Long-Range Discrimination Radar
Clear Air Force Station, Alaska

Environmental Assessment
Proposed Final
April 2016

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ACRONYMS AND ABBREVIATIONS

AADT	Annual Average Daily Traffic
AAAQS	Alaska Ambient Air Quality Standards
AAC	Alaska Administrative Guide
ACAM	USAF Conformity Applicability Model
ACM	asbestos containing material
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADH	Alaska Department of Health and Social Services
ADOT&PF	Alaska Department of Transportation and Public Facilities
AFB	Air Force Base
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
AFSPC	Air Force Space Command
AK	Alaska
AOC	Air Operations Center
APDES	Alaska's Pollutant Discharge Elimination System
APE	Area of Potential Effect
AQCR	Air Quality Control Region
AS	Alaska Statute
ATC	Air Traffic Control
BGEPA	Bald and Golden Eagle Protection Act
bgs	below ground surface
BMDS	Ballistic Missile Defense System
BMEWS	Ballistic Missile Early Warning System
BMPs	best management practices
BOS	Base Operating Service
C&D	construction and demolition
C2	Command and Control
C2BMC	Command and Control, Battle Management, and Communications
CAA	Clean Air Act
CAFS	Clear Air Force Station
CDC	Centers for Disease Control and Prevention
Census	U.S. Census Bureau
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHSP	Construction Health & Safety Program
CO	Carbon Monoxide

CO_2	Carbon Dioxide
CO_2e	Equivalent Carbon Dioxide
CWA	Clean Water Act of 1972, as amended
dB	decibel
dBA	A-weighted decibel
DHV	Design Hour Volume
DoD	Department of Defense
DoDI	Department of Defense Instruction
EA	Environmental Assessment
ECF	entry control facility
EER	Electronic Equipment Room
EMC	electromagnetic compatibility
EMI	electromagnetic interference
EMR	electromagnetic radiation
EO	Executive Order
ESA	Endangered Species Act
ºF	degrees Fahrenheit
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FCC	Federal Communications Commission
FONPA	Finding of No Practical Alternative
FONSI	Finding of No Significant Impact
FPCON	Force Protection Condition
ft	Feet
FY	Fiscal Year
GHG	greenhouse gas
GHz	Gigahertz
GPM	gallons per minute
GVEA	Golden Valley Electric Authority
HazCom	hazardous communication
HazWst	Hazardous Material and Waste
HCS	Highway Capacity Software
HERF	Hazards of Electromagnetic Radiation to Fuel
HERO	Hazards of Electromagnetic Radiation to Ordnance
HERP	Hazards of Electromagnetic Radiation to Personnel
HIRF	High Intensity Radiated Field
HVAC	Heating, Ventilation, and Air Conditioning
HWMP	Hazardous Waste Management Plan
ICRMP	Integrated Cultural Resources Management Plan

IDP	Installation Development Plan
IEEE	Institute of Electrical and Electronics Engineers
IFR	Instrument Flight Rules
INRMP	Integrated Natural Resources Management Plan
IP	Individual Permit, issued by the USACE
IPaC	Information, Planning, and Conservation
IRP	Installation Restoration Program
J/F-12	Joint Frequency Equipment Allocation
JHA	Job Hazard Analysis
JPARC	Joint Pacific Alaska Range Complex
LBP	lead-based paint
LES	LRDR Equipment Shelter
LOS	Level of Service
LPP	LRDR Power Plant
LRDR	Long Range Discrimination Radar
m	Meter
MAJCOM	Major Command
MBtu/hr	Million British Thermal Units per hour
MCF	Mission Control Facility
MDA	Missile Defense Agency
MGD	million gallons per day
MOA	Memorandum of Agreement
MOVES	Motor Vehicle Emission Simulator
MPE	Maximum Permissible Exposure
MSGP	Multi-Sector General Permit
MSL	mean sea level
MW	Megawatts
NAAQS	National Ambient Air Quality Standards
NATA	National Air Toxics Assessments
NEI	National Emission Inventory
NEPA	National Environmental Policy Act
NFA	Near Field Antenna
nm	nautical mile
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places

NSPS	New Source Performance Standards
NTIA	National Telecommunications and Information Administration
NWI	National Wetlands Inventory
NWP	Nationwide Permit
O_3	Ozone
OHSPC	Oil and Hazardous Substance Pollution Contingency Plan
OCM	other regulated materials
OSHA	Occupational Safety and Health Act
P2	Pollution Prevention Management
Pb	Lead
PCB	polychlorinated biphenyl
PM	particulate matter
PM2.5	particulate matter (up to 2.5 micrometers in size)
PM10	particulate matter (up to 10 micrometers in size)
ppb	parts per billion
ppm	parts per million
PSI	pounds per square inch
RF	radio frequency
RHA	Rivers and Harbors Appropriation Act
RICE	reciprocating internal combustion engines
ROI	region of influence
SAF/CIO A6	Air Force, Chief Information Dominance and Chief Information Officer
SDS	Safety Data Sheets
sf	square feet
SHPO	State Historic Preservation Office
SIP	State Implementation Plan
SMC	Sensor Management Cell
SO_2	sulfur dioxide
SSA	space situational awareness
SSL-A	System Security Level A
SSPARS	Solid State Phased-Array Radar System
SUV	sport utility vehicle
SWS	Space Warning Squadron
Tech	Technical
UEWR	Upgraded Early Warning Radar
UFC	Unified Facility Criteria
ug/m^3	micrograms per cubic meter
U.S.	United States
USACE	U.S. Army Corps of Engineers

USAF	U.S. Air Force
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USNORTHCOM	U.S. Northern Command
USPACOM	U.S. Pacific Command
V/m	volts per meter
VFR	Visual Flight Rules
VOC	volatile organic compounds
VOR	Very High Frequency Omnidirectional Range
vpd	vehicles per day
WOUS	Waters of the U.S.
WRCC	Western Regional Climate Center

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1.0 PURPOSE AND NEED FOR PROPOSED ACTIONS

1.1 INTRODUCTION

This Environmental Assessment (EA) evaluates the potential environmental consequences of the proposed construction and operation of a Long Range Discrimination Radar (LRDR) to support the defense of the United States (U.S.) at Clear Air Force Station (CAFS), Alaska (AK). If the decision is made to proceed, the proposed construction activities would begin in Fiscal Year (FY) 2016 and continue through FY 2021, with the site being operational by mid FY 2020.

1.2 BACKGROUND

Within the Department of Defense (DoD), the Missile Defense Agency (MDA) is responsible for developing, testing, and fielding an integrated ballistic missile defense system (BMDS) to defend the U.S., its deployed forces, allies, and friends against all ranges of enemy ballistic missiles in all phases of flight. The BMDS provides a layered defense, consisting of various weapon, sensor and communications, command and control platforms that are used to defeat incoming ballistic missiles.

1.3 PURPOSE AND NEED

The purpose of the action is to provide a properly situated US-based radar site with sufficient capability for midcourse BMDS discrimination and hit/kill assessment in support of enhanced homeland defense. The need is to deploy a LRDR against long-range ballistic missile threats from North Korea as directed in the National Defense Authorization Act for 2014. When complete, this radar would function as part of the BMDS and be functionally capable through the MDA Command and Control, Battle Management, and Communications (C2BMC) system. This EA considers and evaluates the construction and operation of the LRDR.

1.4 SCOPE OF THE ENVIRONMENTAL ASSESSMENT

This EA documents the environmental analysis of installation of a new radar at CAFS, Clear, Alaska, and includes an assessment of impacts to air quality, airspace, biological resources, cultural resources, environmental justice, geology and soils, hazardous materials and hazardous waste management, health and safety, land use, noise, socioeconomics, transportation, utilities, water resources, and wetlands. Details of cost/schedule/performance and alternatives considered but not carried forward are described in Section 2.3.

1.5 FEDERAL ENVIRONMENTAL REQUIREMENTS

This Proposed Action constitutes a Federal action subject to the requirements of the National Environmental Policy Act (NEPA) of 1969, as amended. The President's Council on

Environmental Quality (CEQ) issued regulations (40 Code of Federal Regulations [CFR] 1500-1508) to implement NEPA that include provisions for both the content and procedural aspects of the required environmental analysis. Accordingly, MDA has prepared this EA through adherence to procedures set forth in the CEQ regulations, MDA NEPA Implementing Procedures and Air Force Instruction (AFI) 32-7061, as promulgated at 32 CFR Part 989 (Air Force Environmental Impact Analysis Process) to evaluate alternatives, to identify and evaluate potential environmental impacts, to describe any mitigation measures or commitments required and to communicate its findings to agency decision makers and the public. The scope of analysis presented in this EA is defined by the potential range of environmental impacts that would result from implementation of the Proposed Action.

1.6 INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

The Air Force Space Command (AFSPC) requested Cooperating Agency status in accordance with 40 CFR 1501.6. As a cooperating agency, AFSPC provided input to the EA during development, and conducted reviews at the draft and final stages. The AFSPC (A4C) is expected to sign a joint Finding of No Significant Impact (FONSI) based on this EA in order to meet their statutory and regulatory requirements before the project may proceed.

Federal, state, and local agencies and native tribes with jurisdiction that could be affected by the proposed and alternative actions were notified and consulted during the development of this EA. Consultation with local tribes has been initiated and will continue in accordance with the Comprehensive Agreement between the Nenana Native Council and the Clear Air Force Station. See Section 3.5.4 for additional details.

Appendix A contains the list of agencies consulted during this EA. Also included is the type of correspondence with each entity, responses, and concurrences (as applicable).

1.7 SUMMARY OF PUBLIC PARTICIPATION

As part of the NEPA process for the EA public participation is encouraged. Notification of the availability of the Proposed Final EA and unsigned Proposed FONSI has been published in local newspapers (Fairbanks Daily-News Miner which is the closest local newspaper to CAFS) and posted at U.S. Post Offices of Clear, AK, Anderson, AK, and Nenana, AK, and will be followed by a 30-day comment period. Copies of the Proposed Final EA and unsigned Proposed FONSI have been posted on MDA's website at http://mda.mil.www.news/environmental.reports.html and placed in the local libraries, Anderson Community Library, Anderson, AK; Nenana Public Library, Nenana, AK; and Noel Wein Public Library, Fairbanks, AK.

1.8 RELATED ENVIRONMENTAL DOCUMENTATION

The conclusions from previous NEPA studies conducted at CAFS were reviewed and summarized as appropriate in this EA. Specific documents are summarized in the appropriate sections and listed in Section 5.0.

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2.0 DESCRIPTION OF THE PROPOSED ACTIONS AND ALTERNATIVES

CAFS is located in east central Alaska approximately 56 miles southwest of Fairbanks in the Tanana Valley. It encompasses 11,438 acres, most of which is undeveloped. The developed portion of CAFS (Figure 2.0-1) consists of approximately 350 acres and is divided into four main areas: the Composite Area, where most administrative, recreational and living quarters are located; the Old Camp Area, where civil engineering, maintenance shops and security police offices are located; the Solid State Phased Array Radar Site (SSPARS) site, which is used to detect missile launches as well as to track moving objects through space; and the Old Tech Site, where the BMEWS radars, radar support buildings and power plant are located.

CAFS is bordered to the east by the George Parks Highway (Alaska State Highway 3), to the north by the community of Anderson, and to the west by the Nenana River. The Alaska Range is located to the south. CAFS is accessed from the George Parks Highway, which connects Anchorage and Fairbanks.

CAFS is the home of the 13th Space Warning Squadron (SWS) and the 213th SWS Alaska Air National Guard, which are one of several units of the 21st Space Wing, Peterson Air Force Base (AFB), Colorado. The 13th SWS generates early missile launch warning data and provides total coverage of the North American continent in the event of ground-based or sea-launched ballistic missile attack. It also provides space surveillance data for more than 9,500 manmade objects in orbit around the world. CAFS staff is composed of approximately 300 USAF active-duty, Air National Guard, DoD civilians, and contract employees.

2.1 PROPOSED ACTION

This Proposed Action includes the construction and operation of a missile defense radar system complex in the Pacific Region at CAFS which would support a LRDR and command and control components (Figure 2.1-1). The Proposed Action would require mission critical, mission support, and non-mission support facilities.

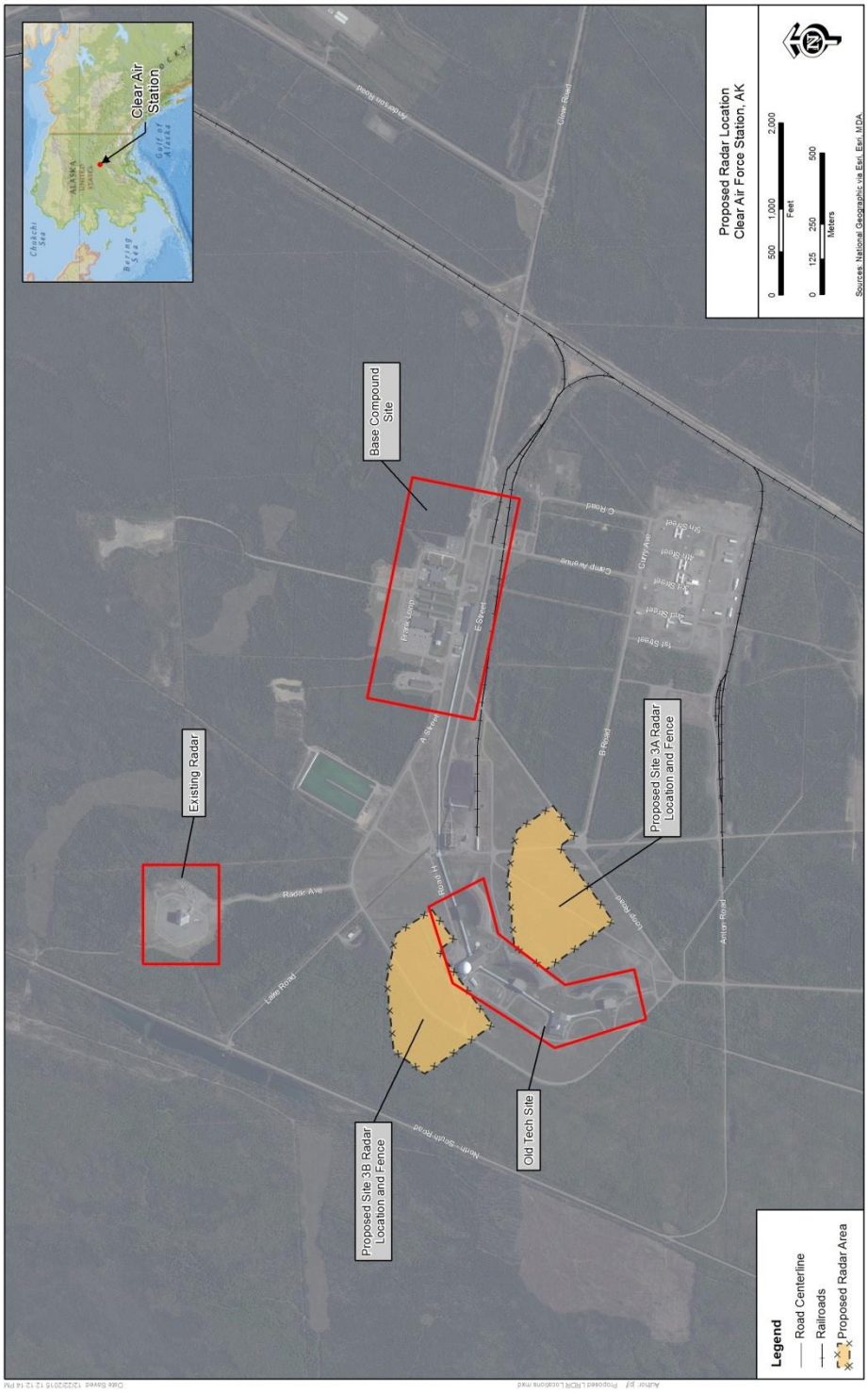
Mission critical facilities would consist of the Mission Control Facility (MCF), LRDR equipment shelter (LES) and foundation that holds the radar, an entry control facility (ECF) with a System Security Level A (SSL-A) secure boundary, a restricted perimeter fence and animal control fence, a power plant; and a fuel storage system. Mission critical facility construction would also include lightning protection, equipment grounding systems, and electromagnetic interference (EMI) shielding and testing. All of the permanent LRDR facilities would be designed and constructed to meet the requirements of Unified Facility Criteria (UFC) 1-200-02, *High Performance and Sustainable Buildings*. Mission critical facilities are further described in Section 2.1.1.

Figure 2.0-1 Developed Portions of CAFS

Southern portion of developed areas at CAFS

Northern portion of developed areas at CAFS

Figure 2.1-1 Proposed LRDR Site Location



Mission support facilities would be located outside the restricted area and would consist of a maintenance facility and near field antennas. Mission support facilities are further described in Section 2.1.2.

