeting and the availability of the PP at the Caribou Public Library.

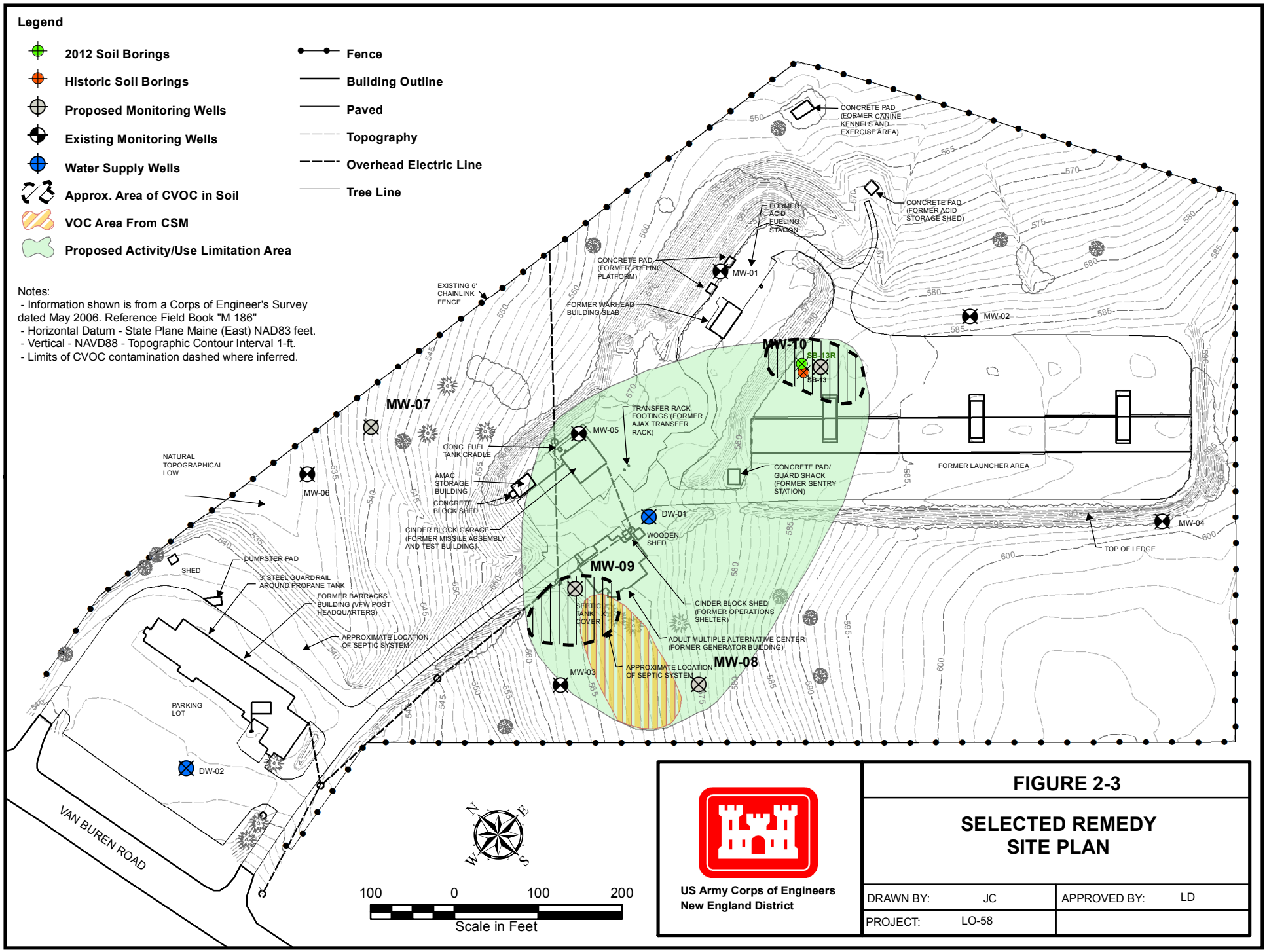
2.4 SCOPE AND ROLE OF RESPONSE ACTION

This DD authorizes the selected remedy to address the groundwater contamination associated with LO-58. The selected remedial alternative is GW2 and VI3 as described below.

The selected remedy for the Site for groundwater is alternative GW2, continued POE treatment of drinking water from on-site drinking water well DW-1, institutional controls (annual notifications to landowner), MNA, and LTM.

GW2 includes MNA/LTM that requires up to four bedrock groundwater monitoring wells be installed in the northwestern and southern portions of the Site to monitor possible off-site migration of contaminated groundwater toward abutting residences (Figure 2-3). Groundwater monitoring will be conducted annually in these wells plus 10 existing wells.

GW2 was chosen due to its already demonstrated protectiveness of human health and the environment, compliance with ARARs, already demonstrated effectiveness in both the short- and long-terms, lack of additional risks to the community or workers, satisfaction of the government's preference for treatment, lack of significant implementation barriers, and overall cost-effectiveness.



US Army Corps of Engineers
New England District

FIGURE 2-3

SELECTED REMEDY SITE PLAN

DRAWN BY:	JC	APPROVED BY:	LD
PROJECT:	LO-58		

The preferred alternative for vapor intrusion is VI3 which includes active sub-slab vapor mitigation, institutional controls and LTM. A sub-slab vapor mitigation system will be used to vent contaminated vapors into the atmosphere. This system will utilize horizontal vapor extraction wells installed under the AMAC Building (former generator building). Institutional controls in the form of landowner notifications specifying that new or existing structures cannot be used for residential purposes unless a vapor management system is in-place and functioning will be used to prevent future human health risks. Annual sub-slab and indoor air monitoring of the AMAC building will be performed to verify that the alternative remains protective.

If a new building is constructed within the restricted zone of the property (Figure 2-3), the property owner will be responsible for installation of an appropriate vapor mitigation system. Indoor air testing will be performed by the USACE to verify that no vapor intrusion issues are occurring. If vapor intrusion issues exist and pose an unacceptable risk due to site contaminants, USACE will evaluate the need to conduct further investigation.

The recommended alternative adds an increased measure of protectiveness through annual notice letters to owners of property where contaminants of concern could potentially be present in groundwater and/or indoor air . DERP Manual, DoDM 4715.20, Encl. 3, p.48, provides "The DoD Component shall provide notice of potential vapor intrusion risks to non-DoD property owners in writing and, as appropriate, include such notice in DDs and transfer documents." The Land Use Control Zone includes locations where groundwater contaminants of concern exceed ARARs. This area may be modified, if necessary, based upon future data from the Groundwater Monitoring Program.

Land use controls will include annual notice letters to current or future property owners to ensure that they are aware of the potential for contaminated groundwater under their property; and to indicate that the Corps is willing to test any new drinking water well for COC's, and to install and maintain GAC filters on a drinking water well, if MCLs are exceeded, or if concentrations are trending toward an MCL exceedance. The notice letters will be sent by the Corps to property

owners. The Town tax records will be checked each year by the Corps to ensure that the current owners of the property receive the notice.

2.5 SUMMARY OF SITE CHARACTERISTICS

2.5.1 Conceptual Site Model (CSM)

A CSM describes: 1) the contaminant source(s); 2) the release and transport mechanisms; 3) the exposure media; 4) the exposure routes; and 5) the potentially exposed populations. An exposure pathway is the link between environmental releases and local populations that might come into contact with, or be exposed to, environmental contaminants. The primary objective of the CSM is to identify the complete and incomplete exposure pathways. A complete pathway has all of the five components listed above; whereas an incomplete pathway is missing one or more.

Source of Contamination

Contaminants of potential concern (COPCs) attributable to releases from the LO-58 Site are VOCs associated with fuels formerly used and stored at the LO-58 Site and chlorinated solvents associated with historical missile maintenance. There is no documentation of the actual release mechanisms for the fuels and chlorinated solvents. However, it is presumed that a combination of surficial spills and discharges as well as subsurface discharges resulted in the observed distribution of COPCs in soil/overburden at the Site.

There appear to be two soil/overburden sources at the LO-58 Site: one located west of the AMAC Building and a second located near the former Launcher Area and former Fueling Platform.

The former USTs and ASTs are no longer considered sources at the LO-58 Site. However, residual contamination in Site soils relating to the former USTs and ASTs may remain sources of fuel-related COPCs.

Release and Transport Mechanisms

There are four mechanisms that can release and transport COPCs at the Site: erosion and surface runoff; wind erosion/volatilization; leaching to and migration of contaminants in groundwater; and migration of volatile COPCs through the vadose zone into buildings. Surface water runoff occurs during rainfall and snowmelt when COPCs in the soil are released through soil erosion and transported to other areas on site via site drainage. Wind erosion of soils can also play a role in releasing COPCs from soil. This holds true where activities such as heavy truck traffic on unpaved roads and other construction-related activity is occurring. Dust emissions may be an important route of exposure if future construction activities occur. Moreover, VOCs present in the soil can volatilize and be inhaled during outdoor activities. The third release and transport mechanism is leaching to groundwater. Following release to the ground surface, infiltration would transport COPCs through the soil column to the groundwater and they would migrate laterally depending on the flow gradient. VOCs present in the soil and groundwater can migrate through the vadose zone and potentially infiltrate buildings located above the contamination as vapor.

