

**Proposed Plan for Site 10  
(Former Warehouse Area, SS010)  
Buckley Air Force Base, Colorado  
Department of the Air Force**



**INTRODUCTION**

Buckley Air Force Base (AFB) Site 10 consisted of a former warehouse area and a former coal pile area that were serviced by a former railroad spur at the northern boundary of the base (which is referred to herein as the installation). These features were created and used during World War II to support mission critical functions. Site activities led to on-installation soil and groundwater impacts. The impacted groundwater has migrated off-installation through five plumes (each with one or more of three contaminants of concern: tetrachloroethylene, trichloroethylene, and 1,4-dioxane) onto City of Aurora property and has resulted in unacceptable human health risks. Remediation activities to date have mitigated soil impacts, but remaining groundwater contamination requires remediation. The Final Focused Feasibility Study (AECOM 2019) summarized the site history and conceptual site model, and developed and ranked 14 remedial alternatives to address remaining groundwater contamination. This Proposed Plan identifies the following four highest ranked Preferred Alternatives and the rationale for their selection for cleaning up the five contaminated groundwater plumes:

Diffuse Plume: Alternative DP2 – Land Use Controls and Long-Term Monitoring

Former Warehouse Area Plume: Alternative FWA3B – Enhanced Reductive Dechlorination of Hot Spot and Treatment Barrier by Pressure Injection, Land Use Controls and Long-Term Monitoring

Western Former Coal Pile (WFCP) Plume: Alternative WFCP2 – Land Use Controls and Long-Term Monitoring

Eastern Former Coal Pile (EFCP)

Overlapping Plumes: Alternative EFCP3 – *In Situ* Chemical Oxidation of Hot Spot by Pressure Injection, Land Use Controls and Long-Term Monitoring

**MARK YOUR CALENDARS**

**PUBLIC COMMENT PERIOD:**

July 16, 2020 – August 28, 2020  
The USAF will accept written and email comments on the Proposed Plan during the public comment period. Comment letters must be postmarked or emailed by August 28, 2020 to:

Mr. Scott Wilson  
Restoration Program Manager  
AFCEC/CZO  
660 S. Aspen St, MS 86  
Buckley AFB, CO 80011  
Email: [Scott.Wilson.7@us.af.mil](mailto:Scott.Wilson.7@us.af.mil)

To request an extension, send a request in writing to Scott Wilson by August 28, 2020.

**For more information, see the** Buckley AFB Administration Record accessed via the U.S. Air Force Civil Engineer Center (AFCEC) Administrative Record website by going to <https://ar.afcec-cloud.af.mil>; selecting Buckley AFB, CO; then finding and selecting “SS010 Former Warehouse Area” in the Sites List and then clicking “Search”.

**Or the Buckley AFB Environmental Website at:**

<https://www.buckley.af.mil/Units/Environmental/>

**Or the Colorado Department of Public Health and Environment Website at:**

<https://www.colorado.gov/cdphe/buckley-air-force-base>

**VIRTUAL PUBLIC MEETING:** Wednesday, August 12, 2020, 5-6:30 PM Zoom: <https://us02web.zoom.us/j/81807088274> Meeting ID: 818 0708 8274  
Password: 684756  
1 346 248 7799 or  
1 669 900 6833

This document is issued by the United States Air Force (USAF), the lead agency for site activities, in consultation with the Colorado Department of Public Health and Environment (the state health department). Input has also been provided by the United States Environmental Protection Agency (EPA) – Region 8 and the City of Aurora, Colorado. The USAF, in consultation with the regulatory agencies, will select a final remedy for the site after reviewing and considering all information submitted during the 30-day public comment period. The USAF, in consultation with the regulatory agencies, may modify the Preferred Alternatives or select another remedy presented in this Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on the remedial alternatives presented in this Proposed Plan.

The USAF prepared this Proposed Plan in consultation with the state health department as part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, 42 United States Code [U.S.C.] § 9617(a)) and Section 300.430(f)(2) and (3) of the National Oil and Hazardous Substances Pollution Contingency Plan, commonly referred to as the National Contingency Plan.

## SITE BACKGROUND

**Facility Description:** Buckley AFB is in Arapahoe County, north-central Colorado, approximately 5 miles east of Denver, Colorado. The installation occupies approximately 3,328 acres (Figure 1) and has been in use since 1942. The installation has stored and used various types of fuels and other chemicals in support of its primary missions of combat training, transient aircraft support, and search and rescue response.

Site 10 is located on the north side of Buckley AFB and five groundwater contaminant plumes extend north across East 6<sup>th</sup> Avenue onto City of Aurora property containing sparse structures (Figure 1). No contaminant source areas exist on the City property. The two primary on-installation former Site 10 operations areas include:

- The Former Warehouse Area - previously consisted of 14 warehouses south of 6<sup>th</sup> Avenue (Figure 1) that stored equipment and supplies and performed maintenance activities. Some waste motor fluids and cleaning solvents were reportedly disposed into a vertical pipe, but the pipe was never located.
- Former Coal Pile - located on the east side of Site 10 (Figure 1) and was used to store and transfer coal from approximately 1945 to 1956 by three rail spurs from the east.