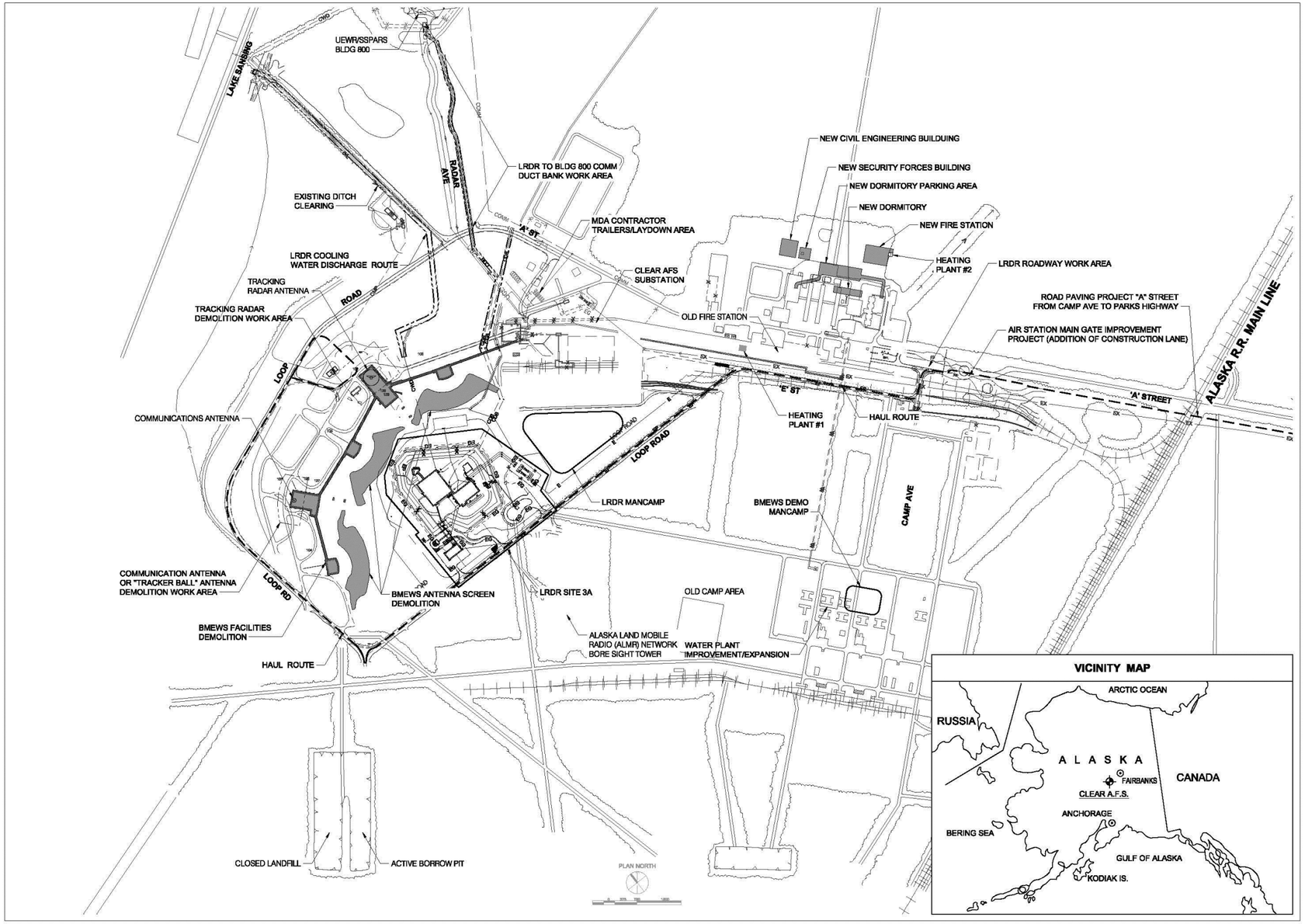
Infrastructure would be provided for both mission critical and mission support facilities consisting of electrical services including an onsite electrical substation, water, sewer, paving, sidewalks, storm drainage, fire protection and alarm systems, site improvements and demolition, telecommunication point of presence, and information management systems.

Several non-mission support facilities associated with the LRDR project were identified and are addressed in this EA. These support facilities are divided into non-mission LRDR-specific and non-mission non-LRDR-specific facilities. The non-mission LRDR-specific support facilities consist of a new dormitory for LRDR operating personnel, a new steam heating plant for the new dormitory, repair and replacement of the potable water facility for the new dormitory and associated heating steam plant, and repairs (mill and overlay) to Clear Road entering the installation. Non-mission non-LRDR-specific facilities are existing planned actions whose scope and/or urgency would be impacted by the LRDR project. These facilities include a new fire station, consolidation of civil engineering facilities, main gate improvements, and demolition of the previous Ballistic Missile Early Warning System (BMEWS) radar and associated facilities. These projects are the responsibility of the U.S. Air Force (USAF) (Lead Service) to validate, program and execute. The non-mission support facilities are further described in Section 2.1.3.

A schematic illustration of the overall proposed LRDR notional site layout and associated support facilities is provided for reference in Figure 2.1-2 based on Alternative 1-Site 3A. The basic layout of the LRDR site shown would be same no matter which location (Site 3A or Site 3B) is selected.

Current estimates of additional manpower required to operate the Proposed Action (the LRDR at CAFS) would be approximately 67 personnel, including additional security forces and maintenance staff.

Figure 2.1-2 LRDR Notional Layout – CAFS (Source: USACE, 2015b)



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2.1.1 Mission Critical Facilities Description

LRDR mission critical facilities are defined as those facilities that are integral and critical to the operation of the radar system in performing the mission and would be located within the SSL-A security boundary. LRDR mission critical facilities include the following:

- MCF.
- LES with foundation and interfaces.
- SSL-A ECF.
- SSL-A Security Fence and Animal Control Fence.
- LRDR Power Plant (LPP).
- Fuel storage.

2.1.1.1 Mission Control Facility (MCF)

The MCF would be shielded and would be connected to the LES via a controls interface link. The radar antenna and related radar system components would be housed in the LES. The MCF would house the Missile Defense Operations Center, Electronic Equipment Room (EER), Radar Maintenance, heat plant, and office accommodations.

The MCF would be a conventional single story structure with prefinished and insulated metal panels attached to a steel column and beam superstructure. It would have a conventional low-sloped warm roof over a metal deck with a fully-adhered membrane and internal drainage. The MCF would be sited and configured to support radar operations, to minimize radar interference, and to facilitate future upgrade. The MCF would be approximately 56,000 square feet (sf) and would be designed and constructed to comply with DoD criteria for *High Performance and Sustainable Requirements* (UFC 1-200-2) and current USAF requirements.

2.1.1.2 LRDR Equipment Shelter (LES)

The LES would be comprised of a multi-story structure to support the radar face and elements. It would be furnished and installed by the Radar Contractor. The LES would support the array faces for the LRDR and would connect to the MCF via a controls interface link.

This LES would be an enclosed structural shell with means of access to the backside of the radar modules using array floors, catwalks or other similar means. The LES would provide the environment needed for the radar equipment and systems to operate. This space would not be occupied except for maintenance activities. Therefore, it would not include restrooms, offices, or workstations.

The LES would include the following subsystems:

- Heating, ventilation, and air conditioning (HVAC).
- Radar process cooling and heating water systems distribution.

- Plumbing.
- Power distribution.
- Lighting.
- Security.
- Communications.
- Fire protection and detection.

2.1.1.3 SSL-A Entry Control Facility (ECF)

An approximate 1,100 sf ECF would provide the LRDR entry checkpoint for passage of personnel and vehicles into the site. Sufficient area would be allocated within the facility to accommodate processing of personnel during peak traffic times.

2.1.1.4 SSL-A Security Fence and Animal Control Fence

A restricted perimeter with a double fence configuration would be constructed around the mission critical facilities which would include a security fence and an animal fence. This fence would include provisions for intrusion detection and site lights.

2.1.1.5 LRDR Power Plant (LPP)

One shielded power plant facility with diesel generators would be constructed. The LPP would meet the emission control requirements for the State of Alaska. Primary power would be provided by commercial power. Until the LPP construction is completed in 2021, a 1-MW diesel powered generator would be provided for emergency building life support only.

2.1.1.6 Fuel Storage

The fuel storage system would include fuel storage capacity to generate power and heat for radar building systems and maintain mission operations for the required timeframes for each location.

The system would include three 50,000-gallon, horizontal, double-walled, steel tanks installed below-grade in individualized concrete vaults, a truck unloading and fuel oil transfer system, and interconnecting supply and return piping. The fuel system would provide fuel storage for all fuel burning equipment for the MCF and LPP areas, including the electrical generators, the heating system boilers, and any other fueled devices. The fuel storage location would not present a human hazard or electronics interference from electromagnetic radiation (EMR) from the radar.

2.1.2 Mission Support Facilities

Mission support facilities are those that host equipment or systems not required to operate or sustain the system but enhance site operations. The main mission support facilities would include the maintenance facility and Near Field Antennas (NFAs).

2.1.2.1 Maintenance Facility

The maintenance facility would be approximately 12,300 sf and sited and configured to support radar operations, minimize radar interference, and facilitate future upgrades. The maintenance facility would contain warehouse space and maintenance space. The warehouse space would contain the radar system and general facility material required to support the direct operation and maintenance of the radar system and other mission support facilities.

To minimize security and safety concerns and facilitate shipping and receiving activities, the maintenance facility would be located outside the SSL-A boundary fence area separate from the radar. The minimum separation distance would meet security and safety requirements, while remaining within walking distance to the MCF.

2.1.2.2 Near Field Antenna (NFA)

Two NFAs would be provided within 150 ft of the LRDR for purposes of testing and calibration of the radar, one for each face. These NFAs would be located outside the security fence. The specific size, configuration, and antenna structure location would be determined for the LRDR radar calibration and electronics equipment during the design being provided by the Radar Contractor. A raised shelter would be needed in the line of sight of the radar face to support the NFA.

2.1.3 Non-Mission Support Facilities

The non-mission support facilities that have been identified as being related to the LRDR project have been categorized as non-mission LRDR-specific actions and non-mission non-LRDR-specific actions. The non-mission LRDR-specific support facilities actions consist of the following:

- A new dormitory for LRDR operating personnel.
- A new steam heating plant for the new dormitory.
- Repair and replacement of the potable water facility (for the new dormitory and associated steam/heating plant.
- Repairs (mill and overlay) to Clear Road entering the installation.

The non-mission non-LRDR-specific support facilities actions consist of:

- A new fire station.
- Consolidation of Civil Engineering facilities
- Main gate (lane addition) improvements.
- Demolition of the previous BMEWS and associated facilities.

2.1.3.1 Non-Mission LRDR-Specific Support Facilities Actions

The non-mission LRDR-specific support facilities actions would consist of the following:

- Dormitory/lodging. The new dormitories would be constructed to support the additional 67 military and contractor support, maintenance, and security forces personnel. The actual dormitory facilities would support up to 96 personnel.
- New steam heating plant. A new steam heating plant would be constructed for heating the new dormitory facilities. The new steam plant would be provided in conjunction with the consolidation of the Civil Engineering facilities. The new steam heating plant has been anticipated to be sized at 7 Million British Thermal Units per hour (MBtu/hr).
- Repair/replace potable water facility. The potable water facility would be repaired with some portions replaced to meet installation and additional potable water demands for the new dormitory (67 LRDR operations personnel) and associated new steam heating steam plant for new dormitories. For this action two new wells would be drilled, installed, and developed outside of the existing water facility. New vertical line shaft turbine pumps with new motors would be installed in each well. Following well installation, the existing wells would be abandoned in accordance with Alaska Department of Environmental Conservation (ADEC) requirements. In addition to the wells, the Building would be expanded to house the wells, provide for unloading/staging of chemicals, and lab/office space, and associated ventilation. Based on the planned building expansions, the current size of the existing water facility (approximately 1,200 sf [USAF, 2013a]) may double or triple in size. In addition to building expansions, sizes of the existing water storage would be increased and piping would be installed to allow for ease of maintenance. Additional description details and analysis regarding this action was provided in the 2007 *Construction/Renovation Project EA* (USAF, 2007a).
- Repairs to Clear Road from CAFS entrance to Parks Highway (Highway 3). Repairs would be made to the Clear Road from CAFS entrance to Parks Highway (or Highway 3) caused by increased traffic related to the construction of the LRDR project. The repair for this approximate 2-mile length of two-lane road would include milling and overlaying following the LRDR construction activities. However, no upgrades (i.e., widening road or shoulders, etc.) of Clear Road are proposed.

The non-mission LRDR-specific support facilities actions will be assessed and evaluated on a resource basis in Section 4.0 of this EA.

2.1.3.2 Non-Mission Non-LRDR-Specific Support Facilities Actions

The non-mission non-LRDR-specific support facilities actions that have been assessed and evaluated for in this LRDR consist of the following:

- Fire Station in Composite Area. Erection of an approximately 20,700 sf concrete and steel structure is proposed which would be used for housing and maintaining firefighting equipment. Additional descriptive details of this action are provided in 2005 Basewide EA (USAF, 2005a).
- Consolidation of Structures in Composite Area. Modifications to existing structures in the Composite Area are proposed to enhance working efficiency, conserve energy, and optimize space utilization. These modifications would affect approximately 65,000 sf of office/maintenance/living space. Additional descriptive details of this action are provided in 2005 Basewide EA (USAF, 2005a).
- Main Gate Improvements. Lane widening for construction activities near the main gate is addressed as a part of the main gate improvements. The lane widening activities will be provided at the initiation of the LRDR construction period; whereas, additional main gate improvements defined in the 2005 Basewide EA (USAF, 2005a) and other CAFS planning documents (USAF, 2013a) will be provided later in the LRDR construction period. .
- Old Technical (Tech) Site Demolition/Cleanup. Demolition/cleanup activities for the Old Technical (Tech) Site are discussed in detail Section 2.2.1.1 and in the 2001 Demolition EA (USAF, 2001a).

The non-mission, non-LRDR specific support facilities actions identified have been assessed and evaluated as actions that may have cumulative impacts related to LRDR mission critical and support facilities. The cumulative impact analyses related to these actions are presented in Section 4.17.

2.2 ALTERNATIVES EVALUATED

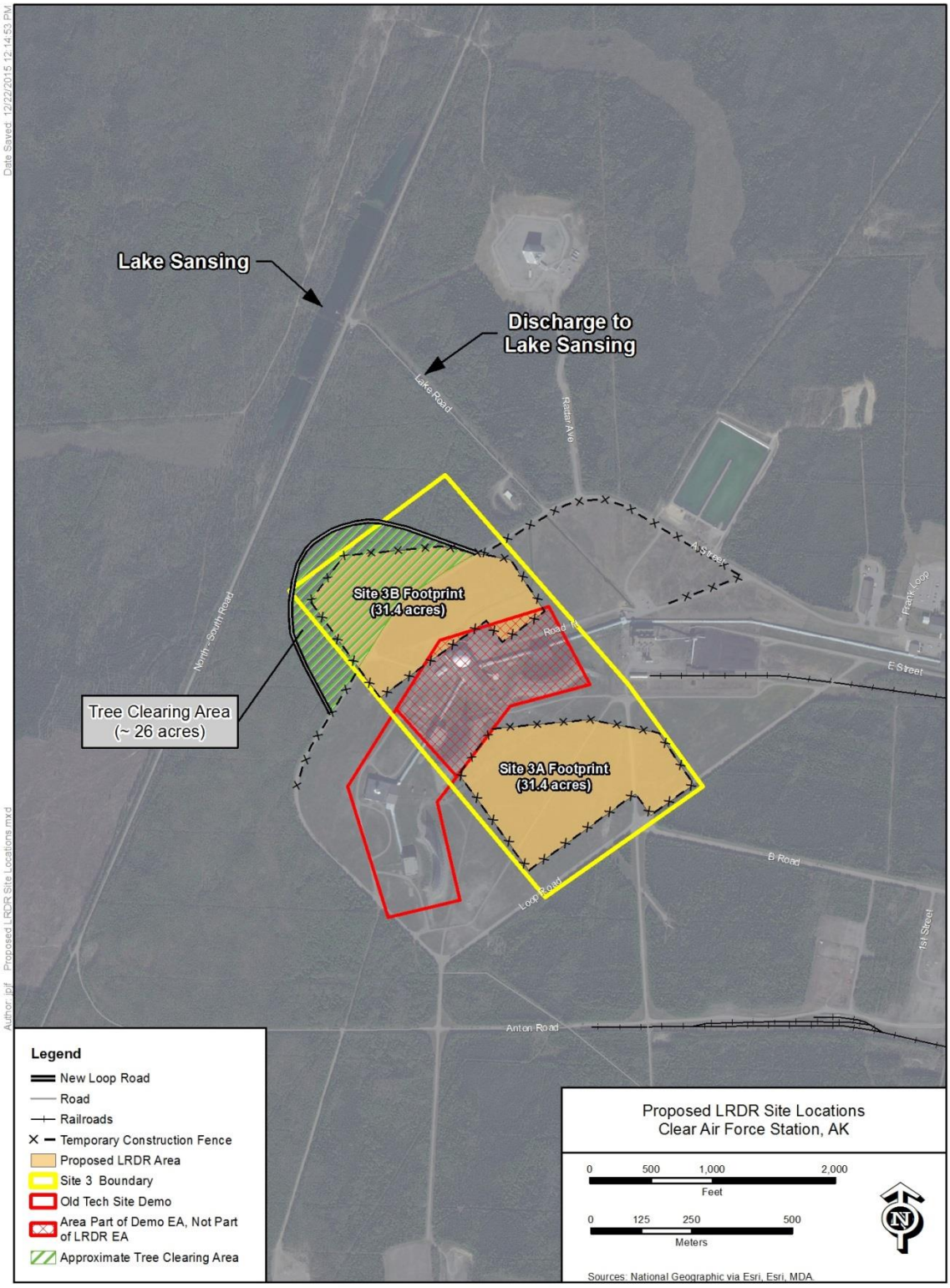
The alternatives evaluated in this EA include the following:

- Alternative 1-Site 3A - CAFS, AK.
- Alternative 2-Site 3B - CAFS, AK.
- No Action Alternative.