Exposure Media, Routes of Exposure and Exposed Populations

The Site was evaluated as two exposure areas for current use: the AMAC Building Area and the Launcher Area. The LO-58 Site was evaluated as two current use exposure areas based on differences in exposure time and land use. The AMAC Building Area exposure is based on AMAC staff and client's indoor exposure throughout a work week, as well as outdoor Site worker activities; whereas the Launcher Area was based on AMAC staff and client exposure while walking throughout the area, occasional trespassing, and outdoor Site worker activities. The entire LO-58 Site area was evaluated for future use. This assumed that future development may occur Site-wide.

For the human health assessment, the potentially contaminated media included soils, groundwater, and indoor air. COPCs in soil may be incidentally ingested and absorbed through the skin. In addition, dust or VOCs released from the soil into the air would be available for inhalation. COPCs in groundwater may also be ingested, absorbed through the skin while bathing/showering, and

inhaled during showering. The inhalation while showering pathway was evaluated for only those COPCs determined to be volatile. VOCs present in indoor air resulting from vapor intrusion would be available for inhalation by building inhabitants.

2.5.2 Site Overview

2.5.2.1 Physical Setting

The LO-58 Site is situated along the sides and on the summit of a small hill located along U.S. Route 1, in the approximate center of Caribou, Maine. The highest portion of the Site is undeveloped and covered in shrub vegetation and tall grasses. Located to the north of the high point is the former Launcher Area on a graded and paved (poor condition and overgrown) flat area in the eastern portion of the Site that was cut into the side of the hill. The former Warhead Building is located north of the former Launcher Area and is approximately 15 ft lower in elevation than the former Launcher Area. The area around the former Warhead Building has been overgrown with shrubs, young trees, and tall grasses. A large earthen berm surrounds the former Warhead Building slab foundation area to the north, east, and south. The top of the berm to the south extends out eastward and is level with the former Launcher Area elevation. The berm slopes down and sharply to the northwest, north, and northeast.

2.5.2.2 Site-Wide Geology and Hydrogeology

Overburden Geology/Hydrogeology

Based on the Surficial Geologic Map of Maine, overburden underlying the property is primarily glacial till consisting of a heterogeneous mix of sand, silt, clay, and stones with local occurrences of boulders, which were deposited during glaciation. The glacial till is generally massive and may contain beds and lenses of variably washed and stratified sediments. Subsurface investigations at the LO-58 Site have generally confirmed these mapped subsurface conditions, although no inclusions of washed or stratified sediments have been noted.

Site-specific observations document that overburden thickness at the LO-58 Site varies depending on location, and ranges from 0 ft bgs at the former Launcher Area where the overburden had been

excavated to approximately 16 ft bgs near the former Test Building. Bedrock outcrops are present along the southern edge of the former Launcher Area.

Overburden groundwater was not encountered at the Site during the April and October 2012 Field Investigations. Subsurface investigations at the Site have indicated that there is little or no saturated thickness in the overburden. Surface water that infiltrates the overburden percolates downward until coming in contact with the bedrock surface. At the bedrock surface, groundwater flows along the surface of the bedrock until reaching a permeable fracture.

Bedrock Geology/Hydrogeology

Bedrock topography was mapped using boring information obtained during the subsurface investigation performed in 1999 and 2001. Observation of the bedrock surface in the vicinity of the former Launcher Area, as well as previous soil boring records indicated that there is little or no weathered bedrock at the overburden-bedrock interface. Vertical seismic profiling did not identify acoustically-incompetent bedrock at the LO-58 Site. A competent bedrock surface is consistent with the geologic history of the LO-58 Site, which indicates that any weathered bedrock would have been eroded during the final Wisconsin-age glacial advance, and that there has been insufficient time for appreciable bedrock weathering during the subsequent 12,000 years. No rock quality designation data are available for any of the bedrock wells at the LO-58 Site. A notable linear depression in the bedrock surface is present that may be indicative of a surface fracture zone. This fracture orientation was generally consistent with fractures observed during geophysical logging of DW-01.

Groundwater flow through bedrock at the Site is likely primarily via fracture flow. It may be concluded that the orientation, length, width, and interconnectedness of joints in the bedrock beneath the Site will dominate groundwater flow direction and contaminant distribution within groundwater. The bedrock aquifer underlying the LO-58 property has minimal storativity. As such, the aquifer responds rapidly to precipitation events (or lack thereof). Examination of the variation of water elevations between sampling events indicated a wide range in depth to water measurements. The overall bedrock groundwater horizontal potentiometric gradient at the LO-58

Site is northerly beneath the eastern and central portions of the LO-58 Site, and north-westerly beneath the western portion of the LO-58 Site, generally consistent with topography. Seasonal variations in the shape of the potentiometric surface appear to be minimal, as the shape of the surface was similar for both the May 2008 and October 2012 synoptic bedrock gauging events.

2.5.2.3 Soils

Based on the Aroostook County Soil Survey, Northeastern Part, soils at the LO-58 Site are primarily mapped as Caribou gravelly loam, with slopes varying from 0 to 15%. Caribou soils are well drained soils formed on loamy till plains and ridges and have moderate permeability (0.6 to less than 2.0 inches per hour).

2.5.2.4 Topography and Drainage

The LO-58 Site is situated on a small hill located along U.S. Route 1. The Site generally grades radially from a topographic high of approximately 610 ft amsl located in the southern portion of the Site to a low elevation of approximately 530 ft amsl along the northwestern property boundary.

Located to the north of the high point is the former Launcher Area, which is located on a man-made terrace at approximately 585 ft amsl. The Former Missile Assembly and Test Building, AMAC Building Garage, and the AMAC Building are located west of the former Launcher Area and former Warhead Building at an elevation of 565 ft amsl. The access road descends the western-facing slope to a low of approximately 540 ft amsl located at the VFW Post Headquarters located at the western edge of the Site. The topographic low elevation of approximately 530 ft amsl occurs in a drainage swale located at the base of the hill, approximately 150 ft east of the former Barracks Building.

2.5.2.5 Nature and Extent of Contamination

A CERCLA compliant RI/FS was completed in 2017 with the following findings:

- Soil, groundwater, soil gas, and indoor air have been impacted by releases of petroleum hydrocarbons and chlorinated solvents related to the historical operations at the Site;
- Petroleum contamination in groundwater has been identified in MW-05;

- The presence of petroleum contamination in the area near MW-05 may be promoting enhanced biological activity in the groundwater samples, thus contributing to elevated manganese concentrations reported in the well;
- No widespread or well-defined source of soil contamination by chlorinated volatile organic compounds (CVOCs) has been identified despite extensive soil sampling across the site. Sporadic, low level detections of VOCs were reported in soil samples from discrete grab samples collected from soil borings;
- Petroleum compounds and CVOCs have been detected in soil gas beneath the AMAC Building and in indoor air within the AMAC Building;
- Based on the observed concentrations of CVOC in groundwater and in indoor air at the AMAC Building, it does not appear likely that CVOCs present in indoor air originate in groundwater beneath the building but may be related to soils above the water table adjacent to the building;
- CVOCs and petroleum hydrocarbons have been detected in pre-treatment samples collected from the AMAC Building drinking water supply well (DW-01);
- Depth profiling of groundwater entering DW-01 indicates CVOCs are following preferential pathways in the subsurface geology as they infiltrate into the well at multiple depths through fractures observed in the well boring; and
- No evidence of Site-specific contamination has been identified in three other sampled drinking water supply wells that are located on downgradient abutting properties (DW-02 at the former Barracks Building, 271 and 241 Van Buren Rd.).

2.6 CURRENT AND POTENTIAL FUTURE LAND AND WATER USES

2.6.1 Land Use

The Site is maintained for a variety of uses. Members of the VFW use the former Barracks Building regularly for social functions including bingo games, dances, and meetings. In addition, VFW members perform landscaping activities in the vicinity of the former Barracks Building, including lawn maintenance. Staff and clients at AMAC use the former Generator Building five days a week, and regularly take walks around the eastern portion of the Site.

According to the City of Caribou Zoning Map, the Site and its immediate vicinity are zoned as Residential District R-3. Residential District R-3 is intended for the kinds of uses which have traditionally dominated rural New England - forestry and farming, farm residence, and a scattering of varied uses not inconsistent with a generally open, non-intensive pattern of land use. Properties in the vicinity of the LO-58 Site include a mix of commercial and residential uses. According to

the Caribou Land Use Table, the current uses of the property, i.e., Private Club and Day Care, are permitted within R-3 Residential District (City of Caribou, 2008). Current, non-residential uses of parcels in the immediate vicinity of the property include, Automobile (Vehicle) Body Shop or Graveyard and Building Materials, Storage and Sale, and are permitted within Residential District R-3 with Planning Board approval (City of Caribou, 2008).

AMAC Building Area – This 0.3-acre area includes the AMAC Building and the approximately 1/4 acre of mowed lawn immediately adjacent to the building. The outdoor lawn area is frequented by AMAC staff and AMAC clients. The lawn area is used for outdoor recreation and outdoor eating by staff and clients alike. This area represents the area of most likely exposure to AMAC staff and clients in terms of frequency of exposure and exposure duration.

Launcher Area – This 15-acre area is currently off limits to the public. Staff and clients of AMAC occasionally take walks in this area. The only other portion of the LO-58 Site previously utilized is a small area in the southern portion of the former Launcher Area which served as a shooting range (handguns) for the City of Caribou Police Department and the U.S. Customs and Border Patrol. This use has been discontinued. Nevertheless, the Launcher Area has been known to attract trespassers who meander the acreage for recreation and wildlife observation.