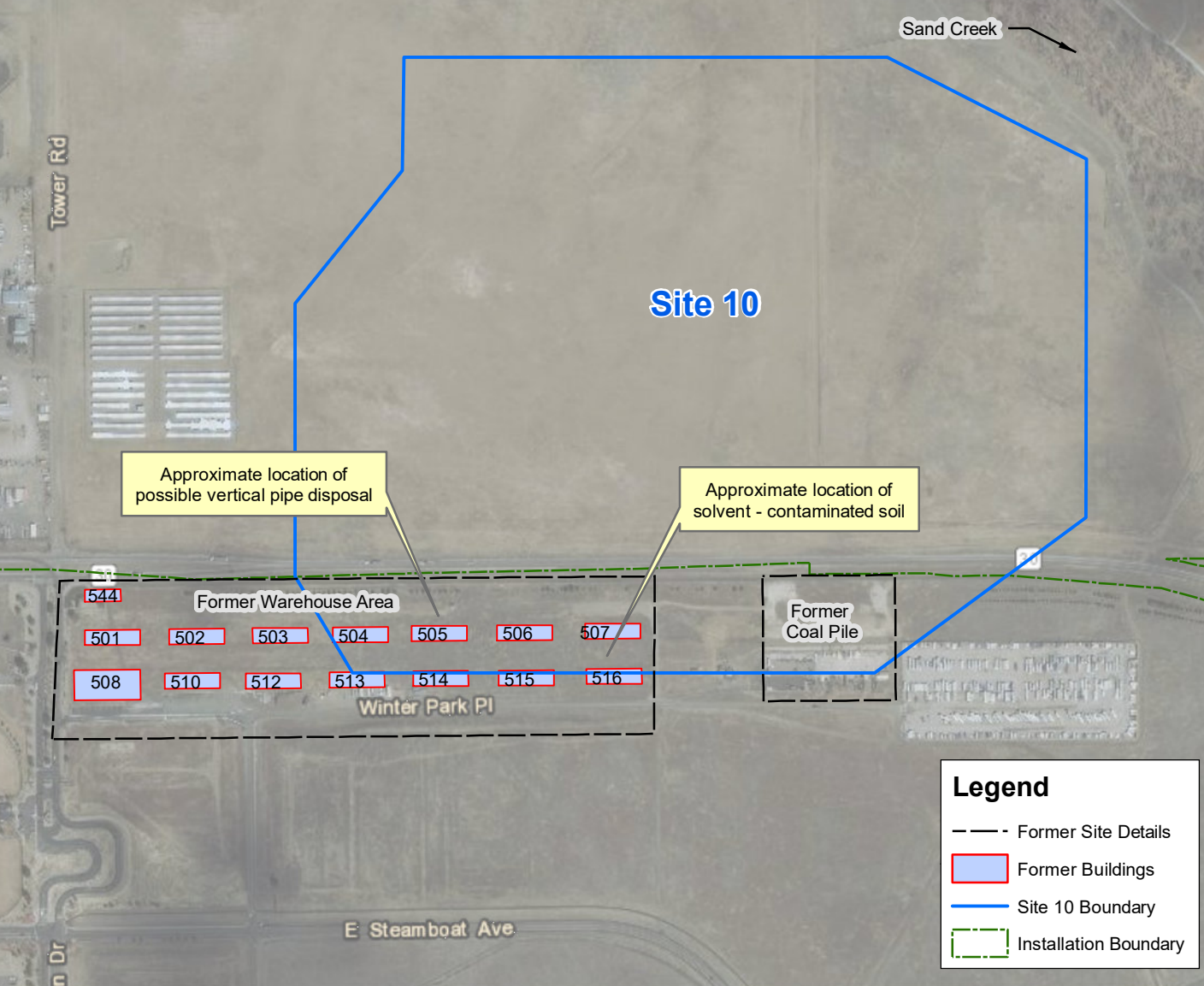
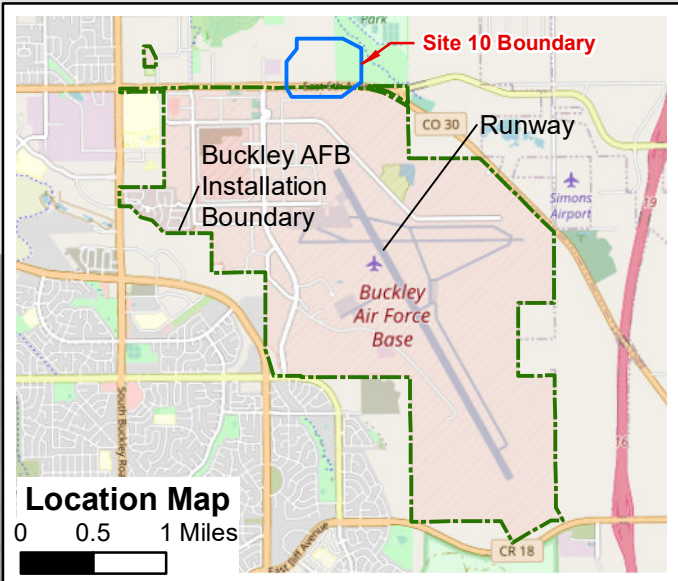
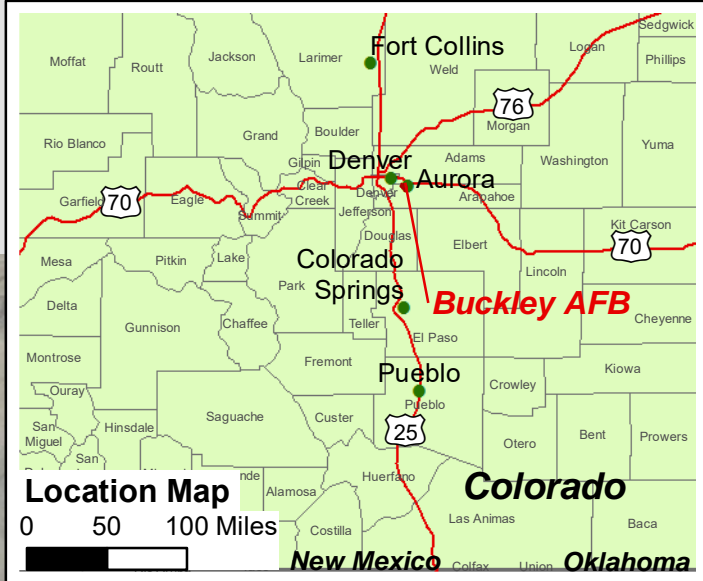
### Summary of Previous Environmental Investigations:

Several investigations were conducted at Site 10 between 1993 and 2015 as presented in the Final Focused Feasibility Study (AECOM 2019). The investigations were performed to refine the nature and extent of groundwater and soil contamination and the Site 10 hydrogeology. Information from the investigations is briefly summarized in the “Site Characteristics” section below and detailed information is available through the Air Force administrative record.

### Summary of Treatability Studies and Interim Remedial Actions to Date:

Several treatability studies and remedial actions have occurred at Site 10 as discussed in detail in the Final Focused Feasibility Study (AECOM 2019). The treatability studies were performed to evaluate technological methods to remediate the groundwater contamination and the results were used to develop and select the preferred remedial alternatives. Interim remedial actions were performed to take immediate steps to mitigate contamination. These events included:

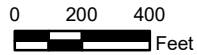
- 1999-2002 *In Situ* Chemical Oxidation Treatability Studies were performed near Buildings 505 and 506 by injecting potassium permanganate into the subsurface. This study successfully reduced tetrachloroethylene concentrations from 7,720 micrograms per liter to non-detect in less than two weeks. The studies also concluded that the distribution of the injected chemicals by pressure injection in a well and injection/extraction in a trench was limited due to the cohesive soils (Environmental Resources Management 2002).



**FIGURE 1**  
**SITE 10**  
**LOCATION MAP**

BUCKLEY AFB, COLORADO

M:\Denver\_GIS\Projects\Buckley\_AFB\FIG\_01\_Site\_10\_Location\_Map.mxd 7/15/2020 (ensleys)



- 2005 Interim Remedial Action consisted of excavating approximately 52,000 cubic yards of solvent-contaminated soil from between former Buildings 505 and 506 (Figure 1). A portion of the excavation was backfilled with organic mulch and sprayed with vegetable oil to promote biodegradation of residual tetrachloroethylene in groundwater before backfilling; this remedial action successfully remediated the source area soil. An air sparge system was also installed near the installation boundary for treatment of downgradient shallow contaminated groundwater (Parsons 2006); this system is currently operating.
- 2007 *In Situ* Chemical Reduction Treatability Study was performed on City of Aurora property near the 3,000 micrograms per liter hot spot. A reagent was injected through high pressure environmental injection which enhanced distribution of the injected reagents, and the study resulted in immediate tetrachloroethylene concentration reductions (URS 2010).
- 2016-2017 Treatability Studies were performed on City of Aurora property at two locations. The studies tested two remedial technologies as well as an injection/distribution technology. The study results are presented in the Final Focused Feasibility Study (AECOM 2019).

The enhanced reductive dechlorination technology was tested and found to be effective in creating a chemically reducing environment, creating and maintaining a sufficient microbial population, and decreasing key contaminant concentrations 70 percent between the injection well and a downgradient monitoring well. This technology is typically effective for several months to years. The treatability study effectiveness was a major factor in selecting Alternative FWA3B for the Former Warehouse Area plume.

The *in situ* chemical oxidation technology was tested at a separate target location. This study was inconclusive regarding this technology's ability to decrease concentrations of the contaminants of concern. The oxidant was detected in

post-injection groundwater, but the groundwater geochemistry was not significantly modified for the technology to be effective. This lack of effectiveness may be due to inadequate contact time of the oxidant and the groundwater contaminants. In addition, low concentrations of 1,4-dioxane are difficult to treat. However, a slurry phase oxidant (dosed above its solubility limit) can persist for several months and has been considered in developing the preferred alternative.

These treatability studies also used high pressure environmental injection to enhance distribution of the treatability study reagents in the aquifer material. The radius of influence was generally observed in geologic fractures within about 10 feet of each injection location; however, it was locally observed to extend up to 20 feet away from the injection locations. This injection technology performed better than just injecting under pressure.

#### **Summary of Public Involvement Activities Regarding Site 10:**

Public involvement activities conducted to address Site 10 include:

- hosting periodic Community Advisory Group meetings and public meetings to update the public on site status and issues;
- publishing the Final Focused Feasibility Study and other documents publicly on the Air Force's Administrative Record web site for review by the community;
- collaborating closely with the City of Aurora Real Property group as remediation activities continued on impacted property.

### **SITE CHARACTERISTICS**

**Physical Site Characteristics:** Site 10 is located on a relatively thin layer of windblown silty soil which overlies the Denver Formation. Portions of recent stream deposits associated with Sand Creek also occur at or near the northern Site 10 boundary. The location of Sand Creek is only shown and labeled on the northeast portion of the photographic satellite map shown in Figure 1 and Sand Creek flows in a west-northwesterly direction.

Groundwater resides primarily within the weathered claystone/siltstone (known as the weathered Denver Aquifer) at approximately 25 to 30 feet below ground surface, and at shallower depths in the Sand Creek alluvium. Details on the site hydrogeology are found in the Final Focused Feasibility Study (AECOM 2019).

Shallow groundwater beneath the site is currently not used for drinking water or irrigation and drinking water for Buckley AFB and off-installation local residents is supplied by the City of Aurora. There are no plans to use the groundwater at the on-installation or off-installation portion of Site 10.