Alternatives considered but not carried through into this EA are discussed in Section 2.3.

The following sections present a description of the alternatives evaluated. Detailed descriptions of the activities planned for implementation of the LRDR are included. It should be noted that for Alternative 2-Site 3B only the differences between the alternatives are described, and as appropriate, the descriptions for Alternative 1-Site 3A are referenced. The primary difference between the two alternatives is the location of the actual LRDR site component of the alternatives. Figure 2.2-1 shows a comparison if the two different locations of the LRDR site component.

Figure 2.2-1 – Proposed LRDR Site Locations – Site 3A and Site 3B



2.2.1 Alternative 1-Site 3A – Clear Air Force Station (CAFS), AK

The proposed Alternative 1-Site 3A location of the LRDR site (includes both the mission critical and support facilities) at CAFS would primarily be at the Old Tech Site. At this location, the LRDR site would be in close proximity to available utilities, such as power, communications, and roads. The proposed location of the LRDR site and features associated with its implementation for Alternative 1-Site 3A are shown on Figure 2.2-2. Alternative 1-Site 3A consists of approximately 44.2 acres with 31.4 acres for the site layout area. Alternative 1-Site 3A is located in a previously developed area requiring minimal site clearing.

In addition to the LRDR site for Alternative 3A, other areas that could be impacted by mission-critical and mission-support facilities during the LRDR construction and operations are shown on Figure 2.1-2 including the following:

- LRDR Man Camp.
- Non-mission LRDR support facilities.
- Non-mission non-LRDR support facilities.

The locations of these proposed facilities are primarily in previously developed areas.

A schedule for the Proposed Action is provided in Figure 2.2-3. The schedule shows the main construction activities for the Proposed Action including the LRDR facilities, the non-mission LRDR support facilities, the non-mission non-LRDR-specific support facilities, and the BMEWS demolition work. Also shown is the anticipated number of personal associated with implementation of the Proposed Action as it progresses. Note that the schedule would be the same no matter which alternative is selected (e.g., Alternative 1-Site 3A or Alternative 2-Site 3B).

2.2.1.1 Demolition/Demilitarization

Prior to the start of LRDR construction, several existing structures located within or adjacent to the site development area would require demilitarization and removal. The area referred to as the Old Tech Site supported a radar system that was replaced with a new system, the SSPARS. The Defense Logistics Agency would demilitarize these structures. An *Environmental Assessment Demolition of Technical Site, Clear Air Force Station, Alaska,* June 2001, analyzed the potential impacts for demolition of the Old Tech Site and resulted in a FONSI (USAF, 2001a).

Figure 2.2-2 Expanded View – Site Footprint for LRDR Site 3A

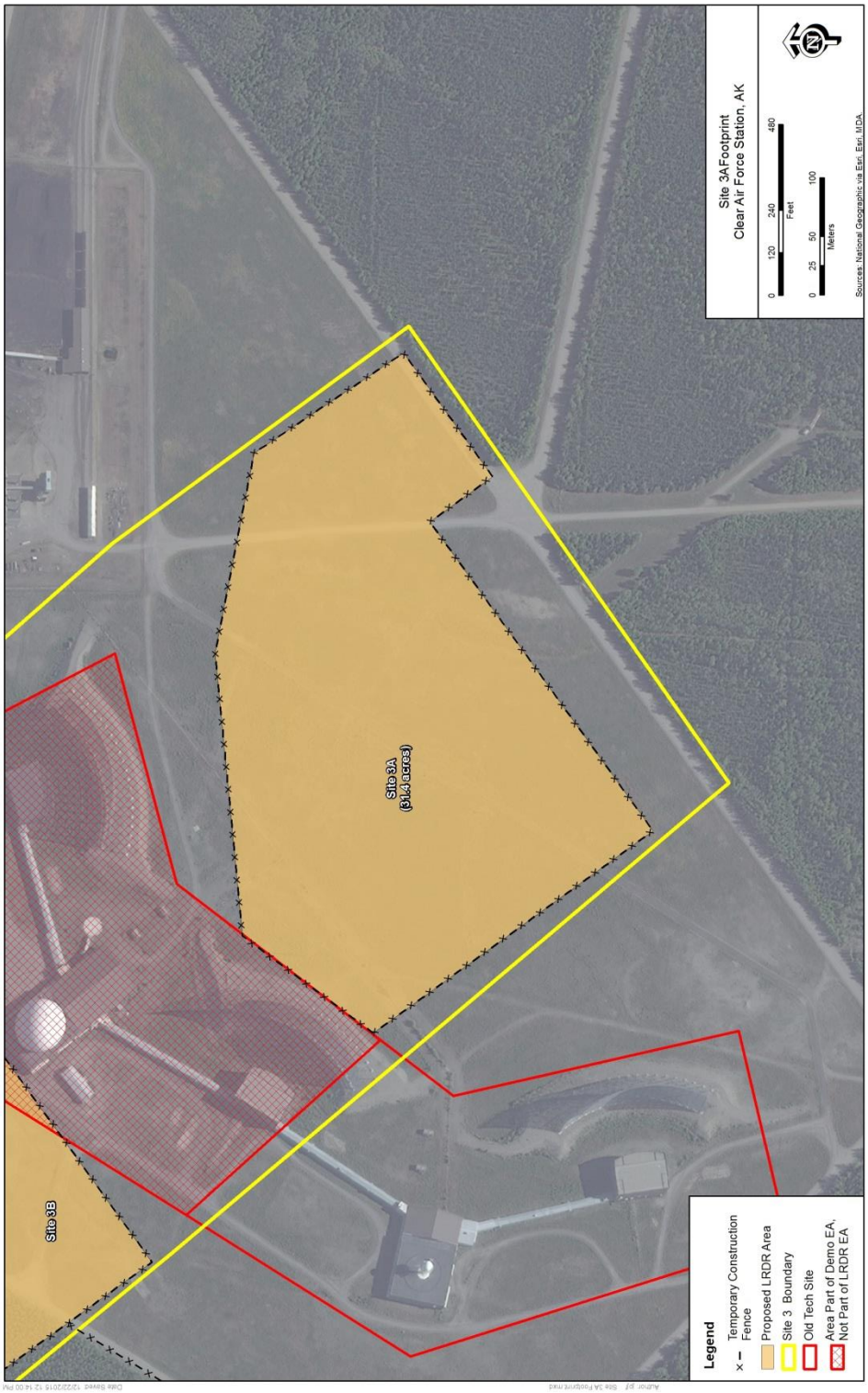
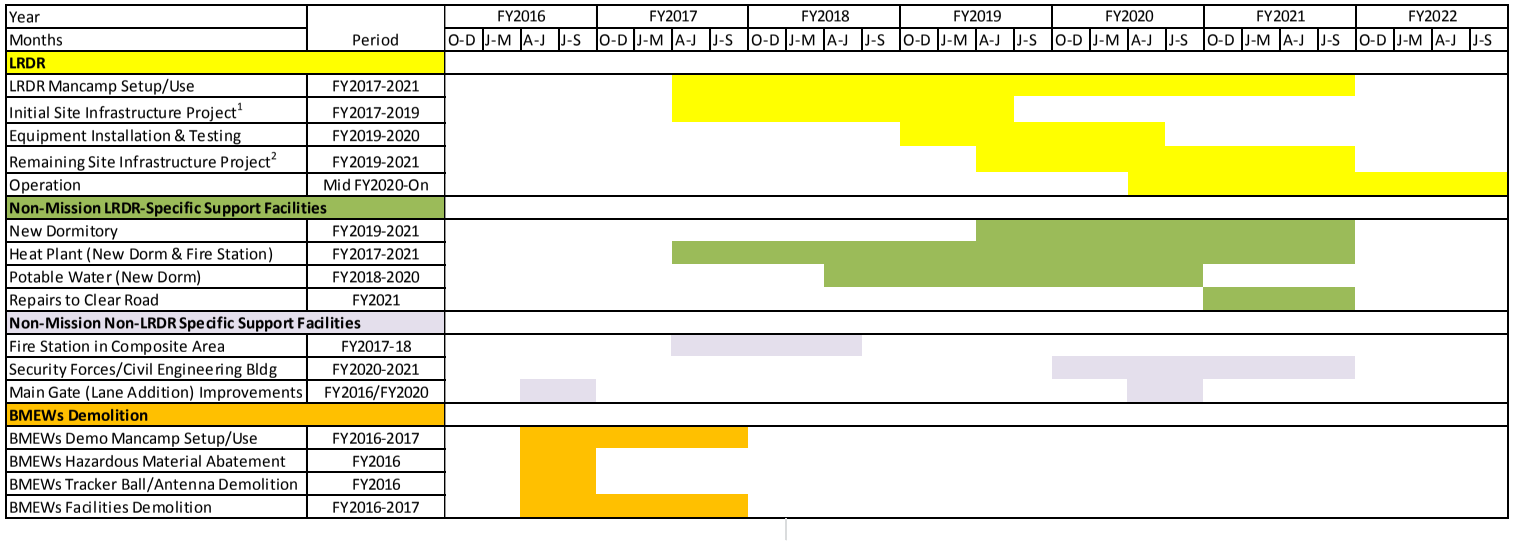


Figure 2.2-3 Composite Schedule and Manpower Estimates for LRDR-Related Activities



Manpower Estimates

Total Average for LRDR Construction					1	58	100	100	87	164	179	172	151	249	347	263	258	260	221	147	89	70	46				
Total Average for LRDR Operation																		67	67	67	67	67	67	67	67	67	67
Total Average for Non-Mission LRDR-Specific Support Facilities Construction						10	40	45	30	20	20	20	30	40	60	20	30	70	70	60	40	30	10				
Non-Mission Non-LRDR Specific Support Facilities	(Manpower estimates addressed by other EAs)																										
BMEWs Demolition Average				40	40	20	10	20	20																		

Notes:
Time estimates to nearest FY quarter.
1) Initial Site Infrastructure Project (Milcon FY2017)
   Mission Control Facility
   LES with Foundation and Interfaces
   Primary Site Infrastructure (including clearing of existing ditch)
   SSL-A Entry Control Facility
   LRDR Power Plant and Electrical Substation
   SSL-A Security Fencing
2) Remaining Site Infrastructure Project (Milcon FY 2019)
   Power Plant Facility
   Fuel Unloading Station
   Maintenance Facility
   Additional Site Infrastructure
   Roads

Below is a summary of the 2001 Demolition EA that describes the actions to be taken and impacts of those actions.

As shown on Figure 2.2-4, the Old Tech Site includes facilities that supported three antenna structures one 90-ft diameter radar dish, and a satellite communication terminal. As defined in the demolition EA, the Proposed Action would include the demilitarization of the BMEWS and satellite structures followed by demolition of all the facilities in the Old Tech Site, including the buildings, utilidor, radars and antenna. Prior to demolition, there would be large quantities of scrap steel, copper, bronze, and aluminum recovered, as well as cables. Equipment, metal, and other material would be reused, recycled, or disposed of depending on the market need and cost. A location within CAFS would be identified to stockpile materials that are being salvaged. After demilitarization of the radar antennas, the gravel embankments may be removed at the three antenna bases and used as cover material for the BMEWS slabs or as fill material at other on base locations.

The demolition process described in the EA also accounted for the presence of hazardous materials (asbestos, lead-based paint [LBP], polychlorinated biphenyls [PCBs], mercury switches, thermostats, fluorescent light bulbs, nickel, cadmium, and lead (Pb)-acid batteries, used oil, and chromium solution). Other applicable environmental issues for the Old Tech Site disposal included the presence of four groundwater wells drawing water for the facility's water supply and for cooling the radar system. Septic tanks in service at the time would be closed in accordance with State requirements.

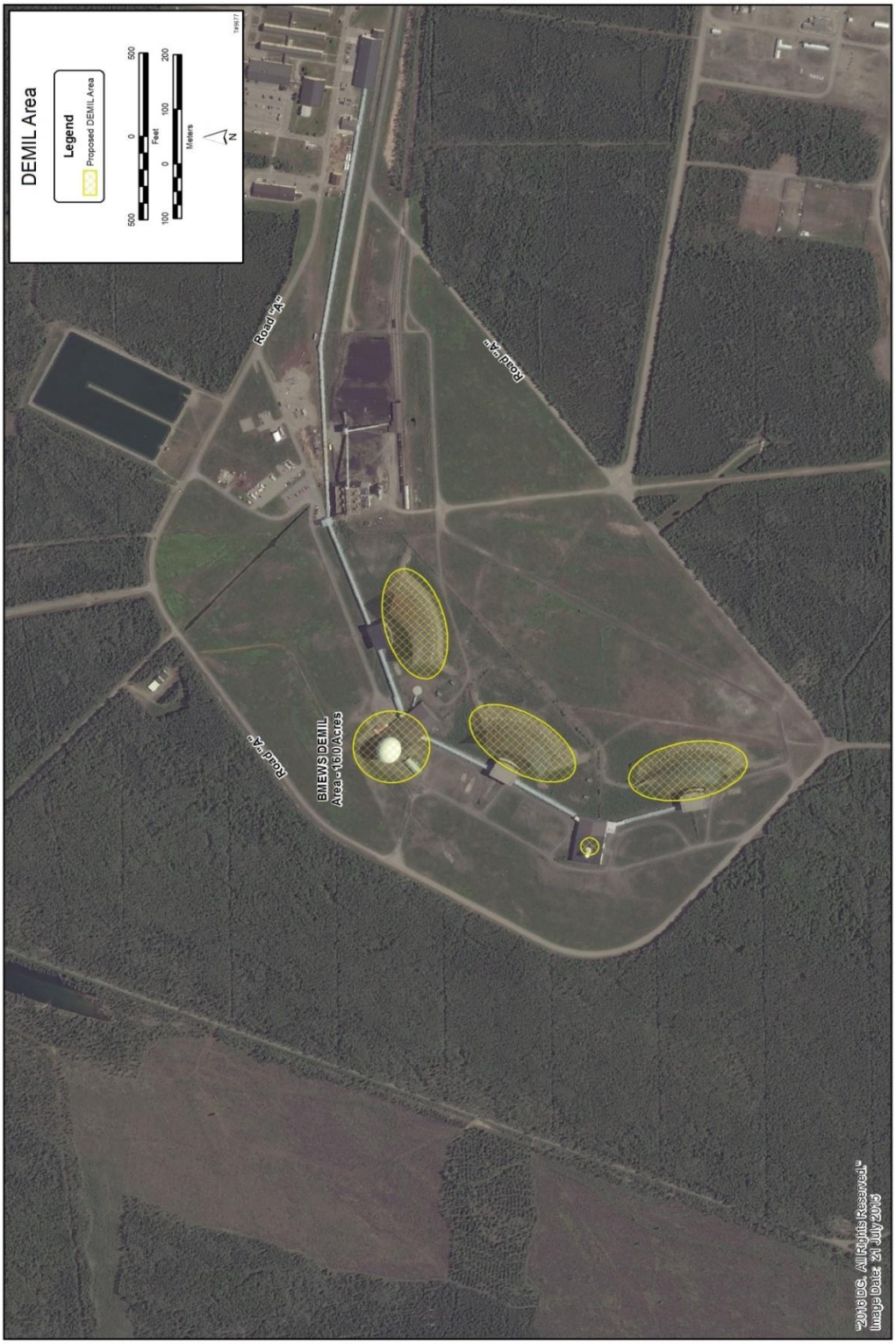
There were four underground storage tanks on the Old Tech Site. Three were closed in place and one was removed; the underground storage tank activities were conducted in accordance with State requirements.

As indicated, the impacts and activities associated with the demolition of the Old Tech Site were defined in an approved 2001 EA (USAF, 2001a). Although the activities to be implemented for the demilitarization/demolition will follow the methods defined in the approved 2001 EA, one area needing to be updated is the method of waste disposal that would be associated with this work and its impacts.

Materials from removal of the previous antennas would primarily be scrapped and recycled. In addition to those materials, additional types of waste that would be generated during the demilitarization/demolition of the Old Tech Site and their planned deposition would include the following:

- **Concrete** demolition debris consists of concrete demolition from buildings, foundations, slabs, parking areas, roadways, etc. Concrete demolition waste is exempt from being disposed of in a permitted landfill. The current plan is to dispose of the concrete demolition debris onsite starting at the north end of the active borrow pit area (see Figure 2.1-2).