2.6.2 Groundwater and Surface Water Uses

The topographic low for the Site exists in a drainage swale located at the base of the hill, approximately 150 ft east of the former Barracks Building. The swale begins at the discharge of a 3-foot diameter corrugated steel drainage culvert and extends to the north/northeast approximately 300 ft towards the newly constructed off-site Access Road located north of the Site. The drainage culvert conveys drainage from the former Launcher Area, the former Warhead Assembly and Test Building area, the AMAC Building area, and the former Barracks Building. Based on observations made during field investigations, it appears that this swale primarily conveys stormwater drainage from the former Barracks Building parking lot. West and northwest of the swale, the ground surface slopes back up towards the rear of the former Barracks Building, and is improved with

manicured lawn and a bituminous concrete access area surrounding the former Barracks Building. This is the only surface water on the site.

Bedrock groundwater is used for private well drinking water supplies in the area of LO-58. Groundwater samples have been collected from private drinking water supply wells DW-01 and DW-02 located on site since 2000. During the October 2012 sampling event, water samples were collected from four water supply wells. Samples were collected from on-site wells DW-01 and DW-02, and from residential wells located at 271 (DW-04) and 241 (DW-03) Van Buren Road which are the nearest residences to the site where access could be obtained. DW-02 is no longer used but has been replaced by a new well. This new well will be integrated into the long term monitoring plan.

2.7 SUMMARY OF RISKS

The following sections summarize the human health and ecological risks posed by Site-related contaminants at LO-58 under current and potential future site conditions.

2.7.1 Human Health

As part of the RI, a HHRA was conducted to estimate the current and future potential adverse effects of contaminants on human health. The HHRA was developed using Environmental Protection Agency (EPA) guidance. Based on previous investigations, a site visit to the area, an analysis of data gaps, and the current and reasonably anticipated future uses, soil (surface and subsurface), groundwater, and indoor air (resulting from the VI pathway) were evaluated as the media of potential concern to human receptors.

The HHRA calculated risks for three exposure areas (EAs): the AMAC Building Area, the Launcher Area, and the Entire Site, and focused on those human populations likely to be exposed to each of the potentially contaminated Site media currently and/or in the future. These populations included AMAC building staff, AMAC building clients, Site workers, trespassers, construction workers, commercial/industrial workers, and possible future residents.

The COPCs that were evaluated in the HHRA included VOCs, PAHs, and metals. Three Site-specific background samples were collected for metals in surface soil and were incorporated into a soil background comparison within the HHRA. Regional background soil levels were also included in the background comparison.

Risks calculated in the HHRA were evaluated to determine the need for a remedial action. For cancer effects, a "cancer risk" was calculated. For example, a cancer risk of 1×10^{-4} translates to a "1 in 10,000 chance." In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to Site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected to from all other causes. For noncancer health effects, a "hazard index" (HI) was calculated. The key concept for a noncancer HI is that a "threshold level" (measured as an HI of less than or equal to 1.0) exists below which noncancer health hazards are not expected to occur.

According to EPA guidance, COPCs that exceed a 1×10^{-4} cancer risk or an HI of 1.0 typically require remedial action at the Site. If remediation is required, the remediation goals are set with consideration of the CERCLA acceptable cancer risk limit of 1×10^{-4} to 1×10^{-6} which corresponds to a one in ten thousand to a one in a million-extra cancer risk, and an HI of 1.0 for noncancer effects.

The HHRA concluded the following:

- Current receptor cancer risks and noncancer HIs across all media were either within or below the EPA acceptable cancer risk range of 1×10^{-6} to 1×10^{-4} and were less than the noncancer target benchmark of 1.0.

- The cumulative cancer risk for the possible future resident slightly exceeded the upper end of EPA's risk range. The future commercial/industrial worker had a cumulative cancer risk within the EPA acceptable cancer risk range of 1×10^{-6} to 1×10^{-4}. The possible future resident and future commercial/industrial worker cumulative noncancer HIs exceeded the noncancer threshold level of 1.0.

- Arsenic and chromium levels in surface soil were either below or within Site-specific and regional background levels and are therefore not likely attributable to site-related activities.

- The primary risk drivers for the residential groundwater exposure scenario, and selected as Site COCs, are 1-methylnaphthalene, and manganese.

- The primary risk drivers for the residential indoor air exposure scenario, and selected as Site COCs, are chloroform, naphthalene and TCE.

2.7.2 Ecological

A Screening Level Ecological Risk Assessment (SLERA) was performed to identify and document potential exposure and consequent risks to ecological receptors exposed to soil and drainageway soil contamination within the study area. The objective of the SLERA was to characterize and quantify, where appropriate, the current impact of contamination on the Site from historical activities as well as the potential baseline ecological risk (i.e., risks that might exist if no remediation, land-use controls, or institutional controls were applied at the Site). In addition, the SLERA provides a basis for supporting a determination that No Further Action is needed or a more realistic and comprehensive evaluation of the ecological risks in a Baseline Ecological Risk Assessment (BERA) is required.

The contaminants of potential ecological concern (COPECs) that were evaluated in the SLERA included VOCs, PAHs, PCBs, and metals. The communities and representative target receptors evaluated in the SLERA were as follows: vascular plants; soil invertebrates/microbes; herbivorous birds/mammals (song sparrow – *Melospiza melodia* and deer mouse – *Peromyscus maniculatus*); and invertivorous bird/mammals (American robin – *Turdus migratorius* and short-tailed shrew – *Blarina brevicauda*).

Hazard quotients (HQs) were developed to determine potential effects to target receptors from exposure to COPECs in soil and prey items. The HQ reflects the magnitude by which the sample concentration or dose exceeds or is less than the toxicity reference value (i.e., soil screening level,

ecological benchmark, criterion or estimated dose). In general, if an HQ exceeds 1, there is a potential for the exposure to elicit an adverse effect.

The SLERA concluded that there were no ecologically significant site-related risks (i.e., risks from site-specific COPECs that could adversely affect evaluated receptor populations) identified for exposures to site or drainageway soils.

2.8 REMEDIAL ACTION OBJECTIVES (RAOS)

RAOs are based on human health and environmental risks that drive the formulation and implementation of response actions. Alternatives have been developed based on the criteria outlined under CERCLA.

The incorporation of ARARs is considered in the development of RAOs and in the evaluation of remedial alternatives. ARARs are used to develop the remedial action cleanup levels that are used to determine the appropriate extent of site cleanup.

COCs were selected based on 1) maximum detected concentrations in exceedance of ARARs or To-Be-Considered criteria (TBCs), 2) human health cancer risks exceeding 1E-05, or 3) non-cancer HIs exceeding 1.0. Groundwater COCs were identified as TCE only. C9-C10 Aromatic Hydrocarbons, 1-methylnaphthalene, and manganese were found to be primary contributors to risk however they are not CERCLA listed hazardouse substances and therefore cannot be addressed under FUDS. ARARs exist only for TCE in groundwater (Federal MCLs). The indoor air COCs were identified as chloroform, naphthalene, and TCE. ARARs and TBCs do not exist for indoor air COCs.

The Proposed RAOs for the Site have an overall objective of addressing human health risks associated with groundwater and indoor air/soil vapor.

Specific RAOs established to address the groundwater and indoor air/soil vapor pathway are selected to:

- Prevent ingestion of water containing COCs in excess of MCLs , an unacceptable cumulative cancer risk greater than 1E-04, and cumulative non-cancer HIs greater than the 1.0 threshold level.

- Prevent exposure to indoor air COCs in excess of preliminary remediation goals (PRGs) (1E-05 risk-based) that pose cumulative cancer risk greater than 1E-04 or non-carcinogenic HIs greater than the threshold level of 1.0.

PRGs developed to meet the RAOs are as follows:

Indoor Air PRGs

COC	PRG (µg/m^3)	Source of PRG
Chloroform	1.1	Risk
Naphthalene	0.7	Risk
Trichloroethene	2	Risk

Groundwater PRGs

COC	PRG (µg/L)	Source of PRG
Trichloroethene	5	MCL

2.9 DESCRIPTION OF ALTERNATIVES

The following remedial alternatives were developed in order to address potential health risks:

Remedial Alternatives – Ground Water

- Alternative GW1 – No Further Action: No Further Action will be taken at the Site to address groundwater contamination.

- Alternative GW2 – Continued POE Treatment, Institutional Controls (annual notifications to landowners), Monitored Natural Attenuation (MNA) and LTM. GW2 includes MNA/LTM that will require up to four bedrock groundwater monitoring wells to be installed in northwestern and southern portions of the Site to monitor possible off-site migration of groundwater toward abutting residences. Groundwater monitoring will be conducted annually in these wells plus 10 existing wells for the baseline sampling event. Subsequent sampling rounds will be based on baseline results and may include a reduced number of wells.

- Alternative GW3 – Installation of New Drinking Water Supply Line, Institutional Controls, MNA, and LTM. A new drinking water supply line will be installed which connects DW-02 to the AMAC Building. Several precautions including additional insulation and heating cables will be installed. Institutional controls as specified in GW2 will be implemented. Monitoring will be performed as described in GW2.

- Alternative GW4 – Bench Scale/Pilot Testing, In-Situ Treatment of Bedrock Groundwater, Installation of New Drinking Water Supply Line, Institutional Controls as described previously, new monitoring well installations as described previously, and groundwater monitoring for approximately two years. In-Situ chemical treatment of bedrock groundwater will be performed to restore bedrock aquifer. Chemical oxidation was selected as the representative process option.