#### **Nature and Extent of Contamination:**

Investigation results and remedial actions led to the conclusion that no contaminants currently exist in soils exceeding regulatory screening levels. Therefore, soil was not considered a medium of concern. In addition, free (non-dissolved) product or principle threat wastes were not encountered during the investigation activities.

Groundwater contaminants of concern were detected at concentrations exceeding the regulatory standards both on-installation and off-installation. The potential degradation products have also been historically detected at Site 10 above their Federal Maximum Contaminant Levels; however, their concentrations will likely decline through natural attenuation or through active remediation. The groundwater contaminants were delineated into five groundwater contaminant plumes as follows (color-coded plumes on Figure 2 from west to east).

**Diffuse Plume (light green)** – A diffuse tetrachloroethylene-dominant off-installation plume with the highest measured tetrachloroethylene concentration (18 micrograms per liter) in the southeastern portion of the plume.

**Former Warehouse Area Plume (yellow)** – A tetrachloroethylene-dominant plume downgradient of the main former source area with the highest measured tetrachloroethylene concentration (1,100 micrograms per liter in 2012) at an off-installation well located in the 2007 treatability study area.

**Western Former Coal Pile Plume (purple)** – A smaller tetrachloroethylene-dominant plume

with the highest measured tetrachloroethylene/trichloroethylene concentrations (210/14 micrograms per liter) at an on-installation well.

**Eastern Former Coal Pile Overlapping Plumes (pink and light blue)** – These plumes are the trichloroethylene-dominant and the 1,4-dioxane plumes with the highest measured trichloroethylene concentration (160 micrograms per liter) and the highest measured 1,4-dioxane concentration (22 micrograms per liter) at off-installation wells located in the center of the plume.

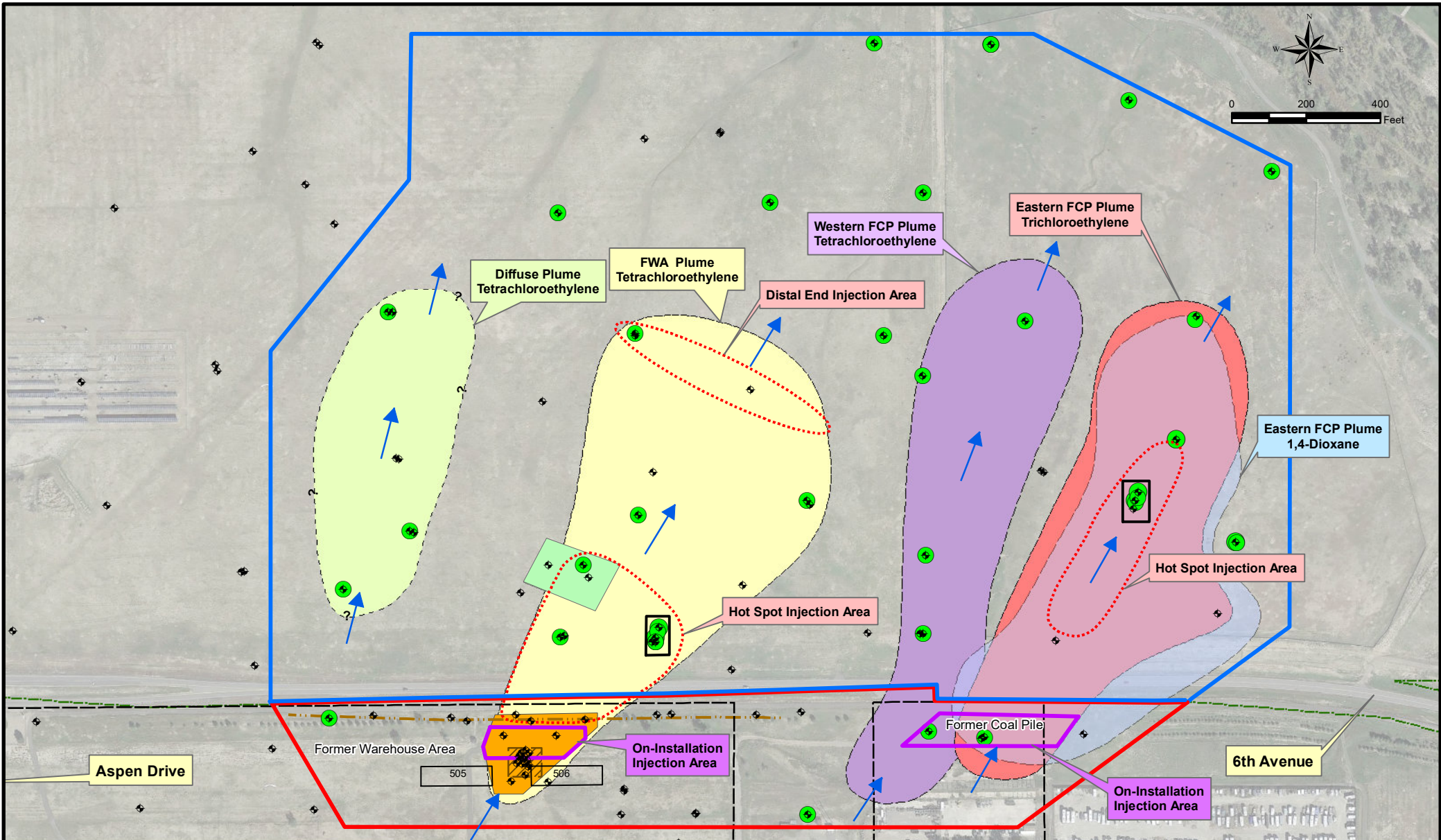
### **SCOPE AND ROLE OF THE PROPOSED RESPONSE ACTION**

An interim remedial action was completed in 2005 and the Supplemental Remedial Investigation was completed in 2009. Additional investigations were performed from 2012 through 2014. Discussions between the USAF, regulatory agencies, and other stakeholders identified the desire for the treatability studies (performed in 2016 through 2017). These studies were followed by the Final Focused Feasibility Study (AECOM 2019) which included the results of investigations and treatability studies, and developed, compared, scored and ranked 14 remedial alternatives for the plumes.

This Proposed Plan addresses proposed remedial actions to mitigate remaining contaminants of concern and potential contaminant degradation products in the five groundwater plumes at Site 10.

### **SUMMARY OF SITE RISKS**

A baseline human health risk assessment and a supplemental risk assessment were performed to determine whether constituents in soil and groundwater at Site 10 might pose a threat to human health (URS 2009 and AECOM 2019). The human health risk assessment evaluates the potential risks from cancer-causing constituents and other constituents that cause adverse health effects other than cancer. In the interest of providing relatively conservative estimates of potential risks, the risk assessment evaluated potential risks associated with a hypothetical residential use scenario.



Legend	
	Existing Monitoring Well
	Proposed LTM Well
	2016 Treatability Study Area
	Air Sparge System
	Groundwater Flow Direction
	Former Site Details
	Former Buildings
	ISCR Test Area
	IRA Excavation
	ISCO Test Area
	Installation Boundary
	Diffuse Plume
	FWA Plume
	Western FCP Plume
	Eastern FCP Plume
	Eastern FCP Plume
	Preferred Remedy Treatment Area
	Preferred Remedy Treatment Area
	Proposed Off-Installation LUC Boundary
	Proposed On-Installation LUC Boundary

**FIGURE 2**  
**SITE 10**  
**SOURCE AREAS, GROUNDWATER**  
**CONTAMINANT PLUMES AND**  
**PREFERRED REMEDIES**

BUCKLEY AFB, COLORADO



Soil risks were below screening levels; therefore, soil contamination is not a concern at Site 10. Groundwater is the only remaining medium of concern for the site.

Human health risks due to groundwater exposure were evaluated quantitatively for on-installation and off-installation portions of Site 10. These hypothetical scenarios are unlikely to occur at Site 10 but were evaluated for risk management purposes (i.e. determining the need for land use controls or assessing alternative remedial technologies if land use changes). The hypothetical scenarios of off-installation indoor workers, on-installation construction workers, and on-installation residents are discussed in more detail in the Supplemental Remedial Investigation (URS 2009) and the Final Focused Feasibility Study (AECOM 2019). It should be noted that there is currently no regular or routine on-installation or off-installation human use of Site 10; therefore, the potential for unacceptable human exposure under current use scenarios is minimal and was not assessed. However, for purposes of developing Site 10 remedial alternatives, risks to the following future potential human receptors were assessed:

Future Off-Installation Utility Workers who may install utility lines off-installation above the groundwater plumes – cumulative cancer risks were within the acceptable range, but non-cancer risks were in the unacceptable range; primary risk contributors were tetrachloroethylene and trichloroethylene. This is the only reasonably anticipated future scenario.