Figure 2.2-4 CAFS Old Tech Site-Demolition/Demilitarization Area



- **Construction and demolition (C&D) debris** consists of all construction debris other than concrete waste, and that is neither toxic nor hazardous which is normally disposed of by landfilling. The current plan is to dispose of C&D waste at the Denali Borough Landfill, some 2 miles from the base.
- **Other regulated materials (ORM)** consists of waste that contain hazardous materials (such as PCB, lead, or mercury) or hazardous waste. These materials will be handled and managed by Defense Reutilization Marketing Office in accordance with applicable Federal, State of Alaska, and local requirements, and associated hazardous waste generated will be transported and disposed of at a permitted facility.
- **Asbestos containing materials (ACM)** consists of any demolition wastes such as insulating products; roofing and siding materials; and ceiling and floor tiles. All potential ACM generated in conjunction with the demolition activities would be handled and disposed of according to the installation Asbestos Management Plan (BAE, 2015c) as well as in compliance with all applicable Federal, State, and local regulations. The current plan for disposal of ACM waste would be to transport and dispose of this waste at the Fairbanks North Star Borough Solid Waste Facility in Fairbanks, AK. This facility has the capacity required for the ACM disposal (estimated quantity versus capacity verified (MDA,2015b), and prior to initiation of demolition efforts, a project application and final approval will be obtained for disposal of the CAFS ACM waste at this facility.

A tabular summary of the estimated quantities of demolition waste materials to be generated and disposed of or recycled is presented in Table 2.2-1. Although modifications to the original EA 2002 are provided by these updates for the waste handling procedures, no significant changes in the overall impacts for the demolition activities based on these modifications are anticipated.

Site restoration activities would be required after the structures are removed.

2.2.1.2 Site Preparation, Site Grading and Storm Drainage

Site preparation activities, such as erection of the LRDR Man Camp, road construction, fencing, water wells, wastewater treatment, temporary power, etc. would be expected to begin around July 2016.

A temporary LRDR Man Camp for approximately 350 workers would be built within the site boundaries for government and government contractor site activation and construction personnel. The LRDR Man Camp would provide office space; housing units; dining facilities; a medical treatment area; and morale, welfare, and recreation activities such as fitness and television rooms.

Table 2.2-1 Estimates of Old Tech Site Demolition Waste – Disposal and Recyclable

Material Waste Description	Unit	Quantity	Disposal Category (Cubic Yard)			
			Concrete	C&D	ORM	ACM
Concrete Waste						
Total Concrete in Facility	Cubic Yard	15,375	15,375			
Construction & Demolition (C&D) Debris (without Concrete)						
Building Demolition Debris	Cubic Yard	146,356		903.4		
Other Regulated Material (ORM)						
PCB Contaminated Materials (10% of concrete waste)	Cubic Yard				1,573.5	
Copper Pipe (Painted) - 8"dia	Linear Feet	192			2.5	
Asbestos Containing Materials						
ACM Pipe Insulation at Joints/Fittings	Cubic Yard	4,222				54.6
ACM Pipe Insulation @ Bldg 104,105,106	Cubic Yard	1,293				16.7
ACM Pipe Insulation@14 " diameter Bldg 645	Linear Feet	3,358				132.9
Popcorn Ceiling Materials	Square Feet	13,345				41.2
Suspended acoustical tile 2'x4' gray core	Square Feet	1,490				4.6
HVAC insulation wrap - friable (interstitial space)	Square Feet	4,230				13.1
Black HVAC insulation wrap - friable (interior ducting)	Square Feet	7,040				21.7
Fabric Covering - friable interior ACM (Room 245)	Square Feet	564				1.7
GWB with ACM joint compound	Square Feet	1,896				5.9
Paper-filled fire doors (with ACM fill)	Each	5				1.0
Fireproofing coating on beam -friable ACM	Square Feet	304				1.9
Vinyl floor tiles (both 9"x9" & 12"x12"), black mastic	Square Feet	22,908				35.4
White or black thermal panels: insulation applied with ACM mastic/caulk	Square Feet	8,840				13.6
Roofing tar & patch/repair materials	Square Feet	979				1.5
Silvery Vent Cover Material	Square Feet	30				0.0
Galbestos metal wall sheathing (black exterior)	Square Feet	181,500				560.2
Totals Waste for Disposal	**Cubic Yard**		**15,375**	**903.4**	**1,576.0**	**906.0**

Recyclable Materials	Copper (Tons)	Aluminum (Tons)	Steel (Tons)
Wave-Guide	420	10,300	
Cable and Wiring (Copper)	9,280		
Computer Cabinets, Electric Bus Cabinets and Control System Cabinets (24 Cubic Feet Each)			1,200
Steel Mess and Rebar from Concrete			787
Commodity Totals (Tons)	**9,700**	**10,300**	**1,987**
Commodity Totals (Cubic Yards)	**5,706**	**6,059**	**1,169**
Source: USACE, 2015c.			

The LRDR Man Camp would be installed prior to the start of construction and expanded as necessary should additional personnel be needed at the construction site. It would be located as shown on Figure 2.1-2. The LRDR Man Camp would be decommissioned and restored back to existing conditions, as practicable, once the construction is completed (i.e., 2020 to 2022) or may remain as needed once the LRDR construction is completed for other CAFS operations or non-LRDR construction related activities.

During the LRDR construction, existing CAFS roadways would be used. The Main Gate entrance would be widened as shown on Figure 2.1-2 to handle the heavier traffic loads anticipated. Parking would be provided in the LRDR Man Camp including electrical outlets for vehicle plug-in heaters.

Site preparation would include cut and fill (grading) to level the site and establish positive drainage. Fill material would come from either an onsite or offsite source, depending on quality of the fill material needed. Site grading and drainage would be in accordance with UFC 3-201-01, Chapter 3, *Storm Drainage Systems*.

The LRDR development area would drain to existing drainage systems. There are no discharge points from the system due to the area's flat topography. All storm water would be retained in small swales, ditches, and shallow ponds until it infiltrates into the soil.

A storm water management strategy would be included with the site grading and drainage design per the requirements of UFC 3-210-10, *Low Impact Development*.

A temporary construction fence could be installed around the construction site and access road.

Once construction had been completed the LRDR Man Camp and temporary fence would be removed and the area returned to its pre-construction state or a state consistent with its reuse.

2.2.1.3 Construction

Construction activities at CAFS would take approximately 4 years to obtain initial capability and an additional 2 years for obtaining objective capability, with the main construction effort occurring during the first 3 years. Most ground-disturbing activities would occur during the first 24 months. Construction and site activation personnel requirements would average 200, with a maximum of 350 during peak construction activities. Construction of the LRDR facilities would begin in 2016 with initial capability being met in 2020 and objective capability in 2022. Figure 2.1-2 displays a notional site layout for CAFS. An approximate construction schedule is provided on Figure 2.2-3.

A network of roads, parking areas and sidewalks would be provided at the MCF and Maintenance Facility to provide circulation throughout the site and to other installation facilities. The existing roadway between Composite Area Street 'A' and LRDR parking area entrance would be upgraded to a paved primary roadway with street lighting.

A diesel fuel storage system would be installed to include fuel storage capacity to the LPP to generate power radar building systems and maintain mission operations. Multiple diesel fuel storage tanks in below-grade, reinforced concrete vaults with piping and pumps to connect to the emergency diesel-generators would be installed. Double-wall UL-142 welded steel tanks with 100 percent epoxy-coated interiors would be used. Vaults would be sized to permit personnel access to the exterior of each tank for inspection and maintenance and would be designed to provide secondary containment of fuel leaks from the tanks and connected piping. Approximately 15 ft of soil would need to be excavated for the vault. This soil would be mounded up against the walls for further protection. A fuel inventory monitoring and truck fuel receipts system would be installed. All underground fuel oil piping would be doubled walled with leak detection system. A single lane (approximately 12 ft) paved road would be constructed outside the perimeter fence for delivery trucks to access the off-loading connections. The fuel truck road should be slightly sloped towards a lined/cement/secondary containment catch basin capable of containing contents/volume of a typical fuel truck. It should be engineered to facilitate pumping of any spill including a catastrophic failure of a fuel delivery truck as well as to keep water from collecting with a basin drain that can be actuated to close when fuel/spill occurs.

2.2.1.4 Utilities

Water wells would be installed to provide water for once pass-through cooling for the radar arrays, domestic and fire protection, providing a continuous supply of 38-degree Fahrenheit (^{o}F) water to the chilled water system. As a basis for design, the average estimated continuous groundwater demand for cooling is 4,000 gallons per minute (GPM) with peak demands of 8,000 GPM for an unspecified duration (Golder Associates, 2015). Discharge of the cooling water would be to Lake Sansing, which is an existing industrial wastewater discharge location, via an existing discharge canal. No modifications to Lake Sansing or the discharge canal are proposed or deemed necessary with the exception of clearing the existing ditch of vegetative overgrowth prior to the initiation of the operations of the LRDR facilities.

Water wells, water pumping systems, water treatment systems, water storage system for potable water supply and water distribution systems would serve all Mission and Mission Support Facilities. Fire water and potable water distribution systems would be separate. Fire protection and cooling water wells would be constructed and documented using ADEC requirements for potable water wells.

Domestic wastewater, sewage collection, treatment, and disposal systems for the MCF and maintenance facility domestic wastewater would independent, single septic tank, leach field systems.

Primary power to the site would be provided by a commercial offsite power provider, Golden Valley Electric Authority (GVEA). Emergency power would be supplied by onsite backup generators meeting U.S. Environmental Protection Agency (USEPA) emission standards and

New Source Performance Standards (40 CFR 60 Subpart III). Generators for LRDR related facilities would provide approximately 30 MW (up to eight 3.6 MW generators) of installed power to service a 22 MW demand with a redundant generator. A fuel storage system is sized accordingly.

2.2.1.5 Communications

Telecommunication capabilities between Mission Facilities and existing communications room located at the SSPARS facility would connect through duct banks, conduit, etc.

Fiber optic cable would be installed in conduits at a minimum of 4 ft below ground surface (bgs). If existing conduits are not available, fiber optic cable would be installed in new conduits placed in previously disturbed soils, where possible (along the shoulders of existing roads).

2.2.1.6 Operations

All radar Mission Facilities would be capable of operating 24 hours per day/7 days per week on a continuous basis. When the LRDR site is fully operational, the total increase in site-related employment would be approximately 67 military and contractor support, maintenance, and security forces personnel. This includes steady state, day time shift, plus non-shift occupancy levels. The radar itself would be remotely operated. Operations at the LRDR site would consist of maintenance of facilities, equipment, and radar to ensure system operational readiness. LRDR operations are anticipated to begin in FY 2020 as shown on Figure 2.2-3.

The LRDR will be controlled via an interface to the BMDS Command and Control, Battle Management, and Communications (C2BMC) network. LRDR can thus be operated from any location that fully supports C2BMC functionality. Remote radar operations would be via C2BMC Global Engagement Manager by appropriately trained Air Force sensor managers in a Sensor Management Cell (SMC).

The SMC will consist of a maximum total staff of 20 personnel at each of two yet to be selected locations. The Air Force will utilize existing Command and Control (C2) interfaces located at U.S. Northern Command (USNORTHCOM) Command Center, Schriever Air Force Base, or the U.S. Pacific Command (USPACOM) 613th (Air Operations Center) AOC, Joint Base Pearl Harbor - Hickam, or US Air Forces in Europe, Ramstein Air Base, depending on mission requirements. Existing facilities will be used to the maximum extent practicable and no substantial external work or change in the land use of the existing building or surrounding area will be required. However, some minor interior and exterior work at these facilities may be necessary, resulting in minimal debris. This minimal work will likely include painting, rewiring, and realignment of interior walls. Consequently, no significant impact will occur as a result of using these facilities as SMCs.

2.2.1.7 Safety Systems

Specific safety plans would be developed to ensure each operation is in compliance with applicable regulations. General safety measures would be developed by the facility user to ensure site personnel and the general public would be provided an acceptable level of safety.

2.2.1.8 Electromagnetic Radiation (EMR) Safety Distances

Electromagnetic radiation EMR includes Hazards of Electromagnetic Radiation to Personnel (HERP), Hazards of Electromagnetic Radiation to Ordnance (HERO), and Hazard of Electromagnetic Radiation to Fuel (HERF). After the system is installed, a radiation survey would be conducted to quantify the environment and to identify any controls (e.g. personnel access and/or operational controls for the radar) that would be implemented to ensure personnel safety. Warning lights would be installed at the radar site and operated to alert personnel when the radar is operating in an active mode. The affected environment and environmental consequences of EMR related to health and safety issues associated with the LRDR are presented in Sections 3.9 and 4.9, respectively. In addition to personnel health and safety, EMR can also effect aircraft instrumentation. The affected environmental and environment consequences of EMR to aircraft and airspace are issues associated with the LRDR presented in Sections 3.3 and 4.3, respectively.

2.2.1.9 Fire Protection

Fire protection, alarm, and suppression systems would be provided at the LRDR facilities. Emergency response infrastructure would be augmented to the extent necessary. Fire protection water supply for the LRDR site facilities would be provided by water wells.

2.2.1.10 Security

Security requirements are an integral component of program safety. Security measures would be incorporated within the project design and operational procedures. Elements of site security would include a perimeter security fence, animal control fence, clear zone, security lighting, emergency backup power, intrusion detection system, and security patrol roads. The clear zone on the inner side of the fence would contain remotely operated lights and cameras. On either side of the security fence, up to 30 ft of the surrounding vegetation would be cleared. The security control center would be located at the SSPARS ECF.

2.2.2 Alternative 2-Site 3B – Clear Air Force Station (CAFS), AK

The proposed Alternative 2-Site 3B location of the LRDR site (includes both the mission critical and support facilities) at CAFS would also primarily be at the Old Tech Site. At this location, the LRDR site would be in close proximity to available utilities, such as power, communications, and roads. The proposed location of the LRDR site and features associated with its

implementation for Alternative 2-Site 3B are shown on Figure 2.2-5. Alternative 2-Site 3B consists of approximately 44.2 acres which includes 31.4 acres for the site layout area and an additional 12.8 acres outside the site layout area for radar sighting above the trees and would require approximately 26 acres of tree clearing.

The Mission Critical Facilities, Mission Support Facilities, and non-Mission Support Facilities for Alternative 2-Site 3B would be the same as those described in Sections 2.1.1, 2.1.2, and 2.1.3, respectively, and are the same for both alternatives.

For use in the resource assessments, a comparison of the LRDR operation areas versus the areas to be disturbed during construction and operation are summarized in Table 2.2-2. As indicated, LRDR operations areas for both alternatives (Site 3A and Site 3B) are assumed to be equal because both would have similar site layout and radar sighting requirements. However, as indicated in Table 2.2-2, the total area for Site 3B is slightly greater than Site 3A, 56.7 acres to 43.9 acres, respectively, due the extra area of tree clearing needed for radar sighting.