- Alternative GW5 – Groundwater Extraction, Treatment, and Discharge, Institutional Controls, MNA, and LTM. Includes removing contaminated groundwater using the DW-01 well, treatment of the removed groundwater, and infiltrating the treated groundwater downgradient from the site. Institutional controls and new monitoring wells, and LTM performed as described previously.

Remedial Alternatives – Vapor Intrusion

- Alternative VI1 – No Further Action. No Further Action will be taken at the Site to address indoor air VI risks.

- Alternative VI2 – Limited Action – Institutional Controls and LTM. No active treatment will occur, however institutional controls in the form of a landowner notifications specifying that new or existing structures cannot be used for residential purposes unless a vapor management system is in-place and functioning will be used to prevent future human health risks, and monitoring will be performed to verify that the alternative remains protective.

- Alternative VI3 – Active Sub-slab Vapor Mitigation, Institutional Controls and LTM. A sub-slab vapor mitigation system will be used to vent contaminated vapors into the atmosphere. This system will utilize horizontal vapor extraction wells installed under the AMAC Building. Institutional controls will be implemented and monitoring will be performed as described previously.

- Alternative VI4 – Vapor Barrier Installation, Institutional Controls and LTM. An impermeable membrane will be installed on top of the existing floor of the AMAC Building to prevent the migration of contaminated soil vapors into indoor air. A protective layer would cover the membrane to prevent direct contact with the barrier. This will require demolition, removal, and reconstruction of the interior flooring. Institutional controls will be implemented, and long-term monitoring well be performed as described above.

2.10 ANALYSIS OF ALTERNATIVES

A summary of the nine evaluation criteria required by the NCP to evaluate the selected remedial alternatives is presented in the FS. The nine criteria are divided into the following three groups:

- Threshold Criteria:
  - Overall protection of human health and the environment
  - Compliance with ARARs
- Primary Balancing Criteria:
  - Short-term effectiveness
  - Long-term effectiveness and permanence
  - Reduction in toxicity, mobility, or volume
  - Implementability
  - Cost
- Modifying Criteria:
  - State acceptance
  - Community acceptance

The following is a brief summary of the evaluation process. The comparison of alternatives is presented in decreasing order from the most to least advantageous.

Overall Protection of Human Health and the Environment

With the exception of Alternative Groundwater (GW) 1, all of the proposed alternatives would be protective of human health. Alternative GW1 provides the least amount of protection of human health and the environment because no actions will be taken to reduce the ongoing risks posed by groundwater contamination. Alternative GW1 will not meet the NCP threshold criterion of protection of human health and the environment. The remaining groundwater alternatives achieve this criterion by preventing ingestion of groundwater containing COCs exceeding MCLs and placing institutional controls in the form of annual notice letters to owners of property where contaminants of concern could potentially be present in groundwater and/or indoor air. Although no VI alternatives are required to be protective of human health for the present use of the AMAC Building, there is potential future residential unacceptable risk based on exposure to indoor air at the AMAC Building.

Alternative VI1 provides no protection of human health because no action will be taken. VI2 uses institutional controls to limit potential future exposure by providing notifications to landowners informing them that vapor mitigation would be necessary for any future residential uses. DERP Manual, DoDM 4715.20, Encl. 3, p.48, provides "The DoD Component shall provide notice of potential vapor intrusion risks to non-DoD property owners in writing and, as appropriate, include such notice in DDs and transfer documents." (DoD, 2012). VI3 and VI4 use active mechanisms and barriers to protect future users of the AMAC Building. VI2, VI3 and VI4 all will use institutional controls to provide for vapor mitigation in future residential buildings.

Compliance with ARARs

ARARs are used to develop remedial action cleanup levels, determine the appropriate extent of site cleanup, and govern implementation and operation of the selected remedial action. Table 2-1 presents a summary of the ARARs.

Alternative GW1 does not meet the MCLs. Alternatives GW2 and GW3 do meet the MCLs by providing treatment for the active drinking water supply (GW2) or by re-routing the drinking water supply source (GW3); both preventing exposure to contaminated groundwater. Alternatives GW4 and GW5 meet the MCLs, because they prevent exposure to contaminated groundwater by re-routing the drinking water supply source. The only additional ARAR (Underground Injection Control) is met by the GW4 alternative.

Table 2-1
Summary of ARARs

Authority	Medium	Requirement	Status	Synopsis of Requirement	Action to be Taken to Attain Requirement
Chemical Specific ARARs					
Federal	Groundwater	National Primary Drinking Water regulations (40 C.F.R. Part 141.61)	Relevant & Appropriate	These regulations establish Maximum Contaminant Levels (MCLs) for common organic and inorganic contaminants applicable to public drinking water supplies. MCLs are relevant and appropriate cleanup standards for aquifers and surface water bodies that are current or potential drinking water sources. Chemical of Concern included for this ARAR is TCE.	The selected groundwater remedy will comply with the ARAR by preventing current and future exposure to contaminants above MCLs.
Federal MCL: available at https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations					

Short-Term Effectiveness

Alternative GW1 does not involve any construction activities; therefore, there are no risks to the community, workers, or the environment. The continued operation of the POE treatment system under Alternative GW2, and the installation of a new potable water supply line under Alternative GW3, will pose no additional risks to the community and will pose minimal short-term risks to workers and the environment. These risks can be minimized with proper health and safety and construction housekeeping procedures. It is estimated that these alternatives result in a longer time to achieve cleanup goals than alternatives GW4 and GW5.

Alternative GW4 poses the highest short-term risk to the community, site workers, and the environment. These risks are associated with the on-site storage of chemicals, pressurized injection of reactive chemicals, and altering the chemistry of the bedrock aquifer that is currently used for drinking water. However, this alternative results in a relatively short estimated time to achieve cleanup goals.

Alternative GW5 poses slightly higher short-term risk to the community than GW2 and GW3, but less than GW4. This risk relates to the on-site discharge of treated groundwater, as well as the off-site disposal of spent activated carbon. Short-term risks to site workers are minimal, and include risks associated with construction of the infiltration gallery and maintenance of the groundwater extraction and treatment system. Short-term risks to the environment are minimal under this alternative and are associated with the potential for dewatering surrounding areas. This alternative results in a shorter estimated time to cleanup than alternatives GW2 and GW3, but longer than alternative GW4.

Alternatives VI1 and VI2 do not involve any construction activities; therefore, there are no risks to the community, workers, or the environment associated with these alternatives; however, residual risks remain unchanged and the estimated time to achieve remedial goals is significant compared to alternatives VI3 and VI4. The construction-related impacts to the community associated with alternatives VI3 and VI4 would be significant in that AMAC building operations would be limited under alternative VI3 and significantly limited (or temporarily terminated) under alternative VI4.

Long-Term Effectiveness and Permanence

Alternative GW1 provides the least long-term effectiveness and permanence. Any reduction in risk will be a result of unmonitored natural attenuation. No controls will be put in place to prevent improper use or exposure to contaminated groundwater. Alternative GW2 will provide a reduction in risk through continued POE treatment of groundwater. Alternatives GW3, GW4, and GW5 each provide drinking water via a rerouted water supply line to DW-02. GW4 and GW5 also include in-situ groundwater treatment and groundwater extraction, treatment, and discharge, respectively.

Under all groundwater alternatives, risks are expected to slowly decrease over time through dissolution/anaerobic degradation of source materials and monitored natural attenuation of groundwater contamination.

The main differences between the groundwater alternatives involve the adequacy and reliability of the controls. The POE system has been operational for a long duration and has demonstrated reliability throughout that period. Although the subsurface conditions have been studied, the heterogeneities within the limestone fractured bedrock cannot be fully understood. Therefore, uncertainty in the controls exists for alternatives GW3, GW4, and GW5. Without further hydrologic study (as recommended in the alternative), the behavior of the aquifer in response to the additional load on water supply well DW-02, particularly with a groundwater extraction system operating (alternative GW5), is not known. This uncertainty is most impactful to alternative GW4 in that the addition of chemical reagents to the subsurface may result in undesirable impacts such as the liberation of inorganics (including the COC manganese) from the host rock, or injected reagents migrating to unanticipated/undesirable locations.

Although an acceptable amount of risk exists under the current property use, Alternative VI1 does not reduce future risk for residential use. Alternative VI2 reduces risk in the long term through institutional controls requiring VI mitigation systems in future residential construction or rehabilitation of the existing building for residential use.

Alternatives VI3 and VI4 reduce current-use risk via active sub-slab vapor recovery and passive vapor barrier system installation. Rehabilitation of the current building to residential use may be performed under alternatives VI3 and VI4 (assuming the vapor mitigation systems are maintained), and other future residential construction would be required to install and maintain a vapor management system under an institutional control.

Reduction in Toxicity, Mobility, or Volume

Under Alternatives GW1 and GW3, no active reduction of mass, toxicity, mobility, or volume of groundwater contamination will take place which does not satisfy the statutory preference for

treatment. However, groundwater contamination will gradually decrease over time through dissolution/anaerobic degradation of contaminants.

Alternatives GW2, GW4, and GW5 satisfy the statutory preference for treatment. The mass, toxicity, mobility, and volume of contamination within the bedrock aquifer will be decreased via extraction and ex-situ treatment under Alternatives GW2 and GW5, and through in-situ treatment under Alternative GW4. Both of these treatment technologies are irreversible.