Future On-Installation Indoor Worker exposed to indoor air impacted by groundwater (vapor intrusion) at the proposed vehicle inspection point building - Inhalation risks for both the cumulative cancer and non-cancer scenarios were both considered acceptable, with tetrachloroethylene and trichloroethylene being the primary risk contributors.

The contaminant of concern 1,4-dioxane was not analyzed for or detected until 2013 and was therefore not included in the original baseline human health risk assessment (URS 2009) A screening level risk assessment was performed to evaluate the potential threat to on-installation and off-installation construction workers and concluded that for direct contact

to 1,4-dioxane in groundwater, the cancer risks were acceptable.

A quantitative ecological risk assessment was not performed for Site 10 as the ecological habitat is extremely limited. Due to the appreciable depths of contamination, the potential for ecological exposure is limited and ecological receptors are not a concern at Site 10.

## REMEDIAL ACTION OBJECTIVES

Based on the Applicable or Relevant and Appropriate Requirements and point of compliance requirements for Site 10, Remedial Action Objectives were developed for groundwater. Additionally, cleanup levels for the contaminants of concern and potential degradation products for groundwater, soil gas, and indoor air are presented in Table 1 below. More specifically, these Site 10 cleanup levels in Table 1 are based on Applicable or Relevant and Appropriate Requirements, which are legal requirements pertaining to the Site 10 remedy, also provided in Table 2 below.

Table 1 – Cleanup Levels

	Groundwater (micrograms per liter)	Soil Gas (micrograms per cubic meter) <sup>1</sup>	Air Screening Concentrations (micrograms per cubic meter) <sup>2</sup>
<i>Contaminants of Concern</i>			
PCE	5 (MCL) <sup>3</sup>	360	10.8
TCE	5 (MCL)	15.9	0.48
1,4-Dioxane	0.35 (CBSG) <sup>4</sup>	18.7	Not Available
<i>Potential Degradation Products</i>			
1,1-DCE	7 (MCL)	6,950	7.3
cis-1,2-DCE	70 (MCL)	Not Available	Not Available
trans-1,2-DCE	100 (MCL)	Not Available	Not Available
Vinyl chloride	2 (MCL)	5.59	0.17

Notes:

<sup>1</sup> EPA Vapor Intrusion Screening Level Calculator, Residential Target Sub-Slab and Near Source Soil Gas Concentrations, (EPA 2019).

<sup>2</sup> Colorado Hazardous Materials and Waste Management Division, Air Screening Concentrations Table, Residential Remediation Goals, as amended January 15, 2016 (CDPHE 2016a).

<sup>3</sup> MCLs specified in 40 Code of Federal Regulations Part 141.61, Subpart G, National Primary and Secondary Drinking Water Standards (EPA 2009)

<sup>4</sup> CBSG specified in CDPHE 2016b. Colorado Basic Standards for Groundwater, 5 Code of Colorado regulations 1002-41, Regulation 41. December (CDPHE 2016b).

CBSG = Colorado Basic Standard for Groundwater  
 CDPHE = Colorado Department of Public Health and Environment  
 DCE = dichloroethylene  
 MCL = Maximum Contaminant Level  
 PCE = tetrachloroethylene  
 TCE = trichloroethylene

Table 2. Applicable or Relevant and Appropriate Requirements

Type	Authority	Medium	Description of Standard, Requirement, Criteria or Limitation	ARAR Status	Status	Action to be Taken to Attain Requirement
<b>Chemical Specific ARARs</b>						
National Primary and Secondary Drinking Water Standards for community and non-transient, non-community water systems (Chemical Specific)	40 CFR Part 141.61, Subpart G	Groundwater	Sets MCLs for organic COCs including PCE and TCE, and their potential degradation products 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and VC.	Applicable	Two organic chemicals in groundwater (TCE and PCE) exceed the standard specified in 40 CFR Part 141, Subpart G, §141.61. In the future, potential degradation products of PCE and TCE such as 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and VC (that can be generated under naturally occurring anaerobic environment or during remedy implementation) may exceed MCL thresholds.	The remedial action is expected to reduce concentrations of COCs (PCE and TCE) and potential degradation products (1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and VC) to below the MCLs. The current MCLs for PCE, TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE and VC are 5, 5, 7, 70, 100 and 2 µg/L, respectively. Site 10 is a CERCLA site, therefore federal MCLs (as specified above for COCs/potential degradation products) are considered the ARARs which would be used in establishing the cleanup levels for Site 10.
Colorado Basic Standards for Groundwater (Chemical Specific)	5 CCR 1002-41, Section 41.5, including Table A	Groundwater	Sets Colorado statewide standards for groundwater. These standards include the narrative standards of Section 41.5(A)(1) and the numeric standards of Section 41.5(B) for organic chemicals, including the COCs, and Section 41.5(C) for applicable statewide standards. The regulations at Section 41.5(B) explain which standards apply and how to measure them. The current COC CBSGs are identified in this table as well as in the text of this document.	Applicable	PCE, TCE, and 1,4-dioxane in groundwater exceed their current CBSGs of 17, 5 and 0.35 µg/L respectively. In the future, COCs (PCE and TCE) and potential degradation products (1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and VC) may exceed CBSG thresholds. The current CBSGs for 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE and VC are 7, 14, 140 and 0.023 µg/L, respectively. There are no potential toxic degradation products associated with 1,4-dioxane. 1,4-dioxane is stable under natural conditions and would degrade to innocuous by-products such as carbon dioxide and water during remedy implementation.	The remedial action is expected to reduce the COCs and their potential degradation products to concentration below the CBSGs. Since there is no MCL for 1,4-dioxane, the current CBSG of 0.35 µg/L will be considered the applicable chemical-specific ARAR and will be used in establishing the cleanup level for 1,4-dioxane at Site 10.



Table 2. Applicable or Relevant and Appropriate Requirements

Type	Authority	Medium	Description of Standard, Requirement, Criteria or Limitation	ARAR Status	Status	Action to be Taken to Attain Requirement
Vapor Intrusion Screening Levels (Chemical Specific)	OSWER Publication 9200.2-154; June 2015 and the Vapor Intrusion Screening Level Calculator and VISL Table (EPA 2018).	Air	Specifies residential soil gas VISLs for VOCs, including for PCE, TCE, 1,1-DCE, and VC, and for 1,4-dioxane, for sites where vapor intrusion may be a concern. VISLs do not exist for cis-1,2-DCE and trans-1,2-DCE.	To Be Considered	PCE and TCE have been detected in groundwater at concentrations that may pose indoor air risks for hypothetical on-base and off-base residents. In the future, potential degradation products of PCE and TCE such as 1,1-DCE, and VC (that can be generated under naturally occurring conditions or remedy implementation) and from 1,4-dioxane, may pose indoor air risks to receptors. Therefore, vapor intrusion may be a concern at the Site.	The Air Force will consider the following residential VISLs (EPA, 2018) specified for PCE, TCE, 1,4-dioxane, 1,1-DCE, and VC: 360, 15.9, 18.7, 6950 and 5.59 µg/m <sup>3</sup> , respectively.
Colorado Hazardous Materials and Waste Management Division - Air Screening Concentrations Table (Chemical Specific)	CDPHE, Hazardous Materials and Waste Management Division, Air Screening Concentrations Table, as amended January 15, 2016 (CDPHE, 2016)	Air	Specifies indoor air RRGs for VOCs, including for PCE, TCE, 1,1-DCE and VC for sites where vapor intrusion may be a concern. RRGs do not exist for cis-1,2-DCE and trans-1,2-DCE.	To Be Considered	PCE and TCE have been detected in groundwater at concentrations that may pose indoor air risks for hypothetical on-base and off-base residents. In the future, potential degradation products of PCE and TCE such as 1,1-DCE and VC (that can be generated under naturally occurring conditions or remedy implementation) may pose indoor air risks to receptors. Therefore, vapor intrusion may be a concern at the Site.	The Air Force will consider the following RRGs (CDPHE, 2016) specified for PCE, TCE, 1,1-DCE and VC: 10.8, 0.48, 7.3 and 0.17 µg/m <sup>3</sup> , respectively.
<b>Action Specific ARARs</b>						
Colorado statutes regarding environmental covenants and notice of environmental use restrictions (Action Specific)	CRS §§ 25-15-317 - 25-15-327	Groundwater	Requires EC, IGA, or RN whenever residual contamination not safe for all uses is left in place or an engineered feature or structure that requires monitoring, maintenance, or operation is included in the remedy.	Applicable	ECs may be required for areas of Site 10 that are not owned by the Air Force (i.e., off-installation properties).	The Air Force will work with the CDPHE to develop and seek enactment of appropriate ECs for areas of Site 10 that are off-installation and not owned by the Air Force. Creation of a legal EC is dependent on compliance with procedural or administrative provisions and the discretion of CDPHE.
Well Permit Requirements (Action Specific)	2 CCR 402-2 Rules 6.1, 6.3, 6.4, 6.5, 6.6, 6.7, 6.8, 6.9, 6.10, 10, 11, 13, 14, 15 and 16	Groundwater	Establishes requirements applicable to the construction, sampling and measuring of monitoring and observation wells.	Applicable	Additional wells may need to be installed at the Site as part of the remedy.	Although CERCLA exempts federal facilities from obtaining permits for on-site remedial actions, the Air Force will comply with the substantive requirements of these regulations.