Table 2.2-2 LRDR Operation Areas versus Areas to be Disturbed for LRDR Construction and Operation

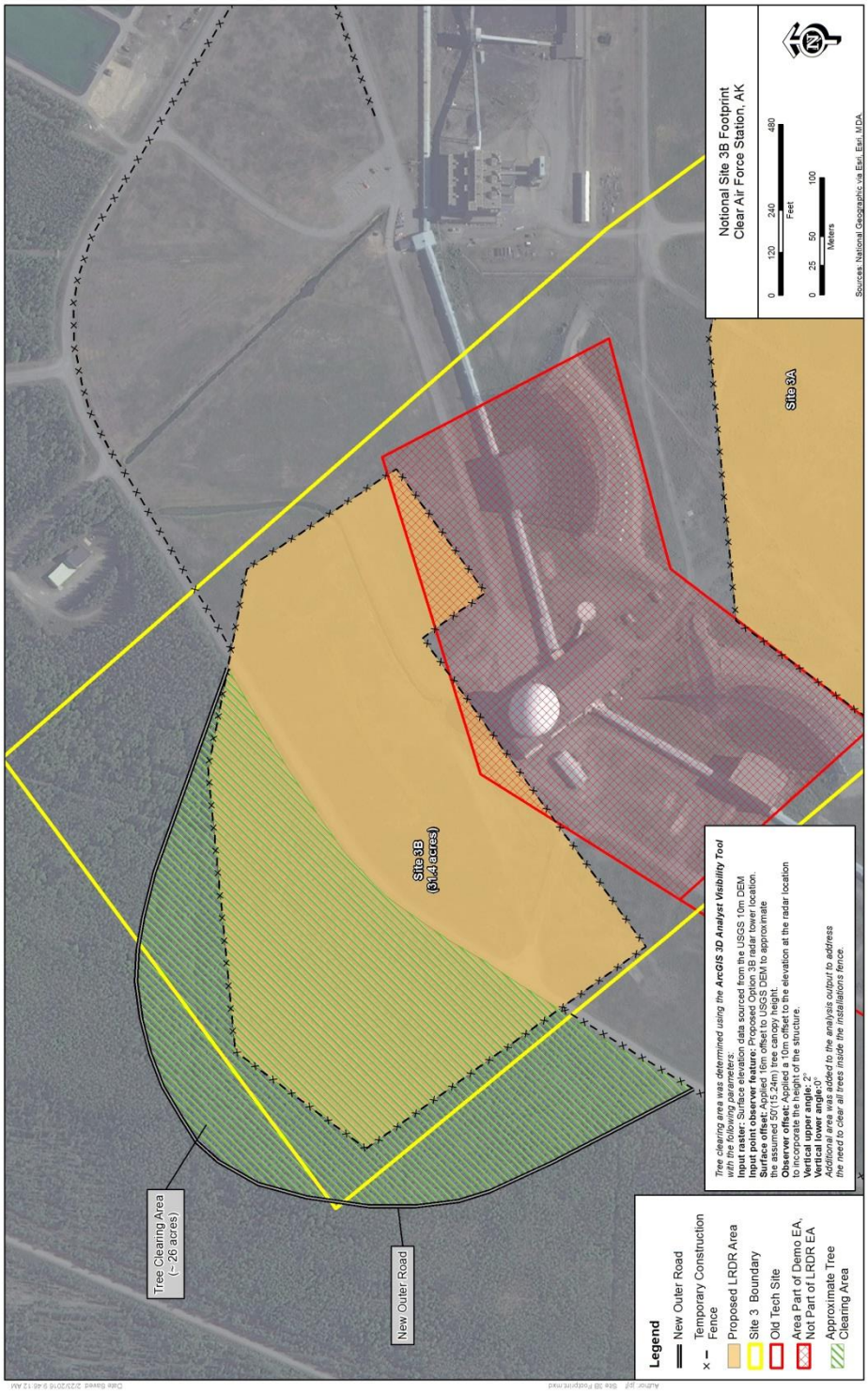
Area Description[1]	Acreages	
	Site 3A	**Site 3B**
LRDR Operation Area	**44.2 acres**	**44.2 acres**
Acres to be Disturbed for Operation		
Total Site Layout Area	31.4 acres	31.4 acres
Acres Outside of Site Layout Area Not Previously Developed	0 acres[2]	12.8 acres[3]
Additional Acres to be Disturbed for Construction		
Man Camp	10 acres	10 acres
Other Areas to Disturbed		
New Dormitory	2.5 acres	2.5 acres
Total Area Disturbed for Construction & Operation	**43.9 acres**	**56.7 acres**

Notes:
[1]Includes site layout area and area required for radar sighting (Site 3A=Site 3B).
[2]Assumed no new areas to be disturbed although general site work would be required.
[3]Acres outside of site layout area to be disturbed: 12.8 acres= Total required tree removal area (26 acres) – tree removal inside the layout (13.2 acres)

2.2.3 No Action Alternative

Under the No Action Alternative, enhanced midcourse radar discrimination capability would not be deployed and the MDA would not establish additional LRDR capability in the Pacific Region to defend the U.S. from a limited ballistic missile attack.

Figure 2.2-5 Expanded View – Notional Site Footprint for LRDR Site 3B



2.3 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

The NEPA requires the federal government to consider environmental consequences of its actions by following a process; preparing and publishing information about environmental effects of, and alternatives to, actions the government is considering taking. Siting is or can be used as part of the NEPA process; NEPA requires that MDA:

- Identify actions that may require an environmental impact analysis.
- Determine whether the action may be categorically excluded from further analysis.
- Determine whether an EA is appropriate.

2.3.1 Methodology

Siting entailed sequential completion of five phases: requirement identification, area narrowing, screening, location evaluation, and documentation of the study.

Area narrowing is a process that applies exclusionary criteria to a performance region.

Screening is a desktop evaluation process that produces a rank-ordered list of locations from which preferred locations were selected for the site survey.

Location evaluation includes delineation and comprehensive evaluation of the candidate sites at each location. The on-site evaluation included meetings with installation subject matter experts such as civil engineers; environmental personnel; and facilities, utilities, and communications personnel.

2.3.2 Ranking

MDA System Engineers working together with the Warfighter identified Alaska as the only Performance Region capable of meeting operational requirements. Alaska, because of its size, was further delineated into two Performance Regions. During Area Narrowing, 50 DoD-owned properties were identified in the State of Alaska. After application of the exclusionary criteria (parcel size, special use land, mission/operational incompatibility, location within the Performance Region, terrain line of sight and accessibility) 45 properties were excluded from further consideration. Screening criteria (infrastructure, communications, accessibility, mission/operational compatibility, separation distance to major airports, cost effectiveness, and system performance) was applied to the five remaining properties and CAFS and Eareckson Air Station were selected for the comprehensive on-site location evaluation. CAFS is the top-ranked installation located within Performance Region 2. Eareckson Air Station is the sole installation in Performance Region 1. Table 2.3-1 provides the screening results.

Table 2.3-1 Screening Evaluation Ranking

SITE	RANK
Clear Air Force Station*	1
Eareckson Air Station*	2
Ft. Wainwright	3
Yukon Training Area	4
Eielson Air Force Base	5
*CAFS and Eareckson Air Station were the two top-ranked installations selected for on-site comprehensive evaluation (location evaluation).	

2.3.2.1 CAFS

CAFS, one of four installations located within Performance Region 2, provides a combination of mission compatibility, cost effectiveness, risk avoidance, and system performance.

- Has reliable accessibility to road, air and transportation modes.
- Provides mission, organizational and operational compatibility.
- Maximizes separation distance to military flight routes and civilian air traffic corridors.
- Has sufficient infrastructure and provides basic services and support.
- Has fiber optic connectivity and satellite communications.

2.3.2.2 Eareckson Air Station

Eareckson Air Station, located within Performance Region 1, provides mission compatibility and suitable system performance, but would incur significant cost, schedule, and operations risk.

- Provides mission, organizational and operational compatibility.
- Has sufficient infrastructure to support LRDR operations.
- Would incur significant construction and sustainment costs.
- Unreliable (adverse climate) accessibility - remote island location (1,500 miles).
- No fiber optic connectivity.

2.3.3 Installations Eliminated From Further Consideration during Screening

Eielson AFB, Fort Wainwright, and Yukon Training Area were eliminated from further consideration. Placement of the LRDR at one of these installations would ensure service members and their families would have ready access to military services and support (e.g. housing, medical and dental), as well as proximity to quality-of-life resources in Fairbanks, Alaska.

However, risk of electro-magnetic interference/compatibility (EMI/EMC) conflict is increased near cities and major airports. Blair Lake Air Force Range (aerial bombing range), Eielson AFB, Fort Wainwright (helicopter operations), Yukon Training Area (runway), and Fairbanks International Airport are located within relative (for air traffic) proximity of each other. Placement of powerful radars near military air traffic, particularly aircraft carrying ordnance, normally results in operational restrictions on the radar, as well as air operations.

2.3.4 Location Evaluation Results

After application of the location evaluation criteria (maximize field of view, electromagnetic environment, communications, existing infrastructure, logistics, environmental impact, site attributes, physical security, cost effectiveness, risk to schedule and operations, system performance, risk from adverse natural events, and quality of life), Eareckson Air Station was eliminated from further consideration because of significant LRDR construction costs and significant sustainment costs over the life of the system.

CAFS attains system performance requirements at minimal cost and risk to schedule and operations. It is in relative proximity (100 miles) to support, services, and quality-of-life resources. Significant advantages include fiber optic network and military satellite communications.

While Eareckson AS has certain advantages, there are significant disadvantages including being located in one of the most hazardous regions (climatic and seismic) in the world and its location 1500 air miles from Anchorage--both factors contribute to high construction (non-recurring) cost (twice mainland Alaska), sustainment (recurring) cost, and significant risk to the Program (schedule and operations).

On May 22, 2015, the DoD issued a public statement announcing CAFS as the preferred location of the LRDR pending completion of required environmental and safety studies. A siting decision will be finalized only after the environmental impact analysis process has been completed. Once CAFS was determined to be the preferred location, six sites within CAFS were further evaluated.

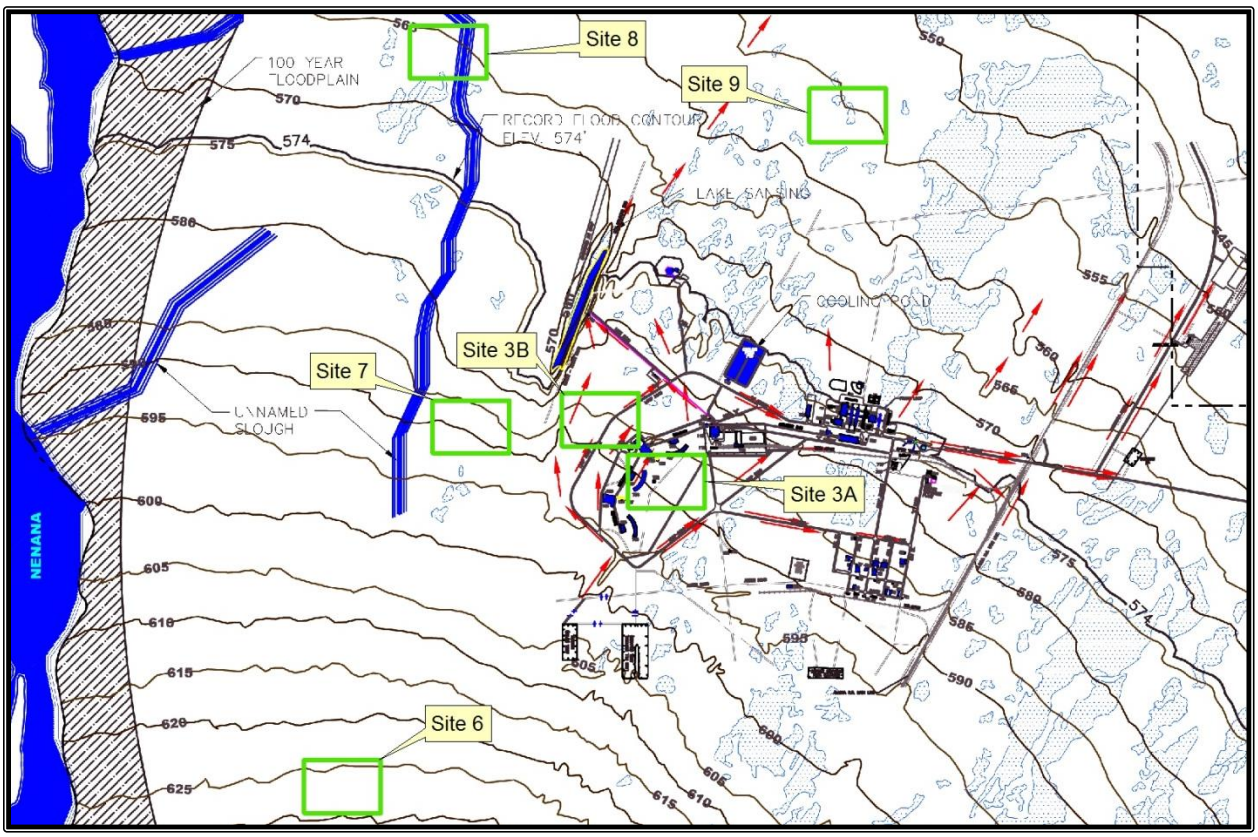
2.3.5 CAFS Overview

Figure 2.3-1 depicts the six candidate sites at CAFS.

Sites 3A and 3B are located at the Old Technical Site, location of the abandoned BMEWS radar. This is a previously developed site containing minimal environmental issues. The sites have nearby roads, power, communications, and water resources and have no wetlands, minimal cut/fill/leveling and no effect to cultural resources. Either of these sites could be developed in the time frame mandated.

Sites 6, 7, 8 and 9, while having operational effectiveness advantages, have greater environmental impacts than sites 3A and 3B. Site 6 requires tree clearance, significant site fill and leveling, and utilities development, including road construction or improvement and routing of power lines, communications lines and cooling water discharge line. Site 7 requires tree clearance, significant site fill and leveling, utilities development, including road construction or improvement and routing of power lines, communications lines and cooling water discharge line, and has the potential for discovery of Native American artifacts near Nenana River. Site 8 is within the record flood contour, requires tree clearance, significant site fill and leveling, utilities

Figure 2.3-1 CAFS Candidate Site Locations for LRDR



the record flood contour, requires tree clearance, significant site fill and leveling, utilities development, including road construction or improvement and routing of power lines, communications lines and cooling water discharge line, and would require wetlands delineation. The additional environmental studies required for these sites could not be completed within the time schedule required to meet the congressionally mandated operational date of 2020.

Post siting study, MDA conducted detailed site planning at CAFS in coordination with the AF to support a 2020 Initial Operational Capability. This included identifying Site 3A as the preferred alternative and developing a design for the LRDR (Radar and all mission support facilities) along with determining how the LRDR would tie into existing CAFS utilities. In addition to the

aforementioned environmental reasons, redesigning the facilities for a different site introduces a cost impact (engineering redesign), cost risk (uncertainty that existing cost estimates are valid for the redesign), and schedule risk (time required to redesign facilities would likely impact readiness to start construction in FY2017). Based on the significant cost and schedule impacts, only Sites 3A and 3B are carried forward for a more detailed environmental analysis.

2.3.6 Rationale for Siting of Non-Mission LRDR-Specific Support Facilities Actions

This section presents a brief description of the rationale used to site the non-mission LRDR-specific support facilities actions described in Section 2.1.3.1 including the dormitory, new steam heating plant, repair/replacement of the potable water facility.

1. Dormitory/lodging - Currently dormitory space is at or near capacity of current and recent mission and mission support personnel. A new 96 person dormitory is required to provide minimum accommodations for personnel directly associated with the new LRDR mission. The preferred choice and two alternatives were evaluated.
    a. Alternative 1: Free up existing rooms by adjusting Base Operating Service (BOS) Contract. This would be cost prohibitive as it would increase the cost of the BOS by $5M per year and place an increased risk of mission failure due to BOS contractors' inability to report to work during extreme conditions.
    b. Alternative 2: Construct dormitory m north of existing admin parking area. This was eliminated due to potential siting in a wetlands area, increased electrical and heat load, and not connected to existing dormitory facilities causing personnel unnecessary exposure to extreme weather conditions.
    c. Preferred location: Build the new dormitory north of Building 203 in the previously disturbed parking lot/sports complex and link the buildings with a corridor between the two dormitories. The preferred location would also require less increase of electrical and heat than Alternative 2.

2. New steam heating plant – A new fire station will be constructed in FY 2017. The heat plant recently built does not have enough capacity to also heat the new fire station. Additional heating will be required at CAFS. Two options were investigated by the USAF: (1) expansion of the current heat plant and (2) construction of a new heat plant that could handle the new fire station load as well as the new dormitory load. A decision was made to install a new heat plant close to the fire station and expand it for the new dormitory when the dormitory is built in FY 2019. The preferred alternative is to construct a Heat Expandable heat plant as part of the fire station construction (USAF, 2014), to initially only supply heat to fire station. During construction of dormitory (FY 2019), the heat plant will be expanded to supply heat to dormitory as well as placed on heat loop for additional heating for composite area. Expansion of existing heat plant is cost prohibitive and would require additional piping to attach to heating system which is not currently funded.

3. Repair/replacement of potable water facility – The existing potable water facility is at the end of its useful life and needs replacing. Also, the existing system cannot provide adequate firefighting pressure to support the new dormitory. Locating the new potable water supply near the Composite Area was investigated but determined to be too costly. The new potable water facility will be in the same location as the existing potable water facility. The replacement of the water pumps does not individually or cumulatively have potential for significant effect on the environment. There would be an addition to the existing facility to house new pumps. Existing diesel backup would remain in the same location and the old pumps would be decommissioned. The analyses of the repair/replacement of the potable water facility is described in further detail under the utilities resources, Section 4.14.2.2, Operations – Water.

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3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section describes the existing natural and human environment conditions that may be affected by Alternative 1-Site 3A, Alternative 2-Site 3B, and the No Action Alternative. The emphasis for this section is to describe the baseline conditions of the resources that would be impacted by individual or cumulative changes that may result from the implementation of the LRDR. Information used in this assessment included review of previous EAs, previous and upcoming installation plans, and regulatory and scientific articles. In addition to these references, information provided by CAFS prior to, during, and after a site visit, as well as observations made during the site visit, was used in this assessment. The descriptions in this section apply to CAFS as a whole, including Alternative 1-Site 3A, Alternative 2-Site 3B, LRDR Man Camp, , discharge to Lake Sansing, and the non-mission LRDR-specific support facilities (e.g., LRDR personnel dormitory, associated heat plant and potable water facility, and entrance road repairs), and the surrounding vicinity, unless otherwise stated.