The highest degree of treatment exists under GW5 followed by GW4. The least amount of treatment occurs with GW2.

Treatment residuals will exist for each of the treatment technologies, including a small amount of spent activated carbon (GW2), a larger amount of spent carbon (GW5), and altered groundwater geochemistry (GW4) which could potentially result in liberation of inorganic constituents including the COC manganese from host rock.

None of the VI alternatives satisfy the statutory preference for treatment.

Implementability

With no proposed actions, Alternative GW1 is the easiest to undertake when compared with the other alternatives; however, it is not reliable and is not monitored. There are no costs for Alternative GW1. Alternative GW2 will be slightly more difficult to implement than alternative GW-1, as it will involve the installation of new groundwater monitoring wells, the continued operation and monitoring the POE system, long-term groundwater and MNA monitoring, and implementation of institutional controls as described above. These activities are easily implementable, able to be monitored, and do not limit potential future remedial actions. Alternative GW3 is more difficult to implement than GW2 in that a pumping test to demonstrate that adequate water supply is available, and excavation (likely within bedrock) for the water supply line, will be required. The same institutional controls included in alternative GW2 will be implemented in this alternative as well. No limitation of future remedial actions is associated with alternative GW-3.

Alternative GW4 will be significantly more difficult to implement than Alternatives GW2 or GW3. This alternative will involve the installation of approximately five bedrock injection wells, as well as the injection of treatment reagents into the bedrock aquifer. Effectively targeting individual bedrock fractures or fracture sets for treatment is difficult to implement, control, and monitor. Bench and pilot-scale testing will be tailored to attempt to address this concern. Modification of the subsurface geochemistry may result in reduced effectiveness of certain remedial technologies (such as biological treatments, or extraction and carbon treatment).

Alternative GW5 is likely to be at least as difficult to implement as alternative GW4. Installation of an upgraded treatment system using approximately the same floorspace and installing an upgraded well pump will be easily implementable. However, the nearest surface water body is too far from the Site to discharge treated groundwater, so an on-site subsurface infiltration system is proposed. The shallow bedrock, the site topography, and the in-place soil materials are not conducive to draining even relatively small volumes of continuous water flow. Additionally, application of certain remedial actions (such as in-situ techniques) within the infiltration system footprint may not be possible.

With no proposed actions, Alternative VI1 is the easiest to implement when compared with the other alternatives. There are no costs for Alternative VI1. VI2 involves institutional controls and is therefore slightly more difficult to implement.

Alternative VI3 is more difficult to implement than Alternative VI2. This involves horizontal drilling beneath the AMAC Building and installation of a vapor extraction system and will require some coordination with the AMAC business to safely construct, test, and monitor the alternative. Additional remedial actions would need to avoid impacting the active vapor mitigation infrastructure. Alternative VI4 will be the most difficult alternative to implement, because it will require the disruption (or temporary termination/ relocation) of the AMAC Building business for a period of approximately three months. It will be necessary to completely strip the interior of the building so that the membrane can be sprayed across the entire floor. A wear layer will be installed above the floor, and the interior will then be re-constructed throughout the entire building. If

additional remedial measures were required, any protrusions through the vapor barrier would need to be repaired and tested prior to acceptance.

Cost

The estimated costs for the groundwater alternatives are as follows:

	Capital Cost	Present Worth O&M Cost	Present Worth Cost
GW1	$0	$0	$0
GW2	$62,780	$565,258	$628,038
GW3	$191,760	$505,806	$697,556
GW4	$951,904	$57,977	$1,009,881
GW5	$347,423	$574,794	$922,217

The estimated costs for the VI alternatives are as follows:

	Capital Cost	Present Worth O&M Cost	Present Worth Cost
VI1	$0	$0	$0
VI2	$18,225	$244,941	$263,166
VI3	$115,994	$248,224	$364,218
VI4	$139,322	$244,941	$384,262

The comparative analysis of remedial alternatives is presented in Table 2-2.

Table 2-2

Comparative Analysis of Alternatives

	Threshold Criteria		Balancing Criteria						
	Protection of Human Health & Environment	Compliance with ARARs	Long-Term Effectiveness & Permanence	Reduction of Toxicity, Mobility, & Volume Through Treatment	Short-Term Effectiveness	Implementability	Total Present Value Cost		Time to Achieve Residential PRGs/RAOs (Cancer Risk = 10^{-5})
Groundwater Alternatives									
GW1 - No Action [Groundwater]	☒	☒	None	None	Very High	None	None	$0	90 yrs
GW2 - Continued POE System Operation, Institutional Controls, LTM & MNA	☑	☑	Very High	High	Very High	Very High	Low	$628,038	90 yrs
GW3 - Shut Down POE System; Reroute Drinking Water Supply Line, Institutional Controls, LTM & MNA	☑	☑	High	None	High	High	Medium	$697,556	90 yrs
GW4 - In-Situ Treatment; Install Drinking Water Supply Line, Institutional Controls, LTM & MNA	☑	☑	High	High	Medium	Low	Very High	$1,009,881	2 yrs
GW-05 - Groundwater Extraction, Treatment, Discharge, Install Drinking Water Supply Line, Institutional Controls, LTM & MNA	☑	☑	High	Very High	High	Low	High	$922,217	52 yrs
Vapor Intrusion Alternatives									
VI1 - No Action [Vapor Intrusion]	☒	☑	None	None	Medium	High	None	$0	>300 yrs
VI2 - Institutional Controls	☑	☑	Medium	None	Medium	Medium	Low	$263,166	>300 yrs
VI3 - Vapor Removal, Institutional Controls	☑	☑	High	None	High	Low	Medium	$364,218	Immediately upon completion of installation
VI4 - Vapor Barrier, Institutional Controls	☑	☑	High	None	Low	None	High	$384,262	Immediately upon completion of installation

Legend

Threshold Criteria

☒ Does not meet criterion
☑ Meets criterion

Balancing Criteria

Relative alternative ranking from 0 (lowest ranked) to 4 for the GW alternatives or to 3 for the VI alternatives
Rankings may be tied for criteria in which there is little to no difference between the alternatives

State Acceptance

As stated in a letter from MEDEP dated 23 July 2018, MEDEP supports the Proposed Plan in general, but continues to have some concerns with the selected remedy (VI2 & GW2) for the site due to the absence of legally binding institutional controls (IC). It is the Department's position that annual notification letters are insufficient to prevent potential human health pathways. The MEDEP stated that the IC for the selected alternatives VI2 & GW2 must comply with the Maine Uniform Environmental Covenant Act (UECA).

Community Acceptance

The preferred remedial alternative was made available to the public through the activities described in Section 2.3 (Community Participation) and also during the 18 July 2018 public meeting. During the public meeting the AMAC Director expressed concern that their clients are a sensitive population and no active remediation of the subslab and indoor air is proposed. The Director further expressed concern that risk to a future resident is considered unacceptable but risk to the AMAC clients is acceptable. The Lister-Knowlton VFW Post 9389 representative likewise expressed these same concerns.

2.11 SELECTED REMEDY

The selected remedy identified in the PP for groundwater is alternative GW2, continued POE treatment of groundwater from well DW-1, institutional controls (annual notifications to landowner), MNA, and LTM. GW2 includes MNA/LTM that will require up to four bedrock groundwater monitoring wells be installed in northwestern and southern portions of the Site to monitor possible off-site migration of groundwater toward abutting residences. Long-term monitoring will be conducted at a frequency sufficient to maintain the treatment systems and to assess changes in groundwater chemistry.

The selected remedy identified in the PP for vapor intrusion is VI2, institutional controls and long-term monitoring. No active treatment will occur, however institutional controls in the form of landowner notifications specifying that new or existing structures cannot be used for residential

purposes unless a vapor management system is in-place and functioning will be used to prevent future human health risks, and monitoring will be performed to verify that the alternative remains protective.

Land use controls for the AMAC building area will include annual notice letters to current or future property owner to ensure that they are aware of the potential for contaminated groundwater under their property; and to indicate that the USACE is willing to test any new drinking water well for COC's. The notice letters will also indicate USACE willingness to install and maintain GAC filters on a drinking water well, if MCLs are exceeded, or if concentrations are trending toward an MCL exceedance. The AMAC building Area notice letters will be sent by the USACE to property owners. The Town tax records will be checked each year by the USACE to ensure that the current owners of the property receive the notice. DERP Manual, DoDM 4715.20, Encl. 3, p.48, provides "The DoD Component shall provide notice of potential vapor intrusion risks to non-DoD property owners in writing and, as appropriate, include such notice in DDs and transfer documents." The Land Use Control Zone or AMEC building area may be modified, if necessary, based upon future data from the Groundwater Monitoring Program.

Public comments and comments received from MEDEP generally agreed with the proposed groundwater remedy. However, the property owner and the on-site tenant did not agree with the proposed vapor intrusion remedy preferring an active recovery system. Based on the public comments received, the Corps has changed the selected VI alternative to Alternative VI3, installation of an active sub-slab vapor mitigation system, institutional controls and LTM. A sub-slab vapor mitigation system will be used to vent contaminated vapors into the atmosphere. This system will utilize horizontal vapor extraction wells installed under the AMAC Building. Institutional controls will be implemented and monitoring will be performed to verify that the alternative remains protective.

MEDEP commented on the proposed institutional controls included in the proposed groundwater and vapor intrusion remedial responses preferring an environmental covenant approach. However

the Army does not have the authority to pursue an environmental covenant under the FUDS program.