Table 2. Applicable or Relevant and Appropriate Requirements

Type	Authority	Medium	Description of Standard, Requirement, Criteria or Limitation	ARAR Status	Status	Action to be Taken to Attain Requirement
Colorado Regulations Pertaining to Solid Waste Sites and Facilities (Action-Specific)	6 CCR 1007-2, Part I, Appendices B and I	Waste	Establishes requirements for activities meeting regulatory definition of "solid waste disposal" including the storage, utilization, processing or final disposal of solid wastes.	Applicable	Implementation of remedy will require the management and disposal of solid waste.	Wastes generated during construction and operation of the remedy will be managed and disposed of in accordance with this regulation.
Colorado Hazardous Materials and Waste Management Division - Hazardous Waste (Action Specific)	6 CCR 1007-3 Parts 261.20(a), 261.30(a) and 262.34(a), (c), (d) and (g)	Waste	Describes how to determine if a solid waste is a hazardous waste and the temporary storage requirements of hazardous waste.	Applicable	The potential for generating hazardous waste during remedial actions exists.	This regulation is applicable to the groundwater alternatives that include installing a new well or borings or sampling groundwater as the drill cuttings or purge water may be characteristic hazardous waste. BAFB is responsible for the characterization and temporary storage requirements of hazardous wastes.
Underground Injection Control Regulations (Action Specific)	40 CFR Part 146 Subpart F	Groundwater	Establishes regulations for subsurface injections for protection of groundwater used for drinking water.	Relevant and Appropriate	The active groundwater remedial alternatives with subsurface injection will inject substrates through Class V wells into a non-drinking water aquifer. Class V wells regulation is administered by EPA and not CDPHE. As the groundwater is not used for drinking water, this subpart is considered Relevant and Appropriate.	Although CERCLA exempts federal facilities from obtaining permits for on-site remedial actions, the Air Force will comply with the substantive requirements of these regulations.
<b>Location Specific ARARs</b>						
Migratory Bird Treaty Act (Location Specific)	16 USC § 703	Wildlife	Prohibits the unlawful taking, possession or sale of any migratory bird native to the United States or its territories.	Applicable	Construction activities may be required while migratory birds are present. Migratory birds known to inhabit BAFB include, but are not limited to, bald eagles, ferruginous hawks and burrowing owls.	Avian survey(s) will be completed approximately two weeks prior to initiation of any remedial action construction or other fieldwork activities.
Bald and Golden Eagle Protection Act (Location Specific)	16 USC § 668(a)	Wildlife	Prohibits the unlawful taking of bald and golden eagles, including their parts, nests or eggs.	Applicable	Construction activities may be required while bald and/or golden eagles are present.	Avian survey(s) will be completed approximately two weeks prior to initiation of any remedial action construction or other fieldwork activities.

## Table 2. Applicable or Relevant and Appropriate Requirements

### Notes:

ARAR = Applicable or Relevant and Appropriate Requirement

BAFB = Buckley Air Force Base

CBSGs = Colorado Basic Standards for Groundwater

CCR = Colorado Code of Regulations

CDPHE = Colorado Department of Public Health and Environment

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act

CFR = Code of Federal Regulations

COC = Contaminant of Concern

CRS = Colorado Revised Statutes

DCE = Dichloroethylene

EC = Environmental Covenant

EPA = Environmental Protection Agency

IGA = Inter-Governmental Agreement

MCL = Maximum Contaminant Level (EPA)

PCE = Tetrachloroethylene

RN = Restrictive Notice

ROD = Record of Decision

RRGs = Residential Remediation Goals

TCE = Trichloroethylene

USC = United States Code

VC = Vinyl Chloride

VISLs = Vapor Intrusion Screening Levels

VOCs = Volatile Organic Compounds

µg/L = micrograms per liter

µg/m<sup>3</sup> = micrograms per cubic meter

Remedial Action Objectives identify the medium-specific goals for protecting human health and the environment. The following remedial action objectives were developed for groundwater, soil gas, and indoor air at Site 10:

- Protect human health by preventing exposure to groundwater containing contaminants of concern (tetrachloroethylene, trichloroethylene and 1,4-dioxane) and potential degradation products exceeding Federal Maximum Contaminant Levels and/or Colorado Basic Standards for Groundwater, whichever is most stringent, until concentrations have been reduced to levels that allow unlimited use/unrestricted exposure.
- Protect human health by preventing exposure to soil gas containing contaminants of concern (tetrachloroethylene and trichloroethylene) and potential degradation products exceeding Residential Vapor Intrusion Screening Levels for soil gas or Residential Remediation Goals for indoor air until concentrations have been reduced to levels that allow unlimited use/unrestricted exposure.
- Protect human health and the environment by preventing migration of groundwater containing contaminants of concern (tetrachloroethylene, trichloroethylene and 1,4-dioxane) and potential degradation products exceeding Federal Maximum Contaminant Levels and/or Colorado Basic Standards for Groundwater, whichever is most stringent, beyond on-installation and off-installation compliance boundaries until concentrations have been reduced to levels that allow unlimited use/unrestricted exposure.

Common to all three Remedial Action Objectives is the unlimited use/unrestricted exposure objective which means there will be no contamination exceeding any cleanup levels for groundwater, soil gas, or indoor air, including all on-installation and off-installation portions of Site 10. This also means the unlimited use/unrestricted exposure objectives, common to all three (3) Site 10 Remedial Action Objectives, will be achieved. Most importantly, this will mean there will be no future need for any land use restrictions or any exposure restrictions, anywhere on Site 10.

### Compliance Boundaries

The on-installation compliance boundary (point of compliance) is defined as the vertical surface located hydrologically at or near the northern installation boundary. Contaminated groundwater has migrated across this boundary and onto City of Aurora property.

The off-installation compliance boundary (point of compliance) is defined as a vertical surface located hydrologically at the downgradient limit of groundwater contamination.

Both the on-installation and off-installation compliance boundaries will be monitored by point of compliance monitoring wells that will be established in the remedial design (CDPHE 2016b).

## SUMMARY OF REMEDIAL ALTERNATIVES

The USAF considered 14 remedial alternatives to address groundwater contamination at the five Site 10 plumes. These options include different approaches to contain, remove, or treat contamination to protect human health and the environment. Alternatives were evaluated for each plume following the feasibility study process outlined in the National Contingency Plan. This process resulted in a total of 14 alternatives, and four of these were selected as the preferred alternatives. The description and evaluation of each alternative is discussed in the Final Focused Feasibility Study (AECOM 2019) and these four preferred alternatives are discussed and evaluated below as the primary subject of this proposed Plan.