3.2 AIR QUALITY

The evaluation of the potentially affected environment provided in this section includes an assessment of the existing climate and meteorology, description of the background air quality near CAFS, identification of existing CAFS emissions sources, and identification of sensitive receptors near CAFS. The Region of Influence (ROI) for air quality varies greatly depending on the pollutant. For criteria pollutants, the ROI is local, specifically the area surrounding CAFS. For GHG, the ROI is the global atmosphere. Note also that the ROI for direct and indirect effects to air quality, and for the other nine resources described in this chapter, are not necessarily the same because of the different nature of effects to various types of resources and resource attributes.

3.2.1 Climate and Meteorology

CAFS is located in central Alaska, approximately 4 miles south of Anderson, AK. It has a continental or subarctic climate characterized by long cold winters, short mild summers, and significant changes in the daily pattern throughout the year. Temperature averages in central Alaska near CAFS range from 72.7°F in July to -15°F in January (NCDC, 2015a). Temperature extremes can vary from a high of almost 100°F in the summer to -69°F in the winter (WRCC, 2015).

Mean annual precipitation at CAFS is 12.72 inches, with annual precipitation at the town of Healy (approximately 30 miles south) being slightly greater than 15 inches, with the majority occurring in the June through September timeframe (WRCC, 2015). Snowfall averages approximately 45 to 50 inches per year, primarily from October through March.

The sites in the region near CAFS, where long-term wind data are collected are Nenana (approximately 20 miles north), Fairbanks (approximately 56 miles northeast), Eielson Air Force Base (approximately 68 miles northeast), and Healy (approximately 30 miles south). The predominant wind directions in the region are primarily influenced by nearby mountainous terrain and the Nenana River Valley. Wind data recorded at Nenana appears to be most representative for CAFS, as it is located near the Nenana River Valley and at a similar elevation. The annual wind rose for the Nenana Municipal Airport is shown on Figure 3.2-1, which indicates the predominant wind directions are from the east-northeast, southwest, and northwest (NCDC, 2015b). Short term meteorological data is available for CAFS itself. Two years of data, from June 2012 to June 2014 was collected from a meteorological station installed at the decommissioned power plant (USACE, 2013; USACE, 2014). While there are some differences between the CAFS and the Nenana wind data for these 2 years, the predominant wind directions at CAFS over the long term (i.e., the 25 years of data compiled in Figure 3.2-1) are expected to be similar to the Nenana wind directions.

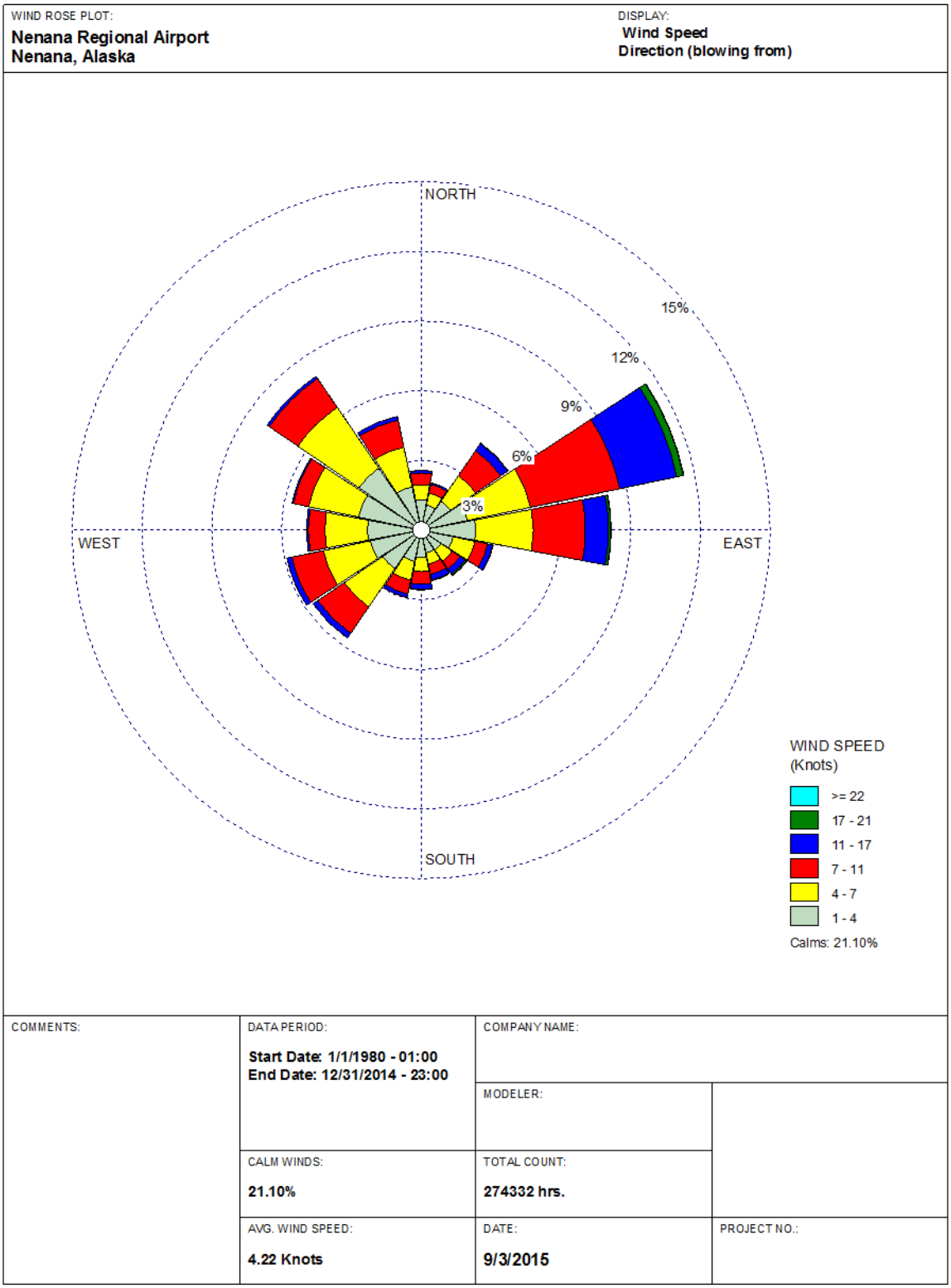
Alaska and CAFS is being affected by climate change. Due to climate change, average annual temperatures in Alaska are expected to rise 2°F to 4°F by 2050. In addition, increases in annual precipitation and increases in soil temperatures are also expected (Chapin et al., 2014).

3.2.2 Regional Air Quality

3.2.2.1 Air Quality Standards

The National Ambient Air Quality Standards (NAAQS), established by the USEPA, and adopted by the ADEC define the maximum allowable concentrations of pollutants that may be reached, but not exceeded, within a given time period. These standards were selected to protect human health with a reasonable margin of safety. Section 110 of the Clean Air Act (CAA) requires states to develop air pollution regulations and control strategies to ensure state air quality meets the NAAQS established by the USEPA. These ambient standards are established under Section 109 of the CAA and they address six criteria pollutants: carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), Pb, particulate matter (PM) (subdivided by size i.e., PM10 particles up to 10 micrometers in size, PM2.5 particles up to 2.5 micrometers in size), and sulfur dioxide (SO_2). Generally, criteria pollutants directly originate from fossil fuel combustion within mobile and stationary sources typically used during construction and operation of a facility. Tropospheric O_3 is an exception, because it is rarely directly emitted from sources. Most O_3 forms as a result of emissions of volatile organic compounds (VOCs) and nitrogen oxides (NO_x) reacting with sunlight. The precursors of O_3 (VOC and NO_2) are primarily emitted from combustion-related activities, while the principal source of particulate matter (PM10 and PM2.5) is generated from both combustion and ground disturbing activities as fugitive dust.

Figure 3.2-1 Annual Wind Rose for Nenana Regional Airport, Alaska



Each state must submit regulations and control strategies for approval and incorporation into the federally enforceable State Implementation Plan (SIP) and in doing so may also develop their own ambient air quality standards which may be lower than the NAAQS and/or have different averaging periods (as Alaska has done). Exceeding the concentration levels within a given time period is a violation and constitutes non-attainment of the pollutant standard. All areas of the country are classified as either attainment, non-attainment, or unclassifiable. Areas which meet the national primary ambient air quality standards are classified as attainment.

These designations are generally assigned to Air Quality Control Regions (AQCRs) defined by the state and federal governments, or to subareas (i.e., individual counties or boroughs) within AQCRs. CAFS is located within the Denali Borough which is part of the Northern Alaska Intrastate AQCR as defined in 18 Alaska Administrative Code (AAC) 50.015 and 40 CFR 81.302.

Table 3.2-1 presents the current NAAQS and Alaska Ambient Air Quality Standards (AAAQS) as defined in 18 AAC 50.010 for the six criteria pollutants (USEPA, 2011). In addition to the six criteria pollutants, Alaska has set standards for reduced sulfur and ammonia.

3.2.2.2 Existing Air Quality

Good air quality exists in the Denali Borough of Alaska, which is designated as in attainment or unclassifiable for all NAAQS and AAAQS (USEPA, 2015). However, a small portion of the Northern Alaska Intrastate AQCR near Fairbanks is designated non-attainment for 24-hour PM2.5. Fairbanks is located approximately 56 miles to the northeast of CAFS and is identified as the Fairbank North Star Borough non-attainment area. This area was also formerly designated as non-attainment for CO, but was redesignated by USEPA as a maintenance area for CO on 27 September 2004. It is under a maintenance plan to monitor and ensure that compliance with the CO air quality standards can be maintained through the plan’s control strategies. CAFS is sufficiently distant from Fairbanks (approximately 56 miles away) that it is not affected by requirements of this PM2.5 non-attainment and CO maintenance area. There are two other non-attainment areas in Alaska: Anchorage Municipality for PM10 and Juneau City and Borough for PM10. Both of these areas are a significant distance from CAFS (more than 200 miles away) and do not impact the air quality near the installation.

Table 3.2-1 Federal and State Ambient Air Quality Standards

Pollutant	Averaging Period	Federal NAAQS		State AAAQS
		Primary	Secondary	
Carbon Monoxide (CO)	1-hour[1]	35 ppm	--	40 mg/m^3
	8-hour[1]	9 ppm	--	410 mg/m^3
Lead (Pb)	3-month rolling	0.15 μg/m^3	0.15 μg/m^3	0.15 μg/m^3
Nitrogen Dioxide (NO_2)	1-hour[2]	100 ppb	--	188 μg/m^3
	Annual	53 ppb	53 ppb	100 μg/m^3
Particulate Matter < 10 microns (PM10)	24-hour[1]	150 μg/m^3	150 μg/m^3	150 μg/m^3
Particulate Matter ≤ 2.5 microns (PM2.5)	24-hour[2]	35 μg/m^3	35 μg/m^3	35 μg/m^3
	Annual	12 μg/m^3	15 μg/m^3	15 μg/m^3
Ozone (O_3)	8-hour[3]	0.075 ppm	0.075 ppm	0.075 ppm
Sulfur Dioxide (SO_2)	1-hour[4]	75 ppb	--	196 μg/m^3
	3-hour[1]	--	0.5 ppm	1,300 μg/m^3
	24-hour[1]	--	--	365 μg/m^3
	Annual	--	--	80 μg/m^3
Reduced Sulfur Compounds	30-minute[5]	--	--	50 μg/m^3
Ammonia	8-hour[1]	--	--	2.1 mg/m^3

Notes:

[1]Second-highest average concentration not to be exceeded more than once in a year.

[2]Standard is attained when the 3-year average of the 98th percentile of the distribution of daily maximum values is less than the standard.

[3]Three-year average of the annual fourth-highest daily maximum 8-hour average O_3 concentration.

[4]Standard is attained when the 3-year average of the 99th percentile of the distribution of daily maximum values is less than 75 parts per billion (ppb), or 196 micrograms per cubic meter (μg/m^3).

[5]Standard is referenced to SO_2 and is not to be exceeded more than once per year.

ppm-parts per million

The closest air quality monitor in the region is in Fairbanks, and is a multi-pollutant monitor operated by the Fairbanks North Star Borough. Fairbanks has more population and more industrial and commercial sources in comparison to the area near CAFS, all of which contributes to the FNSB area being non-attainment with the 24-hour PM2.5 NAAQS. However, for the other monitored criteria pollutants, the values monitored in Fairbanks may be considered conservative background values for CAFS. Table 3.2-2 provides the average air quality values monitored by the FNSB monitor from air quality data from the 3-year period 2012-2014 (ADEC, 2015). The table indicates that with the exception of 24-hour PM2.5, all air quality background values continue to be in attainment with the NAAQS and AAAQS.

Table 3.2-2 Fairbanks Monitored Background Data from 2012-2014

Pollutant	Averaging Period	3-Year Average Value
PM2.5	24-hour	39 µg/m^3
	Annual	11.3 µg/m^3
PM10	24-hour	77.3 µg/m^3
CO	8-hour	2.4 ppm
SO_2	1-hour	42 ppb
O_3	8-hour	0.046 ppm

3.2.2.3 Existing Emission Sources

There are many existing air emission sources at CAFS that provide heat and power to onsite structures and systems. The primary source of criteria pollutant emissions at CAFS, up to recently, were the three coal-fired boilers that were part of the recently decommissioned central heat power plant, These boilers generated more than 90 percent of the PM10, SO_2, NO_x and CO emissions, There are other current criteria pollutant emission sources at CAFS as well, such as diesel-fired boilers, diesel-fired engines, and diesel-fired pumps. Other substantial sources of non-combustion, fugitive-related PM10 emissions are vehicle travel on unpaved roads and coal and ash handling. The existing CAFS emission sources operate under a Federal Title V Operating Permit (ADEC, 2012). The permit identifies the facility's air emission sources along with the conditions and requirements of operation. These requirements are based on CAA air quality regulations (40 CFR 50-97) and Alaska air quality regulations (18 AAC 50).

Table 3.2-3 lists CAFS annual air emissions reported to ADEC for the 2014 annual period (USAF, 2015c). The three coal-fired boilers, two diesel generators, coal ash collection and storage systems, and the coal crusher facility have been shut down and cease to operate. The heat from the coal boilers has been replaced by the installation of three diesel oil fired boilers. A backup diesel generator and fuel storage tanks will also be installed (ADEC, 2014). The

shutdown of these coal-related emission units and the addition of the diesel-fired boilers, backup engine, and fuel storage tanks will significantly lower future air emissions from CAFS.

Table 3.2-3 2014 Annual Emissions Reported from CAFS Emission Sources Sensitive Receptors

Emission Source	CO (tpy)	NO_X (tpy)	PM10 (tpy)	PM2.5 (tpy)	SO_X (tpy)	VOC (tpy)
Fuel Storage Tanks	--	--	--	--	--	0.06
External Combustion [(1)]	131.09	230.97	0.02	0.01	210.93	1.32
Internal Combustion [(2)]	5.60	21.21	0.69	0.69	0.05	0.62
Storage Piles	--	--	2.25	0.34	--	--
Coal Crushing Operation	--	--	1.93	0.29	--	--
Other Miscellaneous Sources	--	--	0.01	0.01	--	0.21
Total Air Emissions	136.7	252.2	4.9	1.3	211.0	2.2

Notes:
[(1)]External combustion sources included coal-fired boilers used to generate power for CAFS and small diesel-fired boilers used for heating purposes.
[(2)]Internal combustion sources include diesel-fired generators and pumps.
tpy – tons per year

3.2.2.4 Sensitive Populations

Sensitive populations are more susceptible to the effects of air pollution than the population at large. Sensitive receptors include health care facilities, retirement homes, schools, playgrounds, and child care centers.

No health care facilities, retirement homes, schools, playgrounds, or child care centers exist on CAFS. There are living quarters on CAFS, but they do not house sensitive populations. The closest such sensitive receptors are located in Anderson, approximately 4 miles to the north of CAFS.

3.3 AIRSPACE

Airspace is defined as that ordinate space which lies above a nation and considered part of that nation's jurisdiction. Airspace, in this context, is a finite resource designated by vertical and horizontal boundaries. It can also consist of a time component and can be considered transient, in regards to its use for aviation purposes, which is a very significant factor in airspace management and air traffic control (ATC). Under the Federal Aviation Act of 1958, as amended (42 United

States Code [USC] 1301 et seq.), the Federal Aviation Administration (FAA) is charged with the safe and efficient use of our nation's airspace.

In the U.S., airspace is categorized as regulatory and non-regulatory. Within these categories exist controlled (Classes A, B, C, D, and E) and uncontrolled (Class G) airspace. These designations are based on which ATC service is provided to Instrument Flight Rules (IFR) flights and certain Visual Flight Rules (VFR) flights. Class F is not used in the U.S. Other airspace type designations include Special Use and Other Airspace.