2.12 STATUTORY DETERMINATIONS

Section 1.4 discusses the statutory determinations. The Selected Remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable. The selected remedy has been shown to be successful over the past several years and under current conditions the site remains protective.

Because this remedy will result in hazardous substance, pollutants or contaminants remaining on -site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted every five years after initiation of remedial action per 40 CFR 300.430(f)(4)(ii) to ensure that the remedy is, or will be, protective of human health and the environment.

2.13 DOCUMENTATION OF SIGNIFICANT CHANGES

The property owner and the on-site tenant did not agree with the proposed vapor intrusion remedy preferring an active recovery system. Based on the public comments, the Corps has changed the selected VI alternative to Alternative VI3, installation of an active sub-slab vapor mitigation system, institutional controls and LTM. A sub-slab vapor mitigation system will be used to vent contaminated vapors into the atmosphere. This system will utilize horizontal vapor extraction wells installed under the AMAC Building. Monitoring will be performed to verify that the alternative remains protective.

MEDEP commented on the proposed institutional controls included in the proposed groundwater and vapor intrusion remedial responses preferring an environmental covenant approach. However the Army does not have the authority to pursue an environmental covenant under the FUDS program .

3. PART 3: RESPONSIVENESS SUMMARY

A PP was issued on 22 June 2018 providing information to the public on the Corps' recommended response for contamination at the former LO-58 Nike Battery Launch Site in Caribou, Maine. The PP presented the Corps' rationale for the preferred approach for the Site and is a tool to encourage and facilitate community participation. The public comment period for the Proposed Plan was 22 June 2018 – 30 July 2018. The Corps hosted a public meeting at the Caribou City Hall on 18 July 2018. This responsiveness summary presents the comments received during the public comment period, including those received during the public meeting, and provides the Corps response to each comment. A transcript of the public meeting discussions is available in the Administrative Record for the Site located at the Caribou Public Library.

3.1 OVERVIEW

A Proposed Plan was issued on 22 June 2018 providing information to the public on the U.S. Army Corps of Engineers (the Corps), New England District, recommended response for contamination at the former LO-58 Nike Battery Launch Site (the Site) in Caribou, Maine. The Proposed Plan presented the Corps' rationale for the preferred approach for the Site and is a tool to encourage and facilitate community participation. The public comment period for the Proposed Plan was 22 June 2018 – 30 July 2018. The Corps hosted a public meeting at the Caribou City Hall on 18 July 2018. This responsiveness summary presents the comments received during the public comment period, including those received during the public meeting, and provides the Corps response to each comment. A transcript of the public meeting discussions is available in the Administrative Record for the Site located at the Caribou Public Library.

The selected remedy identified in the Proposal Plan for groundwater is alternative GW2, continued point of entry treatment of groundwater from well DW-1, institutional controls (IC) (annual notifications to landowner), monitored natural attenuation (MNA) and long-term monitoring (LTM). GW2 will require that up to four bedrock groundwater monitoring wells be installed in northwestern and southern portions of the Site to monitor possible off-Site migration of groundwater toward abutting residences. Groundwater monitoring will be conducted annually in

these wells plus up to 10 existing wells for the baseline sampling event. Subsequent sampling rounds will be based on baseline results and may include a reduced number of wells.

The selected remedy identified in the Proposal Plan for vapor intrusion (VI) is VI2, IC and long-term monitoring. No active treatment will occur; however institutional controls in the form of landowner notifications specifying that new or existing structures cannot be used for residential purposes unless a vapor management system is in-place and functioning will be used to prevent future human health risks. Monitoring will be performed by USACE to verify that the alternative remains protective.

Public comments and comments received from Maine Department of Environmental Protection (MEDEP) generally agreed with the proposed groundwater remedy. However, the property owner and the on-Site tenant did not agree with the proposed VI remedy preferring an active recovery system. The property owner and on-site tenant provided additional information about the current use of the building as an Adult Learning Center, and raised concerns about the potential health risk to individuals who regularly utilize the Center. Many of the building clients have compromised immune systems, and the director has been working on-site for over 30 years. The combination of these factors in the use of the building comes closer to a residential scenario, for which there would be unacceptable risk. Based on the public comments received, the Corps has changed the selected VI alternative to Alternative VI3, installation of an active sub-slab vapor mitigation system, IC and LTM. This change is warranted to mitigate against the human health risk and is reasonable and justifiable in light of the overall cost. The added cost to install a vapor mitigation system in the building is minimal to the overall cost of the remedy and easily executed. A sub-slab vapor mitigation system will be used to vent contaminated vapors into the atmosphere, thereby diverting contaminated vapors away from the breathing space. This system will utilize horizontal vapor extraction wells installed under the AMAC Building. IC will be implemented and monitoring will be performed to verify that the alternative remains protective.

MEDEP commented on the proposed IC included in the proposed groundwater and VI remedial responses preferring an environmental covenant approach. However, the Army does not have the authority to pursue an environmental covenant under the FUDS program.

Summary of Public Meeting Comments Received and Corps Responses

Remedial Alternative Preferences

1) During the public meeting the Adult Multiple Alternatives Center (AMAC, a tenant on the property) Director expressed concern that their clients are a sensitive population and no active remediation of the subslab and indoor air is proposed. The Director further expressed concern that risk to a future resident is considered unacceptable but risk to the AMAC clients is acceptable. The Lister-Knowlton Veterans of Foreign Wars (VFW) Post 9389 representative (property owner) likewise expressed these same concerns.

Corps Response: During the public meeting the Corps explained the different exposure assumptions employed in the risk assessment for the two different exposure scenarios (AMAC workers and clients versus future residents) and how that resulted in acceptable risk levels for AMAC and their clients and unacceptable for a future resident. The Corps also explained that the decision is not final and the community concerns will be incorporated into the final decision.

As a result of the concerns expressed by the property owner and tenant, the Corps changed the selected VI alternative to Alternative VI3 as identified and evaluated in the feasibility study. VI3 includes installation of an active sub-slab vapor mitigation system, IC and LTM. A sub-slab vapor mitigation system will be used to vent contaminated vapors into the atmosphere, preventing them from entering the building. This system will utilize horizontal vapor extraction wells installed under the AMAC Building. IC will be implemented and monitoring will be performed to verify that the alternative remains protective.

2) During the public meeting several questions were asked regarding the timing of implementation of the selected remedy, especially when the indoor air and drinking water for the AMAC building would be sampled. Concern was expressed regarding lengthy delays while the Decision Document is finalized and the remedy is implemented since the drinking water and indoor air has not been sampled in several years. The question was asked if anything could be done to improve the air quality until sampling can be conducted.

Corps Response: During the public meeting the Corps explained the process required to get a final decision document and award a contract to implement the remedial action and projected the sampling would not occur until 2019. MEDEP said they may be able to collect a sample from the drinking water well serving the AMAC building. Following the public meeting, the Corps decided to provide an indoor air purifier for AMAC to use until the next round of VI sampling can be performed and also to collect samples from the AMAC drinking water wells. These actions were completed on 6 November 2018.

3) During the public meeting MEDEP expressed concern regarding the planned IC. They said they supported the overall general plan but felt the annual letter notification to property owners was not sufficient as an IC. They pointed to the fact that the VFW had installed a new drinking water well on-Site about a year ago without MEDEP or the Corps being aware of it. MEDEP prefers an environmental covenant that would, at a minimum, prohibit groundwater use without MEDEP or Corps prior written consent.

Corps Response: During the public meeting the Corps explained that they have no authority as a non-property owner to put controls on anyone. The Corps has seen other States put controls on property owners, but if the property owner does not agree to the control, the Corps cannot build it into their Decision Document. Following the meeting Army office of councel informed the project delivery team that the Army does not have the authority to place deed restrictions or environmental covenants on FUDS properties. The annual letter notifications will be included as the primary IC portion of the remedy.

Other Issues

1) During the public meeting several questions were asked regarding when the AMAC drinking water well was last sampled, when the carbon filters were last changed and why the long delay in getting the VI data to the AMAC building occupants.

Corps Response: The AMAC drinking water well was last sampled (before treatment, between treatment units, and after treatment) in 2015. The carbon filters were changed at the same time. Given the low concentrations of volatile organics in the water, the filters should be good for at least 5 years. The Corps has proposed annual sampling as part of the selected groundwater remedy and has agreed to collect a post treatment sample in September 2018. The VI sampling was performed in April and October 2012. All data was included in the Draft Final Remedial Investigation/Feasibility Study Report which was provided to all stakeholders including the VFW and AMAC in October 2013.

3.2 WRITTEN COMMENTS RECEIVED AND CORPS RESPONSES

Written comments on the Proposed Plan were received from MEDEP. No other written comments were received.

General Comments:

1. Based on our review of the document the MEDEP supports the Proposed Plan in general, but continues to have some concerns with the selected remedy (VI2 & GW2) for the Site due to the absence of legally binding IC. It is the Department's position that annual notification letters are insufficient to prevent potential human health pathways, as the new well at the VFW indicates. Since the IC for the selected alternatives VI2 & GW2 must comply with the Maine Uniform Environmental Covenant Act (UECA), the Department is willing to be the holder of the covenant. The VFW has agreed to sign a covenant that requires prior approval for new drinking water supplies and that any new building construction must include a vapor barrier or similar preventative measures against harmful vapors in indoor air.