### Challenge – 1,4-Dioxane Treatment

- Has been used as a solvent stabilizer in chemical products to inhibit deterioration and ultimate breakdown of the solvent.
- Is highly soluble and mobile in water, and very weakly attenuated during groundwater transport from physical and biogeochemical processes.
- The following characteristics make 1,4-dioxane extremely difficult to treat through *in situ* methods at Site 10 as demonstrated through the 2016 treatability study.
  - Low starting concentrations.
  - Proven *in situ* treatment methods remain unavailable or are cost-prohibitive at low starting concentrations.
- *Ex situ* technologies such as pump and treat were not retained in the Focused Feasibility Study due to Site 10 aquifer characteristics, low concentrations and high treatment costs.
- Although this challenge remains, routine reviews conducted every five years will consider industry research and development advancements to hopefully identify new and successful *in situ* treatment technologies, which may be applied at Site 10. In the meantime, existing available *in situ* 1,4-dioxane treatment technologies showing promise will be applied and continue to be evaluated at Site 10.

### Common Elements

With the exception of the “No Action” Alternative for each plume, the alternatives presented below and evaluated in the Focused Feasibility Study include common elements of performance monitoring, long-term monitoring, land use controls, and Five-Year Reviews. These four elements are discussed here instead of repeating the detail in each of these four Preferred Alternatives below.

**Performance monitoring** evaluates the remedial action performance by sampling and analyzing groundwater samples from selected monitoring wells for contaminants of concern, potential degradation products and geochemical parameters. This sampling would occur at a prescribed frequency for up to approximately one year after implementation of the remedy. Performance monitoring results will be compared to the Site 10 Cleanup Levels, provided in Table 1, and the Site 10 Applicable or Relevant and Appropriate Requirements, provided in Table 2.

**Long-term monitoring** would be performed as a standalone activity after completion of performance monitoring or as a component of a remedial alternative. This monitoring evaluates contaminant concentration changes, spatial and temporal trends, plume dynamics of advection, dispersion, diffusion, and adsorption and their role in attenuation of contaminant concentrations. Monitoring results will also be used to assess attainment of remedial action objectives and unlimited use/unrestricted exposure within expected timelines.

**Land Use Controls** are institutional controls (e.g., administrative actions or legal restrictions such as permits, easements, or use restrictions) or engineering controls (e.g., fencing, signs, landfill covers) that limit the use of resources or restrict receptors’ exposure to contaminants to protect human health and the environment. The land use controls will be implemented and maintained until groundwater contaminant concentrations are at levels allowing unlimited use/unrestricted exposure.

The preliminary Site 10 land use controls are all institutional controls, and the Record of Decision will document the final land use controls. The preferred alternative for each plume includes one or more of the following land use controls:

1. The installation well permitting system will prevent any use of groundwater for drinking water. The Buckley AFB dig permit system requires all entities to file Form 103 with the Customer Service Section of Base Civil Engineering that the 460<sup>th</sup> Civil Engineering Squadron must approve before the subsurface (below 4 inches below ground surface) is disturbed. This system will prevent drilling of any groundwater production wells and therefore any use of groundwater within the Site 10 boundary.
2. The installation dig permit system will prevent activities that could disturb any components of the groundwater monitoring network or any other engineered components of the remedy. Any construction action that might damage or interfere with the proper operation or maintenance of any engineered

component of the remedy, including monitoring or remediation wells, will not be permitted. The Buckley AFB dig permit system requires all entities to file Form 103 with the Customer Service Section of Base Civil Engineering that the 460th Civil Engineering Squadron must approve before ground below 4 inches is disturbed. This form will activate formal utility and infrastructure clearance procedures.

3. All proposed on-installation construction over any part of the five contaminant plumes shall be reviewed by the 460th Civil Engineering Squadron for potential hazards or risks posed by contaminated groundwater. The Buckley AFB design review/construction review process, triggered by submittal of a Base Civil Engineer Work Request that the 460<sup>th</sup> Civil Engineering Squadron must approve, and the Buckley AFB dig permit system will prevent construction before review. The 460th Civil Engineering Squadron will require additional investigation (e.g., updated groundwater data) or analysis of hazard and risk for the plume to determine if there is an unacceptable risk to human health or the environment. If unacceptable risk is identified, the 460th Civil Engineering Squadron will require new construction to include engineering controls to protect human health and the environment.
4. The installation environmental impact analysis process will assess the potential environmental impact of any action proposed at the site, to include compliance with land use controls for the site. The environmental impact analysis process is implemented and approved by the 460th Civil Engineering Squadron, Installation Management Flight, Environmental Element.
5. All Record of Decision use limitations and exposure restrictions shall be entered in the Base Installation Development Plan and the Geographical Information System by the Base Community Planner within 30 days after Record of Decision signature.
6. The off-installation portions of the contaminant plumes will be addressed by an environmental covenant between the state health department and the City of Aurora.
7. The USAF is responsible for implementing, maintaining, monitoring, reporting and enforcing all on-installation land use controls. The State of Colorado and the City of Aurora will be responsible for enforcing and ensuring compliance with the off-installation Environmental Covenant. The USAF is responsible for ensuring the off-installation land use controls that are part of the Record of Decision are established, monitored, maintained and reported on to ensure protection of human health and the environment.
8. The USAF shall inform, monitor, enforce, and bind, where appropriate, authorized lessees, tenants, contractors and other authorized occupants of the site regarding the land use controls affecting the site.
9. The USAF will notify the state health department as soon as practicable, but no longer than ten (10) days after discovery, of any activity that is inconsistent with the land use control objectives or use restrictions, or any other action that may interfere with the effectiveness of the land use controls. The USAF will include in such notice(s) a list of corrective actions taken or planned, and associated dates, to address such deficiency or failure.
10. The USAF must provide notice to the state health department at least six (6) months prior to any transfer or sale of property containing land use controls, including federal-to-federal transfers of property accountability, so that the state health department can be involved in discussions to ascertain that appropriate provisions are included in the transfer or conveyance documents to maintain effective land use controls. If it is not possible to notify the state health department at least six months prior to any transfer or sale, then the facility will notify the state as soon as possible but no later than 60 days prior to the transfer or sale of any property subject to land use controls.
11. The USAF shall not modify or terminate land use controls, modify land uses that

might impact the effectiveness of the land use controls, take any anticipated action that might disrupt the effectiveness of the land use controls, or take any action that might alter or negate the need for land use controls without 45 days prior to the change seeking and obtaining approval from the state health department of any required Record of Decision modification.

12. The USAF will monitor and inspect all site areas subject to land use controls at least annually.
13. The USAF will report annually to the state health department on the frequency, scope, and nature of land use control monitoring activities, the results of such monitoring, any changes to the land use controls, and any corrective measures resulting from monitoring during the time period.

With the exception of the land use control addressing engineering controls (item 3 above), these land use controls apply in plume areas where groundwater constituent concentrations exceed the Colorado Basic Standards for Groundwater or Federal Maximum Contaminant Levels, as highlighted on Figure 2.

**Five-year reviews** will be required for the five Site 10 plumes because it will take approximately 30 years to achieve unlimited use/unrestricted exposure in accordance with the National Contingency Plan. The Five-year reviews would be performed to determine whether the remedies in place are functioning as intended, the remedial action objectives are still appropriate, and no new information has been encountered that calls into question the protectiveness of the remedies in place.

#### **Description of the Preferred Remedial Alternatives Considered for this Action:**

The four preferred remedial alternatives considered for the five Site 10 groundwater contaminant plumes are presented below. Information regarding the ten alternatives not selected for these plumes can be found in the Final Focused Feasibility Study (AECOM 2019). The key features and costs for each alternative are summarized in Table 3. This table includes plume names, remedial alternative names, remedial strategies, expected timeframes (in years) to achieve

cleanup goals, expected timeframes (in years) to achieve unlimited use/unrestricted exposure, the designated compliance monitoring wells, the net present value cost to achieve unlimited use/ unrestricted exposure, and the alternative score and rank. The higher the score value, the better the alternative, and the lower the rank number, the more preferable the alternative.

#### Diffuse Plume

*Alternative DP2: Land Use Controls and Long-Term Monitoring* - As described under Common Elements. This alternative is expected to require approximately 30 years to achieve the remedial action objectives.