3.3.1 Controlled and Uncontrolled Airspace

Controlled and uncontrolled airspace is divided into six classes, dependent upon location, use, and degree of control. Class A airspace, which is not specifically charted, is generally, that airspace from 18,000 ft mean sea level (MSL) up to 60,000 ft. Unless otherwise authorized, all aircraft must be operated under instrument flight rules (IRF). Class B airspace is generally that airspace from the surface to 10,000 ft MSL surrounding the nation's busiest airports in terms of IFR operations or passenger enplanements. An ATC clearance is required for all aircraft to operate in the area, and all aircraft that are so cleared receive separation services within the airspace. Class C airspace is generally that airspace from the surface to 4,000 ft above the airport elevation. It surrounds those airports that have an operational control tower, are serviced by a radar approach control, and have a certain number of IFR operations or passenger enplanements. Class D airspace is generally that airspace from the surface to 2,500 ft above the airport elevation that surrounds those airports having an operational control tower. Class E airspace is controlled airspace that is not Class A, Class B, Class C, or Class D airspace.

Uncontrolled airspace, or Class G airspace, has no specific definition but generally refers to airspace not otherwise designated. No ATC service to aircraft operating under either IFR or VFR is provided other than possible traffic advisories when the ATC workload permits and radio communications can be established (Illman, 1999).

The airspace within the vicinity of CAFS is composed of Class A airspace from 18,000 ft MSL up to 60,000 ft. Below 18,000 ft, the majority of the airspace is Class E airspace, with no Class B, Class C, or Class D airspace present at CAFS.

3.3.2 Special Use Airspace

Complementing the classes of controlled and uncontrolled airspace described previously are several types of special use airspace used by the military to meet its particular needs. Special use airspace consists of that airspace wherein activities must be confined because of their nature, or wherein limitations are imposed upon aircraft operations that are not a part of these activities, or both. Except for Controlled Firing Areas, special use airspace areas are depicted on aeronautical

charts, which also include hours of operation, altitudes, and the controlling agency. Typical kinds of special use airspace include:

- Restricted Areas: Restricted Areas contain airspace identified by an area on the surface of the earth within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Activities within these areas must be confined because of their nature, or limitations imposed upon aircraft operations that are not a part of these activities, or both. Restricted Areas denote the existence of unusual, often invisible, hazards to aircraft such as artillery firing, guided missiles or high intensity radio frequency fields. Restricted Areas are published in the Federal Register and constitute Federal Aviation Regulation (FAR) Part 73 Aeronautical Information Manual (FAR/AIM, 1998).

- Military Operations Areas: Military Operations Areas consist of airspace of defined vertical and lateral limits established for the purpose of separating certain non-hazardous military training activities from IFR traffic and to identify (for VFR) traffic where these activities are conducted. Whenever a military operations area is being used, non-participating IFR traffic may be cleared through a military operations area if IFR separation can be provided by ATC. Otherwise, ATC will reroute or restrict non-participating IFR traffic (FAR/AIM, 1998).

FAA has designated an airspace restriction (R-2206, Clear, AK) in the vicinity of CAFS (Airnav, 2015). The restriction applies continuously at altitudes from surface to 8,800 MSL, with the Commander, 13th Missile Warning Squadron assigned as the designated user. The restriction boundary encompasses most of CAFS. The aeronautical chart contains this note: "Caution: Possible damage and/or interference to airborne radio due to high level radio energy vicinity R-2206".

There are no military operation areas over CAFS. According to the F-35A Operational Beddown – Pacific Final Environmental Impact Statement, two squadrons of F-35As will be located at Eielson AFB, Alaska in early FY21 (USAF, 2016). Due to their predominantly higher altitude missions, advanced electronics, and speed, the F-35As would primarily use the Military Operations Areas (MOAs), Air Traffic Control Assigned Airspace, and Restricted Areas within the northern portion of Joint Pacific Alaska Range Complex (JPARC), and no new airspace considerations over CAFS for this activity will be required (USAF, 2016).

3.3.3 Other Airspace Areas

Other types of airspace include airport advisory area, military training routes, temporary flight restrictions areas, flight limitations/prohibitions areas, parachute jump aircraft operations areas, published VFR routes, and terminal radar service areas (FAR/AIM, 1998). None of these other airspace areas have been identified for CAFS.

3.3.4 En Route Airways and Jet Routes

Very High Frequency Omnidirectional Range (VOR) Federal Airway V-436 runs from Anchorage, AK, to Deadhorse, AK, with waypoints at Talkeetna, Nenana and Chandalar Lake (Airnav, 2015). The leg connecting Talkeetna to Nenana passed directly overhead CAFS, from a base altitude of 8,800 feet MSL to a maximum altitude of 18,000 feet MSL. Above 18,000 feet Jet Route J-125 transits CAFS along the same flight path as V-436.

3.3.5 Airports and Airfields

CAFS does not own or operate an airfield. However, Clear Public Airport, which can be used by the installation for airlift or air transport is approximately 1.5 miles outside CAFS main gate (USAF, 2013a). Airspace and runway protection zones are controlled by the FAA. Primary users include private pilots flying single engine passenger aircraft. Military aircraft known to use this airport include C-130 Hercules transport aircraft and UH-60 Blackhawk helicopters. The military aircraft flights typically originate from Eielson AFB (approximately 68 miles) or Elmendorf AFB near Anchorage (210 miles), and are used for personnel and medical transportation. Fairbanks International Airport in Fairbanks is the closest major commercial airport (approximately 52 miles). Nenana Municipal Airport is approximately 18 miles north.

3.4 BIOLOGICAL RESOURCES

Vegetation, wildlife, and the habitats where they occur commonly are characterized as biological resources. Along with an overview of the wildlife and vegetation present, an emphasis was placed on the presence of species listed as rare, threatened, or endangered by Federal or state agencies. The general intent in this EA is to assess sensitivity of wildlife and vegetation to the effects of the Proposed Action. The ROI for the analysis of effects to biological resources includes all areas that are proposed to be disturbed for the Proposed Action and surrounding areas where wildlife could be adversely affected by noise, lights, and EMR. This region is entirely within the CAFS.

The Federal and State statutes and guidelines with specific requirements pertaining to biological resources located at CAFS are described briefly in the following section. This list is not exhaustive, but it characterizes those regulations with the greatest influence on the project.

3.4.1 Biological Resources Statutes and Regulatory Requirements

The following sections summarize the Federal and State laws and regulations related to biological resources. There are no threatened and endangered species or critical habitats at CAFS where these requirements apply (see Section 3.4.5).

3.4.1.1 Federal Statutes and Guidelines

Endangered Species Act (ESA) of 1973, as amended by The National Defense Authorization Act of 2004 (16 USC 1531 et seq.). The purpose of the ESA is to protect and recover imperiled species and the ecosystems upon which they depend. Under Section 7 of the ESA, Federal agencies are required to coordinate their actions with the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration (NOAA) to prevent jeopardizing the continued existence of species. The ESA protects endangered and threatened species and their habitats by prohibiting the "take" of listed animals and the interstate or international trade in listed plants and animals, including their parts and products, except under Federal permit.

Migratory Bird Treaty Act of 1918 (16 USC 703-712). The Migratory Bird Treaty Act prohibits take of migratory bird species, including nests, parts of migratory birds or products derived from migratory birds, and implements a series of international treaties protecting migratory birds that cross international boundaries on migration.

Fish and Wildlife Conservation Act of 1980 (16 USC 2901-2911). The Fish and Wildlife Conservation Act authorizes financial and technical assistance to the states for development, revision, and implementation of conservation plans and programs for nongame fish and wildlife.

Fish and Wildlife Coordination Act (16 USC 661-666c). The Fish and Wildlife Coordination Act was enacted to protect fish and wildlife when federal actions result in the control or modification of a natural stream or body of water. The statute requires federal agencies to take into consideration the effect that projects would have on fish and wildlife resources, take action to prevent loss or damage to these resources, and provide for the development and improvement of these resources.

Bald and Golden Eagle Protection Act (BGEPA) of 1940 (16 USC 668-668c). The BGEPA contains provisions for the protection of Bald Eagles and Golden Eagles, including prohibitions of take, habitat destruction including nests, or use of eagle parts and products without a permit.

Magnuson-Stevens Fishery Conservation and Management Act of 1976 (16 USC 1801-1884). This act serves to conserve and manage the fishery resources off the U.S. coast (including the Great Lakes), and the anadromous species and Continental Shelf fishery resources of the U.S.

Sikes Act (16 USC 670a-670o). The Sikes Act seeks to ensure that ecosystems on military lands are protected and enhanced while allowing military lands to meet the needs of military operations. The Act includes provisions for preparation and implementation of Integrated Natural Resource Management Plans (INRMPs) in cooperation with the USFWS, National Marine Fishery Service, and the applicable state fish and wildlife agency.

AFI 32-7001. This AFI implements Department of Defense Instruction (DoDI) 4715.17, Environmental Management System, and Air Force Policy Directive (AFPD) 32-70, Environmental Quality, and is consistent with AFPD 90-8, Environment, Safety, and Occupational Health. This Instruction establishes the framework for an Environmental Management System (EMS). The guidance and procedures outlined in this Instruction generally apply to all USAF installations within the U.S., its territories, and in foreign countries.

DoDI 4715.03, Natural Resources Conservation Program. This instruction develops new policy and updates policy for the integrated management of natural resources (including biological and earth resources) on property and lands managed or controlled by DoD.

AFI 32-7064. This AFI implements DoDI 4715.03, Natural Resources Conservation Program, and AFPD 32-70, Environmental Quality. It identifies requirements to manage natural resources on Air Force installations in accordance with applicable federal, state, and local laws and regulations and addresses the issues of managing and conserving soil, water, forest, fish, wildlife, and outdoor recreation resources on USAF lands.

3.4.1.2 Alaska Statutes and Guidelines

Endangered Species (5 AAC 93.020). The AAC establishes a state list of endangered species and regulations governing endangered species permits and other activities affecting endangered species.

Fish Habitat Permits and Special Use Permits. In general, actions that would result in environmental impacts are prohibited without a permit issued by the Alaska Department of Fish and Game (ADF&G). There are two permit types, Fish Habitat and Special Area.

3.4.2 Physical Setting

CAFS is located in the Tanana Valley near the Nenana River in the Alaska interior, approximately 10 miles north of the foothills to the Alaska Mountain Range. This physiographic Region is known as the Tanana-Kuskokwim Lowland (USAF, 2015b; Carlson and Gotthardt, 2009). CAFS is located on a broad glaciofluvial out wash plain consisting of Pleistocene sediments and Tertiary gravels from the Nenana River. This out wash is composed of coarse, well-drained material such as sandy gravel, overlain by a thin organic mantle (3 to 12 inches thick) and approximately 4 ft of sandy silt. The sandy glaciofluvial deposit is reported to be several hundred feet thick. Below the gravel outwash is bedrock of the Birch Creek Schist variety, formed during the Precambrian era (USDA, 2005; USAF, 2015b). Elevation ranges from approximately 650 ft in the south and 550 ft in the north, with little topographic relief throughout the installation. Slopes in most places are nearly level to strongly sloping along river terraces and the terrain is generally modestly undulating and rolling (Carlson and Gotthardt, 2009).

The Region is classified as a subarctic continental climate zone that is separated from maritime influence by the Alaska Range to the south. Climatic conditions are characterized by a great contrast between summer and winter temperatures and large daily variations in the weather. Temperature averages in central Alaska near CAFS range from 72.7°F in July to -15°F in January (NCDC, 2015a). The average freeze-free period at CAFS is approximately 101 days, with the first killing frost on 30 August and the last on 21 May, on average (USAF, 2015b).

The mean annual precipitation at CAFS is 12.72 inches, with annual precipitation at the town of Healy (approximately 30 miles south) being slightly greater than 15 inches. The mean total snowfall at CAFS is approximately 45.6 inches, with a record single event snow depth on the ground of 44 inches. Measurable amounts of snow occur during the months of September through May, with an average of 181 days with 1 inch of snow or more on the ground.

The land area is in a Region of discontinuous or intermittent permafrost. The coarse-grained soils at this site are well drained and, thus, frost and permafrost related problems are not seen. Irregular patches of permafrost have been encountered at CAFS at depths between 10 and 20 ft. This permafrost is described as dry frozen with water content between 1.5 and 2.2 percent. The water table has an average depth of 60 ft below the surface (USAF, 2015b).

3.4.3 Vegetation

The vegetation at CAFS is mainly a secondary growth forest estimated at more than 50 years old, originating after a wildfire in the 1940s or 1950s. The historic vegetative cover at CAFS is not significantly different from the current vegetative cover. CAFS is vegetated by a nearly homogeneous open conifer forest, with scattered patches of thicker conifer forest. The dominant tree species include White Spruce (*Picea abies*), Black Spruce (*Picea mariana*), Quaking Aspen (*Populus tremuloides*), and Paper Birch (*Betula papyrifera*). Prominent shrubs include alder (*Alnus* sp.) and willow (*Salix* spp.), primarily in moist to wet soils. Because of low annual precipitation rates and a thin organic layer, the forest floor is covered with a vegetative mat made up of moss, grasses, berries, and wildflowers (USAF, 2015b).

The vascular plants at CAFS tend to be widespread boreal forest species. This includes shrubs and small trees, such as Feltleaf Willow (*Salix alaxensis*), Littletree Willow (*Salix arbusculoides*), Bog Labrador Tea (*Ledum groenlandicum*), Prickly Rose (*Rosa acicularis*), and Trailing Red Currant (*Ribes procumbens*). Common low shrubs and forbs such as Kinnikinnick (*Arctostaphylos uva-ursi*), Bog Blueberry (*Vaccinium uliginosum*), Black Crowberry (*Empetrum nigrum*), Twin Flower (*Linnaea borealis*), Bunchberry Dogwood (*Cornus canadensis*), Northern Bedstraw (*Galium boreale*), Woodland Horsetail (*Equisetum sylvaticum*), and Tall Bluebells (*Mertensia paniculata*) are known from CAFS (LaGory et al. 1996 as cited in Carlson and Gotthardt, [2009]).

The species in saturated peatlands also are widespread boreal species. These include Silvery Sedge (*Carex canescens*), Sweetgale (*Myrica gale*), and Tamarack (*Larix laricina*). Boreal species from well-drained, as well as warmer summer habitats are by species such as Alaskan Wheatgrass (*Elymus alaskanus*), Holboell's Rockcress (*Arabis holboellii*), Staghorn Cinquefoil (*Potentilla bimundorum*), Siberian Aster (*Eurybia sibirica*), Purple Reedgrass (*Calamagrostis purpurascens*), Rock Harlequin (*Corydalis sempervirens*), Silverberry (*Elaeagnus commutata*), Streamside Fleabane (*Erigeron glabellus*), Altai Fescue (*Festuca altaica*), Red Fescue (*Festuca rubra*), Alpine Sweetvetch (*Hedysarum alpinum*), Field Locoweed (*Oxytropis campestris*), Gray Pubescent Plantain (*Plantago canescens*), and Eastern Pasqueflower (*Pulsatilla patens*).

During a biodiversity study at CAFS (Carlson and Gotthardt, 2009) the species collected were generally common boreal species of interior Alaska. Ubiquitous species in the forest understory were Bluejoint (*Calamagrostis Canadensis)*, False Toadgrass (*Geocaulon lividum)*, Highbush Cranberry (*Viburnum edule)*, Bunchberry Dogwood, and Arctic Raspberry (*Rubus arcticus)*. Common wetland sedges (*Carex aquatilis*) and Silvery Sedge were observed and collected in several areas with standing water or in saturated peatland. Jakutsk Snowparsley (*Cnidium cnidiifolium*), Silverberry, and Eastern Pasqueflower are three of the species encountered in an Aspen-Tall Willow barren in the southwestern corner of CAFS (Carlson and Gotthardt, 2009).

For additional information including a list of vascular plants previously recorded at CAFS and within 20 miles of CAFS, refer to Carlson and Gotthardt (2009), Appendix II.

Maintained turf surrounds the composite area buildings and the softball field. The grass type(s) used in turf areas was not documented (USAF, 2015b). The remaining developed area is landscaped with gravel. Natural revegetation by pioneer species has occurred through the gravel in areas with low traffic patterns. These areas are maintained based on CAFS security requirements and the vegetation designation as semi-developed. Landscaping plants around buildings are a selection of species native to the area, such as White Spruce, Tamarack, and cranberry (*Vaccinium* sp.) (USAF, 2015b).

Fourteen plant community types have been identified at CAFS (LaGory et al. 1996 as cited in Carlson and Gotthardt [2009]; Table 3.4-1). Aspen and spruce forests were divided into nine communities based on the relative dominance of the species, canopy cover, and the substrate on which they are growing. Carlson and Gotthardt (2009) recognized five plant community types, as further described and adopted for this EA: Gravel Floodplains, Gravel Barrens, Developed Areas, Mixed White Spruce and Aspen Forests, and Black Spruce Forest.

Table 3.4-1 Plant Community Types Formerly Observed at CAFS

Plant Community Types	
Gravel floodplains	Black spruce forest and woodland (burned, short stature
Gravel barrens	Black spruce forest (unburned, tall stature)
Human disturbance	Black spruce – aspen forest (burned, short stature)
Aspen woodland on gravel (short stature)	Mosaic black spruce – aspen forest (burned, short stature)
Aspen – birch forest (burned, tall stature)	Spruce woodland on gravel
Aspen forest (burned, tall stature)	Floodplain deciduous forest and shrubland
Aspen – black spruce (unburned, tall stature)	Floodplain white spruce forest
Source: Adapted from LaGory et al. (1996), as cited in Carlson and Gotthardt (2009).	