Corps Response: The Corps had initially agreed to revise the IC to include an environmental covenant. However, subsequently discussions with Army office of councel determined that Army does not have the authority to implement deed restrictions and/or environmental covenants under the FUDS program. The annual letter notifications are still included as part of the IC portion of the remedy. It is also the Department's position that any drinking water supplies relying on carbon or other filtration systems should have a long-term filtration agreement with the property owner and any tenants. The Department has templates for these Agreements and would be glad to provide one. These Agreements spell out roles and responsibilities that are beneficial to all parties.

Corps Response: The Army does not have the authority to enter into such agreements under the FUDS program. New carbon filters will be provided for the baseline sampling event. Future carbon filtration will be evaluated and changed as necessary based on analytical results and inspections during the annual sampling events.

Specific Comments

1. Page 4, Figure 2. The lettering in this map is barely legible. Please enlarge the map or the font size. Misspelled word on figure ("Laucher Area" - should be "Launcher Area"?).

Corps Response: Comment is noted. This will be corrected in the Decision Document as appropriate. The Proposed Plan will not be revised.

2. Page 6, Site Characterization, fifth paragraph. "The post-treatment drinking water samples have not contained detectable concentrations of TCE." This is not true; there have been multiple detections of TCE in post-treatment samples, including three exceedances of the MCL. In post-treatment samples, detections of 5.8, 5.5, 4.5, 6.62, and 2.1 µg/L were detected at DW-1 on 5/2/2001, 8/7/2002, 10/24/2002, 1/21/2003 and 11/15/2006, respectively. It is possible that some of these exceedances represent errors in labeling (confusing the pre-filter with the post-filter samples), but we have no verification of this and we don't think that all of them could be mislabeling errors. Please provide

evidence that these detections are errors or correct this statement in the PP. If these data are incorrect, please consult with us so that we can correct our database.

Corps Response: The Corps began operating and maintaining the DW-1 water treatment system in 2009 and so the raw, intermediate and post treatment data that the Corps has begins in October 2009. As long as the Corps has operated and maintained the system, no TCE has been detected in the post treatment samples (12 rounds of data). The statement regarding TCE in post treatment samples will be clarified in the Decision Document as appropriate. The Proposed Plan will not be revised.

3. Page 7, Field Investigation, fourth bullet. It is true that no widespread source of soil contamination of CVOCs was identified, but the RI/FS states that two localized sources were identified. Please add this conclusion of the RI/FS to the PP.

Corps Response: Comment is noted. This will be added to the Decision Document as appropriate. The Proposed Plan will not be revised.

4. Page 8. "The possible I future resident and future commercial/industrial worker... "Please delete "I".

Corps Response: Comment is noted. This will be corrected in the Decision Document as appropriate. The Proposed Plan will not be revised.

5. Page 8. "The primary risk drivers for the residential groundwater scenario selected as Site COCs are 1-methylnaphthalene, and manganese." According to the RI/FS, the primary risk drivers are 1-methylnaphthalene, benzo(a)pyrene, dibenzo(a,h)anthracene, and manganese. Please include all the COCs listed in the RI/FS.

Corps Response: Although 1-methylnaphthalene, benzo(a)pyrene,dibenz(a,h)anthracene, and manganese were all risk drivers identified in the HHRA, only 1-methylnaphthalene and manganese were selected as COCs. The selection of COCs is discussed in detail in the RI/FS. Subsequent to the public meeting on the Proposed Plan, The Army Center of Expertise and office of councel informed the project delivery team that three COCs listed for the groundwater drinking pathway could not be listed as COCs since they are not CERCLA listed hazardous

substances. The list of COCs and PRGs for these substances (manganese, 1-mthylnaphthalene and C9-C10 Aromatics Hydrocarbons) have been deleted from the Decision Document for this reason. The sole remaining COC for the groundwater is TCE. Also, it should be noted that the recommended remedy of carbon filtration with LTM/MNA will result in adequate removal of all chemicals of potential concern.

6. Page 9, Basis for Action. The RI/FS includes the exceedance of chemical-specific standards (ARARS) in the basis for action. Please include the exceedance of ARARS as a basis for action or explain why it was deleted.

Corps Response: The basis for action per DERP requirements is unacceptable risk. Once an action is required, remediation goals/cleanup levels are selected based on risk and ARARs.

7. Page 9, Technology Evaluation, second column, last two bullets: State policy requires cumulative cancer risk not exceed 1 x 10^{-5} not 1 x 10^{-4} as referenced in here.

Corps Response: Per DERP requirements, unacceptable risk uses CERCLA/EPA criteria of a cumulative risk exceeding 1 x 10^{-4}. Preliminary remediation goals were established based on ARARs, if they exist, or risk at 1 x 10^{-5} for individual chemicals without ARARs to keep the cumulative risk below the 1 x 10^{-4} criteria.

8. Page 10. According to the RI/FS, the indoor air PRGs include 1,2-dichloroethane, which is not included in this table. Please include 1,2-dichloroethane in the table of indoor air PRGs.

Corps Response: Although 1,2-DCA was originally considered a COC, an EPA RSL update resulted in the elimination of 1,2-DCA as a COC in indoor air.

9. Page 12, Remedial alternative, VI2 is described differently in the PP compared to the RI/FS. In the RI/FS, the IC in this alternative is described as a land use restriction to be placed on the property, yet in the PP, it is described as annual notifications letters. The IC for the selected alternative VI2 must comply with the Maine UECA.

Corps Response: See response to General Comment #1. Page 12. Remedial alternative GW2 described differently in the PP compared to the RI/FS. In the RI/FS, the IC in this alternative is

described as a land use restriction to be placed on the property, yet in the PP, it is described as annual notifications letter. The IC for the selected alternative GW2 must comply with the Maine UECA.

Corps Response: See response to General Comment #1. Page 14, Table 3. Table 3 is different than the same table in the RI/FS (Table 12-1). Several boxes changed from "partially meets criterion" to "meets criterion". There is grading scheme of low, medium, high, and very high in the PP whereas in the RI/FS, it was: "does not meet criterion", "partially meets criterion", and "meets criterion". There appears to be inconsistency between the classification schemes, for example some cases where "does not meet criterion" is selected in the RI/FS, "very high" was selected in the PP. These tables need to be consistent with each other.

Corps Response: Several errors were found in this table and a different format was deemed preferable for the Proposed Plan.

10. Page 14. As mentioned in Comments 9 and 10, IC need to be land use restrictions on properties as agreed in the RI/FS, not annual notice letters.

Corps Response: See response to General Comment #1. Page 15, Long-term effectiveness and permanence, second paragraph. Long term filter systems (such as the AMAC building is using) need written agreements spelling out sampling and maintenance schedules and responsibilities.

Corps Response: See response to General Comment #2

11. Page 15, Long-term effectiveness and permanence, second paragraph. "Although the subsurface conditions have been studied, the heterogeneities within the limestone fractured bedrock cannot be fully understood. Therefore, uncertainty in the controls exists for alternatives GW3, GW4, and GW5." We concur that heterogeneities in the bedrock make certain remedies difficult to guarantee, but we don't see why that would add uncertainty to GW3, which is the installation of a new water supply line. While the Department concurs that the Proposed Plan (with our recommendations) is protective of human health and the environment, we also believe that connection to the new VFW well is probably more cost effective over the long term.

Corps Response: Comment is noted.

12. Page 18, Preferred alternative, fourth paragraph. Please note that there are no building codes in Maine that require installation of radon systems in new buildings. Please correct this paragraph to make it clear that his action will be completed by USACE, not the property owner.

Corps Response: Comment is noted. This has been added to the Decision Document as appropriate. Per DERP requirements, the Corps will not install vapor mitigation systems for new buildings constructed within the Activity/Use Limitation area. That will be the responsibility of the property owner. The Corps will provide air monitoring to verify no indoor air issues exist. The Proposed Plan will not be revised.

13. Page 18, Preferred Alternatives, second column, top of page: According to the text, "Land use control within the AMAC building area is shown on Figure 2". Should this be Figure 4?

Corps Response: While Figure 2 is not incorrect, Figure 4 would be a better reference. This will be changed for the Decision Document as appropriate. The Proposed Plan will not be revised.

14. Page 18, How Will the Land Use Controls Work, second column, mid-page: The document states, "The proposed AMAC building area land use control will include any new well installed to be tested and treated." Who will test and treat the well?

Corps Response: The Corps will test and treat the well if needed.

Risk Assessment

1. RI/FS review comments dated November 29, 2016 concluded that potential risks from the site were not adequately assessed in the HHRA. At the time, the USACE acknowledged that the 2012 sampling data was inadequate for risk assessment and stated they intended to achieve better data for site characterization and reassess for contaminants of potential concern upon the next sampling effort. Specifically, detection limits were inadequate to evaluate many site-associated chlorinated solvents and explosives in groundwater. USACE acknowledged this

in the Uncertainty section of the RI/FS, however failed to emphasize that the many of the contaminants listed in Section 5.5.1 are in fact site-related (solvents and explosives) and potential risks from these contaminants have not been addressed. The LTMP should specify data quality objectives that will generate data adequate to address the groundwater contamination data gaps.

Corps Response: Comment is noted. The LTMP will address the data quality objectives as they relate to a more sensitive analysis for the pre-design and LTM groundwater analyses.

2. The Groundwater PRG for C9-C10 aromatic hydrocarbons is the 2016 Maine MEG of 200ug/L. Using 200 ug/L in the EPA RSL risk calculator for residential Tap water results in a child's Hazard Index (HI) of 36.7. The 2016 Maine MEG did not consider the inhalation pathway.