#### Former Warehouse Area Plume

*Alternative FWA3B: In Situ Enhanced Reductive Dechlorination of Hot Spot and Treatment Barrier/Pressure Injection, Land Use Controls, and Long-Term Monitoring* - Under Alternative FWA3B, Enhanced Reductive Dechlorination would be implemented by high pressure environmental injections of carbon substrates and bioaugmentation culture in the hot spot area of the plume and in a treatment barrier near the distal end of the plume. Enhanced reductive dechlorination involves modification of the subsurface environment to promote appropriate microbial growth and enhance biological degradation of the contaminants of concern. This technique, using vendor formulated carbon substrate and nutrients, known as 3DME<sup>®</sup>, was pilot tested at the Former Warehouse Area Plume in 2016 and has shown promising results. The 3DME<sup>®</sup> substrate remains effective approximately 2 to 4 years after a single application. This technology was effective in remediating the aquifer as tetrachloroethylene concentrations decreased approximately 70 percent in a period of nine months during the treatability study.

The injection points in the hot spot area and the treatment barrier would be installed in multiple rows oriented perpendicular to groundwater flow and designed to provide sufficient residence time for the complete biological degradation of contaminants to occur. One round of injections would occur in the hot spot area, and four rounds of injection would occur at the treatment barrier every

three years so that the entire Former Warehouse Area Plume meets the regulatory standards. The injections would occur in the upper 30 feet of the aquifer through four injection zones at each point to distribute the substrate laterally outward.

Performance monitoring and long-term monitoring would be conducted until the contaminants of concern meet and remain at or below the regulatory standards. Groundwater samples will be analyzed for contaminants of concern, potential degradation products, and geochemical parameters.

It should be noted that an air sparge system is currently in place to prevent migration of contaminants of concern from the on-installation portion to the off-installation portion of the Former Warehouse Area Plume. The air sparge system can impede successful implementation of enhanced reductive dechlorination and would be shut down.

On-installation treatment of the Former Warehouse Area Plume using *in situ* enhanced reductive dechlorination would be implemented to address existing higher concentrations of contaminants of concern and potential degradation products that may migrate beyond the on-installation compliance boundary.

A groundwater model developed for the Former Warehouse Area Plume indicates that it would take about 12 years for the entire Former Warehouse Area Plume to meet the regulatory standards and remedial action objectives. During this period or until the contaminants of concern meet regulatory standards for the entire plume, land use controls would be in place to protect human health and the environment.

Alternatives FWA3B and FWA4B have identical scores and ranks as shown in Table 3. Although Alternative FWA4B is expected to cost less, Alternative FWA3B was selected as the preferred alternative due to the demonstrated site-specific effectiveness of this technology during the Site 10 treatability studies.

#### Western Former Coal Pile Plume

*Alternative WFCP2: Land Use Controls and Long-Term Monitoring* - As described under Common Elements. This alternative is expected to require approximately 30 years to achieve the remedial action objectives.

#### Eastern Former Coal Pile Overlapping Plumes

*Alternative EFCP3: In Situ Chemical Oxidation/Pressure Injection of Hot Spot, Land Use Controls and Long-Term Monitoring* - Alternative EFCP3 would include implementation of *in situ* chemical oxidation using high pressure environmental injection for the delivery of an oxidant in the trichloroethylene/1,4-dioxane hot spot area of the Eastern Former Coal Pile Plume. The average vertical treatment depth is 30 feet below the water table. The higher measured 1,4-dioxane concentrations (up to 22 micrograms per liter) are also located within the 100 micrograms per liter trichloroethylene isocontour hot spot area.

*In situ* chemical oxidation is currently the only *in situ* technology available that can effectively remediate both chlorinated volatile organic compounds and 1,4-dioxane present at the Eastern Former Coal Pile plumes. The oxidant considered for the conceptual design in the Focused Feasibility Study is Klozur<sup>®</sup> KP, an environmental grade potassium persulfate that can generate more powerful oxidants to destroy both chlorinated volatile organic compounds and 1,4-dioxane.

Follow-on performance monitoring, long-term monitoring, and land use controls would be the same as described previously.

On-installation treatment of the Eastern Former Coal Pile and Western Former Coal Pile plumes using *in situ* chemical oxidation would be implemented to address existing higher concentrations of contaminants of concern/potential degradation products and 1,4-dioxane that may migrate beyond the on-installation compliance boundary. This alternative is expected to require less than 35 years to achieve the remedial action objectives.



Table 3 – Summary of Remedial Alternatives

Plume	Remedial Alternatives	Remedial Strategy	Expected Timeframe (Years) for COCs/Potential Degradation Products to Achieve Cleanup Goals at Hot Spot	Expected Time (Years) for COCs/Potential Degradation Products to Achieve Cleanup Levels throughout Plume and at Compliance Wells to Achieve UU/UE	Designated Compliance Wells	Net Present Value	Overall Scoring/ (Ranking) Based on Detailed Evaluation
Diffuse Plume (6 acres)	DP1: No Action	None	NA	30	—	\$0	NA
	DP2: LUCs and LTM	Exposure Control/Contaminant Tracking	NA	30	—	\$334,231	NA
Former Warehouse Area Plume (15 acres)	FWA1: No Action	None	NA	100	MW-211, MW-212	\$0	6/(6)
	FWA2: LUCs and LTM	Exposure Control/Contaminant Tracking	NA	100		\$417,361	7/(5)
	FWA3A: <i>In Situ</i> ERD of Hot Spot/ Pressure Injection, LUCs, and LTM	Hot Spot Remediation/ Exposure Control/ Contaminant Tracking	5	68		\$4,344,886	15/(2)
	FWA3B: <i>In Situ</i> ERD of Hot Spot and Barrier/ Pressure Injection, LUCs, and LTM	Hot Spot Remediation/ Distal End Plume Barrier/ Exposure Control/ Contaminant Tracking	5	12		\$8,656,703	20/(1)
	FWA4A: <i>In Situ</i> Chemical Reduction of Hot Spot/Pressure Injection, LUCs, and LTM	Hot Spot Remediation/ Exposure Control/ Contaminant Tracking	5	68		\$5,715,608	14/(3)
	FWA4B: <i>In Situ</i> Chemical Reduction of Hot Spot and Barrier/Pressure Injection, LUCs, and LTM	Hot Spot Remediation/ Distal End Plume Barrier/ Exposure Control/ Contaminant Tracking	5	12		\$8,137,108	20/(1)
	FWA5: ISCO of Hot Spot/Pressure Injection, LUCs, and LTM	Hot Spot Remediation/ Exposure Control/ Contaminant Tracking	5	68		\$6,714,484	13/(4)
Western Former Coal Pile Plume (10 acres)	WFPC1: No Action	None	NA	30	—	\$0	NA
	WFPC2: LUCs, and LTM	Exposure Control/Contaminant Tracking	NA	30	—	\$371,860	NA
Eastern Former Coal Pile Plumes (12 acres)	EFCP1: No Action	None	NA	35	MW-213, MW-214	\$0	7/(3)
	EFCP2: LUCs and LTM	Exposure Control/Contaminant Tracking	NA	35		\$475,120	10/(2)
	EFCP3: ISCO/Pressure Injection, LUCs, and LTM	Hot Spot Remediation/ Exposure Control/ Contaminant Tracking	5	Significantly shorter time than 35 years	MW-213, MW-214	\$3,067,350	20/(1)

**Note:** The higher the overall scoring is, the more preferable the remedial alternative would be in meeting the criteria specified in the National Contingency Plan for detailed evaluation. Scoring was not performed for the Diffuse and Western Former Coal Pile plumes because of limited number of remedial alternatives. The preferred alternatives are highlighted.

CBSG = Colorado Basic Standard for Groundwater  
 COCs = contaminants of concern  
 DP = Diffuse Plume  
 EFCP = Eastern Former Coal Pile  
 ERD = Enhanced Reductive Dechlorination  
 FWA = Former Warehouse Area  
 ISCO = *in situ* chemical oxidation

LTM = long-term monitoring  
 LUCs = land use controls  
 MCL = Maximum Contaminant Level  
 NA = not applicable  
 WFPC = Western Former Coal Pile  
 UU/UE = Unlimited Use/Unrestricted Exposure

## EVALUATION OF ALTERNATIVES

To evaluate the remedial alternatives, each alternative was compared to the nine selection criteria established in 40 Code of Federal Regulations 300.430 (e) (9) (iii). These criteria fall into one of three categories (40 Code of Federal Regulations 300.430(f)(1)(i)): threshold criteria, primary balancing criteria, and modifying criteria. These categories are summarized below:

- **Threshold criteria** are requirements that each alternative must meet to be eligible for selection: Overall Protection of Human Health and the Environment; and Compliance with Applicable or Relevant and Appropriate Requirements.
- **Primary balancing criteria** are used to weigh major trade-offs among alternatives: Long-Term Effectiveness and Permanence; Reduction of Toxicity, Mobility, or Volume; Short-Term Effectiveness; Implementability; and Cost.
- **Modifying criteria** can be considered early in the alternative development process but are formally considered after public comment is received on the Proposed Plan: State of Colorado/Support Agency Acceptance; and Community Acceptance.