Corps Response: Comment noted. The noncancer toxicity criteria used in the derivation of the Maine MEG for C9-C10 aromatic hydrocarbons as provided in Remediation Guidelines for Petroleum Contaminated Sites in Maine, differ from those applied in the EPA RSL calculator. The RfC in particular, is more conservative in the RSL calculator (0.03 mg/m^3) than that used in the MEG derivation (0.05 mg/m^3). The MEG assumes pyrene as the representative surrogate for C9-C10, whereas the RSL calculator assumes the more conservative naphthalene (aromatic medium) as the representative surrogate for the tapwater calculations. The updated toxicity criteria assumed in the RSL calculator will be applied to the LTMP to ensure protectiveness of future Site receptors.

3. Inhalation is a major risk driver for C9-C10 aromatics in groundwater, the EPA tap water RSL for mid-range aromatic hydrocarbons, adjusted to the Maine target HI of 1, is 5.5 ug/L. The 2016 Maine MEG for C9-ClO aromatics will be revised to incorporate the BPA RSL inhalation pathway modeling. Please be advised that the PRG for C9-C10 aromatic hydrocarbons will need to be updated for the ROD.

Corps Response: See response to Risk Assessment comment #2.

4. PART 4: REFERENCES

DoD 2012, Department of Defense Manual 4715.20: *Defense Environmental Restoration Program (DERP) Management*, March 9, 2012.

USACE, 2010. *Final Borehole Hydrophysics and Geophysics Report, Former LO-58 Nike Battery Launch Site, FUDS, Caribou, Aroostook County, Maine*. June 17, 2010.

USACE (U.S. Army Corps of Engineers). 2011. *Public Participation Requirements for Defense Environmental Restoration Program*. Engineer Pamphlet 200-3-1. 30 September 2011.

USACE, 2011a. *Final Conceptual Site Model, Former LO-58 Nike Battery Launch Site, Caribou, Maine*. August.

USACE. 2015. *Public Involvement Plan, Former LO-58 Nike Battery Launch Site, Caribou, ME,* February 2015.

USACE. 2017. *Final Remedial Investigation/Feasibility Study, Former LO-58 Nike Battery Launch Site, Caribou, ME,* February, 2017.

USACE. 2018. *Proposed Plan, Former LO-58 Nike Battery Launch Site, Caribou, ME,* June 2018.

USEPA (U.S. Environmental Protection Agency). 1999. *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*. OSWER 9200.1-23P. July 1999.

USEPA. 2016. *Superfund Community Involvement Handbook*. January 2016.

Appendix A

MEDEP Comment Letter on the 2018 Proposed Plan for LO-58, Caribou, ME

Dated 23 July 2018

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

PAUL R. LEPAGE
GOVERNOR

PAUL MERCER
COMMISSIONER

July 23, 2018

Mr. James Kelly
U.S. Army Corps of Engineers
696 Virginia Road
Concord, MA 01742-2721

Re: 2018 Proposed Plan for LO-58, Caribou Maine

Dear Mr. Kelly:

The Maine Department of Environmental Protection (MEDEP) has completed its review of the 2018 Proposed Plan for LO-58 in Caribou, Maine.

Based on our review of the document the MEDEP supports the Proposed Plan in general, but continues to have some concerns with the selected remedy (VI2 & GW2) for the site due to the absence of legally binding institutional controls (IC). It is the Department's position that annual notification letters are insufficient to prevent potential human health pathways, as the new well at the VFW indicates. The IC for the selected alternatives VI2 & GW2 must comply with the Maine Uniform Environmental Covenant Act (UECA), the Department is willing to be the holder of the covenant, and the VFW has agreed to sign a covenant that requires prior approval for new drinking water supplies, and that any new building construction must include a vapor barrier or similar preventative measures against harmful vapors in indoor air.

It is also the Department's position that any drinking water supplies relying on carbon or other filtration systems should have a long-term filtration agreement with the property owner, and any tenants. The Department has templates for these Agreements, and would be glad to provide one. These Agreements spell out roles and responsibilities that are beneficial to all parties.

Specific Comments

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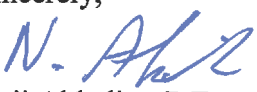
data for site characterization and reassess for contaminants of potential concern upon the next sampling effort. Specifically, detection limits were inadequate to evaluate many site-associated chlorinated solvents and explosives in groundwater. USACE acknowledged this in the Uncertainty section of the RI/FS, however failed to emphasize that the many of the contaminants listed in Section 5.5.1 are in fact site-related (solvents and explosives) and potential risks from these contaminants have not been addressed. The LTMP should specify data quality objectives that will generate data adequate to address the groundwater contamination data gaps.

The Groundwater PRG for C9-C10 aromatic hydrocarbons is the 2016 Maine MEG of 200ug/L. Using 200 ug/L in the EPA RSL risk calculator for residential Tap water results in a child's Hazard Index (HI) of 36.7. The 2016 Maine MEG did not consider the inhalation pathway. Inhalation is a major risk driver for C9-C10 aromatics in groundwater, the EPA tap water RSL for mid-range aromatic hydrocarbons, adjusted to the Maine target HI of 1, is 5.5 ug/L. The 2016 Maine MEG for C9-C10 aromatics will be revised to incorporate the EPA RSL inhalation pathway modeling. Please be advised that the PRG for C9-C10 aromatic hydrocarbons will need to be updated for the ROD.

If you have any questions related to this letter, please feel free to contact me at 207.557.4312.

Sincerely,



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Chris Swain, MEDEP
Gail Lipfert, MEDEP
Pamela Wadman, MECDC

Appendix B

State Concurrence with the Decision Document, Former LO-58 Nike Missile Site, Caribou, ME

Dated 7 Feb 2019

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

JANET T. MILLS
GOVERNOR

GERALD D. REID
COMMISSIONER

February 7, 2019

Mr. James Kelly
U.S. Army Corps of Engineers
696 Virginia Rd.
Concord, MA. 01742-2721

RE: State Concurrence with the Decision Document, *Former LO-58 Nike Missile Site*, Caribou, Maine

Dear Mr. Kelly:

The Department has reviewed the United States Army Corps of Engineers' (USACE) Decision Document (DD) dated January 2019 for the former LO-58 site in Caribou Maine (Site). The Department concurs with the proposed remedies set forth in the DD that include:

1. Point of Entry treatment for contaminated wells;
2. Sub-slab vapor mitigation for indoor air
3. Institutional Controls to prevent future public health risks;
4. Monitored Natural Attenuation; and
5. Long-term monitoring

The Department concurs because this remedy will protect public health from all CERCLA and RCRA pollutants. Additionally, the Department provides the following comments on the Decision Document:

- At similar sites being remediated in Maine through other programs, responsible parties use best efforts to obtain Environmental Covenants (ECs) that meet the standards in Maine's *Uniform Environmental Covenants Act*, 38 M.R.S. §§ 3001-3013 (UECA) before settling for annual notification letters like the ones in this Site's Decision Document. As discussed, the Department will assist in establishing effective Land Use Controls by seeking an EC at this Site from the current property owner.

- As previously noted in meetings and written comments, the Department has strong concerns regarding a lack of written agreements between the USACE and the property owners concerning the operation and maintenance of the filter system. The Department understands that the USACE will send a letter to the property owners which details the USACE and the owner's responsibilities for the O&M of the filtration systems. This addresses our concerns and is acceptable to the Department.

- Section 1.3 Description of the Selected Remedy, second paragraph. "Groundwater monitoring will be conducted annually in these wells plus 10 existing wells for the baseline sampling event."

  We recommend leaving the frequency of sampling and number of sample points to the Long-Term Monitoring Plan. By declaring the number of sample points and the sampling frequency in a DD, any change to this will require an Explanation of Significant Differences to the Decision

Document. Our suggested language is: “Long-term monitoring will be conducted at a frequency sufficient to maintain the treatment systems and to assess changes in groundwater chemistry.”

- 2.6.2 Groundwater and Surface Water Uses, last paragraph. The USACE is aware that DW-02 is no longer used, but has been replaced by a new well. The DD should have mentioned that DW-02 is no longer in use and has been replaced by a newly drilled well on the same property. Please provide sample results and any other information for this well to the Department.
- Section 2.7.1. and 2.8. The additional pollutants identified as contaminants of concern (COCs) in Table 4-1 of the Remedial Investigation / Feasibility Study should have been carried forward in the DD as Site COCs for the reasons enumerated in the RI/FS and to address releases of both CERCLA and RCRA pollutants at the site.

The Department’s concurrence of the selected remedy should not be construed as the Department’s concurrence with any conclusion of law or finding of fact, which may be set forth in the Decision Document or supporting documents for the LO-58 site in Caribou, Maine. The Department reserves any and all rights to challenge any such finding of fact or conclusion of law in any other context.

This concurrence is based on the Department’s understanding that the USACE will continue to solicit the Department’s review and concurrence with implementing the selected remedy, particularly the locations and frequency of groundwater monitoring and the need for continued filtration of the Adult Multiple Alternative Center or other drinking water supplies.

If you should have any questions or comments regarding this letter, please contact Naji Akladiss at naji.n.akladiss@maine.gov or call him at 207-557-4312.

Sincerely,

David Wright, Director
Division of Remediation
Bureau of Remediation & Waste Management
Maine Department of Environmental Protection

CC Naji Akladiss, DEP