Each alternative was evaluated with respect to the first seven of the nine criteria for the five plumes as summarized in the Final Focused Feasibility Study (AECOM 2019). The overall scoring and ranking for each plume and the 14 alternatives are presented on Table 3 above, and the preferred alternatives are a result of this evaluation and ranking. It should be noted that Alternatives FWA3B and FWA4B had the same score and ranking, but FWA3B was chosen over the lower cost FWA4B because that technology was effective during the treatability studies and had favorable results.

## PREFERRED ALTERNATIVES

The USAF selected the four Preferred Alternatives for the five plumes present at Site 10. Based on information currently available, the USAF believes the Preferred Alternative for each plume meets the threshold criteria

and provides the best balance of tradeoffs among the other modifying criteria. In addition, each preferred alternative leads to unlimited use/unrestricted exposure. The USAF expects the Preferred Alternatives to satisfy the following statutory requirements of CERCLA § 121(b): (1) be protective of human health and the environment (2) comply with Applicable or Relevant and Appropriate Requirements (3) be cost-effective (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as the principal element.

The state health department supports the Preferred Alternatives. The Preferred Alternatives can change in response to public comment or new information.

## COMMUNITY PARTICIPATION

The USAF and the Colorado Department of Public Health and Environment provide information regarding the cleanup of Buckley AFB to the public through periodic public meetings of the Community Advisory Group, special public meetings, the Information Repository, and announcements published in the Sentinel of Aurora, Colorado.

Final Proposed Plans, Site Status Reports, and final documents that form the basis for the selection of the site response can be accessed via the U.S. Air Force Civil Engineer Center (AFCEC) Administrative Record <https://ar.afcec-cloud.af.mil>; selecting Buckley AFB, CO; then finding and selecting “SS010 Former Warehouse Area” in the Sites List and then clicking “Search.” The Site Status Reports are found by typing “Status” in the “Subject or Title” field and clicking on “Search.” These documents can also be found on the state health department’s web page <https://www.colorado.gov/cdphe/buckley-air-force-base>.

Instructions for providing public comment on this Proposed Plan are provided on the first page of this document and below. A comment form is provided at the end of this document for the reader’s convenience.

Although a public meeting is required for this Site 10 Proposed Plan, the worldwide

pandemic prevents traditional processes such as an in-person public meeting. Buckley AFB and the state health department will host a virtual public meeting to present Site 10 information and address public comments. This virtual meeting will be held using a

common platform so that anyone with a computer or phone (with or without video capabilities) will be able to participate and ask questions. (Please see the first page of this document for details about this meeting.)

## REFERENCES

- AECOM Technical Services, Inc. 2019. *Final Focused Feasibility Study, Site 10 (SS010), Buckley Air Force Base, Aurora, Colorado*. June.
- Code of Federal Regulations, Title 40, Part 300 (40 CFR §§ 300.1-300.1105), National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan).
- Colorado Department of Public Health and Environment (CDPHE). 2016a. *Air Screening Concentrations Table*. Effective 15 January.
- \_\_\_\_\_. 2016b. *Colorado Basic Standards for Groundwater, 5 Code of Colorado Regulations 1002-41, Regulation No. 41*. Effective 30 December.
- Environmental Resources Management. 2000. *Installation Restoration Program Revised Final Pilot Test Summary Report for the Former Warehouse Area*. May.
- \_\_\_\_\_. 2002. *Expanded Pilot Test – Summary Report, Installation Restoration Program, Site 10, Buckley Air Force Base, Aurora, Colorado*. September.
- Parsons Corporation. 2006. *Construction Completion Report, Site 10 Source Area Remediation*. Buckley Air Force Base, CO. May.
- United States Code. Title 42, Sections 9601-9675 (42 U.S.C. §§ 9601-9675), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).
- United States Environmental Protection Agency (EPA). 2009. *Federal Drinking Water Maximum Contaminant Levels*. 40 Code of Federal Regulations 141.
- \_\_\_\_\_. EPA. 2019. Vapor Intrusion Screening Levels. Available On-Line at: [https://epa-visl.ornl.gov/cqi-bin/visl\\_search](https://epa-visl.ornl.gov/cqi-bin/visl_search)
- URS Corporation (URS). 2009. *Final Site 10 Supplemental Remedial Investigation Report*. Buckley Air Force Base, Aurora, CO. August.
- \_\_\_\_\_. 2010. *Site 10 Treatability Study Evaluation Report*. Buckley Air Force Base, Aurora, CO. May.

## GLOSSARY AND ACRONYM LIST

3DME®	3-D MicroEmulsion® a Regenesis product
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
Applicable or Relevant and Appropriate Requirement	Any standard, requirement, criteria, or limitation under federal environmental law or more stringent promulgated standard, requirement, criteria or limitation under state environmental or facility siting law that is legally applicable to the hazardous substance, pollutant or contaminant or is relevant and appropriate under the circumstances of the release.
CDPHE	Colorado Department of Public Health and Environment, the state health department
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. §§ 9601-9675 (CERCLA) – A Federal statute that establishes a comprehensive framework to identify, investigate, and clean up releases or threatened releases of hazardous substances, pollutants, or contaminants into the environment. CERCLA provides the statutory authority for cleanup of hazardous substances, pollutants, or contaminants that could endanger public health, welfare, or the environment.
Contaminant of concern	Chemical substances found at the site that pose an unacceptable risk to human health or the environment. These are the substances that are addressed by cleanup actions at the site.
DP	Diffuse Plume
Environmental Covenant	A prohibition on one or more uses of, or activities on, specified real property. Upon creation, an environmental covenant creates an obligation on real property that survives transfer of ownership of that property. Regulated under Colorado Revised Statutes § 25-15-321 to 327.
EFCP	Eastern Former Coal Pile
EPA	U.S. Environmental Protection Agency
Enhanced Reductive Dechlorination	Addition of nutrients, food, or microorganisms (e.g., bacteria) to soil and groundwater to increase the number and activity of microorganisms that can naturally degrade (breakdown) chemicals under conditions where low or no oxygen is present.
FWA	Former Warehouse Area
<i>in situ</i>	In place – (i.e., remediation performed within the contaminated media)
<i>In situ</i> chemical oxidation	Involves the injection of reactive chemical oxidants into groundwater for rapid and complete contaminant destruction.
<i>In situ</i> chemical reduction	Combines biological processes and metallic particle driven abiotic pathways to chemically reduce chlorinated contaminants into harmless end products within the media.
Long-term monitoring	Ongoing collection of information about the environment (e.g., groundwater data) that helps gauge the effectiveness of a clean-up action.
Land use control	An institutional control (e.g., administrative actions or legal restrictions, such as permits, easements, or use restrictions) or an engineering control (e.g., fencing signs, landfill covers) that restricts the use of, or limits access to, resources or real property to prevent or reduce risks to human health or the environment.
National Contingency Plan	National Oil and Hazardous Substances Pollution Contingency Plan outline of procedures, organization, and responsibility for responding to spills and releases of hazardous substances and oil into the environment.
Net present value	Estimated cost in current (base) dollars that includes future spending. Determination of present value costs evaluates expenditures that occur over different time periods. By discounting all costs to a common base year, the costs for different remedial action alternatives can be compared on the basis of a single cost for each alternative.
Point of compliance	A vertical surface that is located at some specified distance downgradient of the activity being monitored for compliance. If a groundwater contaminant plume is being monitored, a POC is typically a monitoring well.
Site 10	Former Warehouse Area (SS010)
Unlimited Use/Unrestricted Exposure	Refers to a situation when there are no restrictions on the potential use of land, or on other natural resources, needed as part of a remedy to protect human health or the environment.
USAF	United States Air Force
WFCP	Western Former Coal Pile



---

*fold here*

---

*fold here*

Mr. Scott Wilson  
Restoration Program Manager  
AFCEC/CZO  
660 S. Aspen St. MS86  
Buckley AFB, CO 80011