The following five community descriptions were adapted from Carlson and Gotthardt (2009), who provided an updated and condensed series of plant communities for CAFS:

- **Gravel Floodplain.** The gravel floodplains are sand and gravel bars along the braided Nenana River. They are vegetated with a diverse assemblage of grasses, forbs, and short shrubs. These gravel bars are highly dynamic and short-lived, as the Nenana River shifts channels, alternately burying or exposing gravel bars. Older, more stable gravel bars have mature willow, alder, and cottonwood (*Populus* sp.) in closed to open shrubland communities. These shrublands transition into mixed deciduous forests of alder, cottonwood, birch, and Quacking Aspen.
- **Gravel Barren.** The gravel barren habitat occurs on older river terraces and channels, surrounded by spruce or aspen forests on well-drained coarse gravel with little or no soil development. This is an unusual community in central Alaska that tends to have a significant component of plant species from warmer and drier microsites in central Alaska. Additionally, small willows, cottonwoods, and drought-stressed white spruce and aspen are interspersed in the gravel barrens.
- **Developed areas.** While the developed portion of CAFS is relatively small, it does contain an assemblage of plant species unique to CAFS. Areas where ground disturbance has occurred contain high densities of weedy native and non-native grasses and forbs. These areas are of particular concern because non-native species may colonize the less disturbed natural habitats and alter the biodiversity.
- **Mixed white spruce and aspen forest.** On moderately well drained substrates, mixed white spruce and aspen forests occupy a large portion of CAFS. This composite community consists of naturally regenerated second growth forest, which developed following a wildfire around 1940. This boreal community has a broad range of understory plant species. Smaller areas of paper birch and alder forests are present in this mixed forest community.
- **Black spruce forest.** Dense black spruce forests occupy a small portion of the installation, mainly in wetter locations. The black spruce forests typically have a thick peat layer, poorly drained soils, generally are underlain with permafrost, and have

relatively low plant diversity. Small patches of Tamarack are in Black Spruce forest and peatlands. Spruce forest is becoming the dominant community type and many stands already are occupied exclusively by spruce.

3.4.3.1 Rare Plant Species

Four Regionally rare plant species listed by the Alaska Natural Heritage Program were present at CAFS in 2009 (Carlson and Gotthardt, 2009). The rare species were associated with gravelly or sandy habitats; three were collected along the Nenana River on early successional habitats. One rare species was found on gravel roadsides and adjacent gravel barrens. The rare species were Polar Milkvetch (*Astragalus Polaris*), Williams' Milkvetch (*Astragalus williamsii*), Setchell's Willow (*Salix setchelliana*), and Menzies' Campion (*Silene menziesii* ssp. *williamsii*). These four species are ranked as S3[1] to S3/S4[1] by the Alaska Natural Heritage Program (Carlson and Gotthardt, 2009), meaning species vulnerable to imperilment because of decreasing numbers or limited distribution. None of these species are listed as threatened or endangered in Alaska; however, because they are rare and of limited distribution, random events could cause local extinctions, reducing the overall state population of a species.

3.4.3.2 Non-native Invasive Species

Based on a 2004 survey, 36 non-native species have been documented on CAFS. The majority of these non-native species are weedy species that are not damaging to ecosystem function or community structure (i.e., they do not tend to replace or displace native species, but generally co-exist). Non-natives were poorly represented in forested areas away from human activity areas and they were restricted to areas of human activity (road fill, parking lots, trails, etc.).

Of the 36 non-native species, 8 are considered are invasive and pose an invasive threat to the native plant communities in the area (North Wind, 2005). They are:

- Bird vetch (*Vicia cracca*).
- Yellow toadflax or butter-and-eggs (*Linaria vulgaris*).
- White sweetclover (*Melilotus alba*).
- Ox-eye daisy (*Leucanthemum vulgare*).
- Quackgrass (*Elymus repens*).
- Alsike clover (*Trifolium hybridum*).
- Narrow-leaved hawksbeard (*Crepis tectorum*).
- Lambsquarters (*Chenopodium album*).

Two non-native invasive species, bird vetch and yellow toadflax, have been actively controlled on CAFS since 2006 (USAF, 2015f). Three non-native invasive species in particular are of

[1] State rankings – S3=Rare within the state; at moderate risk of extirpation because of restricted range, narrow habitat specificity, recent population decline, small population sizes, a moderate number of occurrences. S4=Apparently secure but uncommon within the state; may be a long-term conservation concern.

concern because of the potential for suppression or exclusion of rare plant species as well as common natives, altering nutrient processing and succession. These are White Sweetclover (Melilotus alba), Yellow Sweetclover (Melilotus officinalis), and Siberian Wildrye (Elymus sibiricus). At CAFS, these species have been located in areas along the Nenana River, which puts them outside the area affected by the Proposed Action. Population control of non-native invasive species through early detection and rapid response would have a positive effect on rare plant species and other biological resources on CAFS (Carlson and Gotthardt, 2009).

3.4.4 Wildlife

Wildlife species that inhabit CAFS are typical of interior Alaska and generally reflect the relative undisturbed and remote nature of the station and surroundings. Two bird species on the State of Alaska's Species of Concern List were observed on the station (Carlson and Gotthardt, 2009), and another three species observed at CAFS are on other federal agencies' watch lists.

3.4.4.1 Terrestrial Wildlife

Mammals known to occur at CAFS include the Red Fox (*Vulpes vulpes*), Grizzly Bear (*Ursus arctos horribilis*) American Black Bear (*Ursus americanus*), Moose (*Alces americanus*), Snowshoe Hare (*Lepus americanus*), Red Squirrel (*Tamiasciurus hudsonicus*), Porcupine (*Erethizon dorsatum*), Gray Wolf (*Canis lupus*), Lynx, and Beaver (*Castor canadensis*) (Carlson and Gotthardt, 2009; USAF, 2015b). A wide array of birds are known to occur at CAFS during the breeding season, including waterfowl, raptors, shorebirds, seabirds and numerous landbird species (LaGore et al. 1996 as cited in Carlson and Gotthardt, [2009]). Hunting for bear, moose, and small game is permitted on some areas of CAFS (Carlson and Gotthardt, 2009). CAFS is part of a statewide study of upland game birds, including Ruffed Grouse (*Bonasa umbellus*) (USAF, 2015b).

Other wildlife that could be present at CAFS include Belted Kingfisher (*Megaceryle alcyon*), Alder Flycatcher (*Empidonax alnorum*), Olive-sided Flycatcher (*Contopus cooperi*), Blackpoll Warbler (*Setophaga striata*), Boreal Owl (*Aegolius funereus*), Great Gray Owl (*Strix nebulosa*), and Rusty Blackbird (*Euphagus carolinus*). Furbearers and small mammals likely present in the area include Mink (*Neovison vison*), Pacific Marten (*Martes caurina*), Muskrat (*Ondatra zibethicus*), River Otter (*Lontra canadensis*), Caribou (*Rangifer tarandus*), Northern Red-backed Vole (*Myodes rutilus*), and Meadow Vole (*Microtus pennsylvanicus*) (ADF&G, 2006).

3.4.4.2 Aquatic Wildlife and Fish

Rivers and streams near CAFS may contain fish, such as the commonly encountered Northern Pike (*Esox lucius*), Sheefish (*Stenodus leucichthys*), Whitefish (*Salangichthys microdon*), and Chum Salmon (*Oncorhynchus keta*) (ADF&G, 2006). Three species of salmon (Chum, Coho [*O. kisutch*], and Chinook [*O. tshawytscha*]) have been identified in the Nenana River, at CAFS

western boundary (Johnson and Litchfield, 2015). Except for Northern Pike, these fish species migrate from salt water to spawn in freshwater streams and rivers (anadromous species). Lake Sansing has been stocked with trout by the ADF&G and is open to fishing by installation personnel.

3.4.4.3 Migratory Bird Species

Breeding bird and seasonal usage surveys, along with incidental sightings, were conducted across CAFS to create an avian species list for CAFS. During the 2007 field season, 53 species of birds were recorded at the station (Carlson and Gotthardt, 2009). Five of these species are considered to be declining and in need of conservation (Table 3.4-2).

In addition to surveys conducted at CAFS, a list of migratory birds likely to use CAFS during migration was obtained using the USFWS Information, Planning, and Conservation (IPaC) website (USFWS, 2015). This list indicated another nine species of conservation concern that could potentially use CAFS (Table 3.4-3).

Table 3.4-2 Bird Species of Conservation Concern Recorded at CAFS

Common Name	Scientific Name	Global Rank(1)	State Rank(2)	Federal(3)	State(4)	Other State(5)	Other National(6)
Blackpoll Warbler	*Setophaga striata*	G5	S4B	BLM SENS	SSC	Audubon, BPIF PSOC	
Gray-cheeked Thrush	*Catharus minimus*	G5	S4S5B	BLM SENS	SSC	BPIF PSOC	
Osprey	*Pandion haliaetus*	G5	S2B	USFS SENS			
Rusty Blackbird	*Euphagus carolinus*	G4	S3S4B			Audubon, BPIF PSOC	NALCP
White-winged Crossbill	*Loxia leucoptera*	G5	S5			BPIF PSOC	

(1) Global Rank: G4= Apparently secure but uncommon; some cause for long-term concern because of declines or other factors. G5= Secure; common, widespread, and abundant.
(2) State Rank: S2=Imperiled within the state; at high risk of extirpation because of few occurrences, declining populations, limited range, and/or habitat. S3=Rare within the state; at moderate risk of extirpation because of restricted range, narrow habitat specificity, recent population decline, small population sizes, a moderate number of occurrences. S4=Apparently secure but uncommon within the state; may be a long-term conservation concern. S5=Secure and widespread within the state; not at risk for extirpation because of widespread abundance.
(3) BLM SENS = Bureau of Land Management Sensitive Species List; USFS SENS = U.S. Forest Service Sensitive Species List
(4) SSC = State of Alaska Species of Special Concern
(5) Audubon = Audubon Alaska Watchlist, BPIF PSOC = Boreal Partners in Flight Priority Species
(6) NALCP = North American Landbird Conservation Plan
Source: All data derived from Table 7 in Carlson and Gotthardt (2009)

Table 3.4-3 Migratory Bird Species of Conservation Concern at CAFS

Common Name	Scientific Name	Season of Occurrence
Arctic Tern	*Sterna paradisaea*	Breeding
Fox Sparrow	*Passerella iliaca*	Breeding
Lesser Yellowlegs	*Tringa flavipes*	Breeding
Olive-sided Flycatcher	*Contopus cooperi*	Breeding
Rusty Blackbird	*Euphagus carolinus*	Breeding
Short-eared Owl	*Asio flammeus*	Breeding
Solitary Sandpiper	*Tringa solitaria*	Breeding
Upland Sandpiper	*Bartramia longicauda*	Breeding
Whimbrel	*Numenius phaeopus*	Breeding
Bald Eagle	*Haliaeetus leucocephalus*	Year-round
Source: Data obtained online from IPaC System (USFWS, 2015).		

3.4.5 Threatened and Endangered Species

The ESA provides a means for conserving the ecosystems that endangered and threatened species depend on and a program for the conservation of such species. The ESA directs all federal agencies to participate in conserving these species. Specifically, Section 7(a)(1) of the ESA directs federal agencies to aid in the conservation of listed species, and Section 7(a)(2) requires the agencies, through consultation with the USFWS, to ensure that the agencies' activities are not likely to jeopardize the continued existence of listed species or adversely modify designated critical habitats.

The ADF&G is responsible for determining and maintaining a list of endangered species in Alaska under AS 16.20.190. A species or subspecies of fish or wildlife is considered endangered when the ADF&G Commissioner determines that the species' numbers have decreased to such an extent as to indicate that its continued existence is imperiled. The State Endangered Species List consists of two birds and three marine mammals (Table 3.4-4).

Table 3.4-4 Species of Conservation Concern in Alaska

Common Name	Scientific Name	Federal Status	State Status
Birds			
Short-tailed Albatross	*Phoebastria albatrus*	LE	E, SGCN
Eskimo Curlew	*Numenius borealis*	LE	E, SGCN
Marine Mammals			
North Pacific Blue Whale	*Balaenoptera musculus*	LE	E, SGCN
Humpback Whale	*Megaptera novaeangliae*	LE	E, SGCN
North Pacific Right Whale	*Eubalaena japonica*	LE	E, SGCN
Notes: Federal Status: LE = endangered State Status: Endangered = E; Species of Greatest Conservation Need = SGCN Sources: State data obtained online at http://aknhp.uaa.alaska.edu/zoology/species-information/ . Federal data obtained online at http://www.fws.gov/endangered			

No threatened or endangered species listed by the USFWS or the ADF&G or critical habitat have been recorded at CAFS (LaGory, et al. 1996, as cited by Carlson and Gotthardt [2009]). Additional studies were conducted in 2005 (vegetation) and 2007 (birds/habitat), reaching the same conclusion (Carlson and Gotthardt, 2009). Information from the USFWS also indicates that endangered or threatened species are not present, based on reported wildlife survey data (USFWS, 2015).

3.5 CULTURAL RESOURCES

Cultural resources include archaeological, historical, and Native American items, places, or events considered important to a culture, community, tradition, religion, or science. Archaeological and historic resources are locations where human activity measurably altered the earth or left deposits of physical or biological remains. Prehistoric examples include arrowheads, rock scatterings, and village remains. Historic archaeological resources generally include campsites, roads, fences, homesteads, trails, and battlegrounds. Architectural examples of historic resources include bridges, buildings, canals, and other structures of historic or aesthetic value. Native American resources can include tribal burial grounds, habitations, religious ceremonial areas or instruments, or anything considered essential for the persistence of their traditional culture.

3.5.1 Existing Conditions

Cultural resource management at USAF installations is specifically established in AFI 32-7065 and DoDI 4715.16, Cultural Resources Management. AFI 32-7065 details compliance requirements for protecting cultural resources through an Integrated Cultural Resources Management Plan (ICRMP). DoDI 4715.16 details procedures for managing cultural resources at DoD facilities. CAFS recently completed an ICRMP in 2015 (USAF, 2015a).

The ICRMP includes an inventory and evaluation of all known cultural resources; identification of the likely presence of other significant cultural resources; description of installation strategies for maintaining cultural resources and complying with related resource statutes, regulations, policies, and procedures; standard operating procedures and action plans; clear identification and resolution of the mission impact on cultural resources; and conformance with local, state, and federal preservation programs. CAFS's ICRMP discusses building and property surveys; procedures for consultation with the Alaska State Historic Preservation Office (SHPO) and Alaskan Native groups; agreements developed from these consultations; and other program responsibilities. This plan is intended for use by personnel involved in planning, construction, maintenance operations, and real property management at CAFS.

The affected environment for cultural resources is defined through determination of the area of potential affect (APE). The APE is defined by 36 CFR 800.16 as the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of

historic properties, if any such properties exist. The APE of the LRDR project at CAFS includes the following for the alternatives:

Alternative 1-Site 3A – Includes the approximately 45-acre LRDR operation area shown on Figure 2.2-2 along with the areas of the non-mission support facilities shown in Figure 2.1-2.

Alternative 2-Site 3B – Includes the approximately 45-acre LRDR operation area plus the additional 12.8 acres requiring tree removal shown on Figure 2.2-5 along with the areas of the non-mission support facilities shown in Figure 2.1-2.

The existing cultural resources at the Project site and in the vicinity have been discussed in previous reports and NEPA documents that were produced for other Proposed Actions at CAFS. Their findings are summarized in the following sections.

3.5.2 Site Archaeological Conditions

Two cultural resource surveys have been conducted at CAFS. The 1991 survey (Goebel and Bigelow, 1991) investigated undeveloped portions of the station through sampling and intensive subsurface testing of areas that had high potential (likely to reveal traces of archaeological resources) for archaeological site discovery. The 1994 survey (Northern Land Use Research, Inc., 1995) was an expansion of the 1991 survey to sample additional undisturbed lands through visual survey, soil probes, and systematic and judgmental shovel testing. No prehistoric archaeological sites were identified. Two historic archaeological sites, a railroad camp and a portion of the original Alaska Railroad bed, were identified as potentially eligible for inclusion in the National Register of Historic Places (NRHP). However, based on the additional survey conducted in 1994 and review and concurrency by the Alaska SHPO, both sites were determined to be ineligible for listing on the NRHP and no further study was required.

CAFS is also considered to have a low potential for archaeological resources based on topography and previous disturbance associated with construction. Through the survey development and review, the SHPO agreed that there were no significant archeological resources known or likely to occur on CAFS property.

3.5.3 Regional History

Archaeological evidence indicates that the Region around CAFS has been occupied for about 12,000 years (Powers and Heffecker, 1989). Although no specific sites have been found within the boundary of CAFS, sites in nearby locations have been characterized by projectile points, cores, and tools for preparing animal skins and food. A 1994 study (Northern Land Use Research, Inc., 1995) found the region to have moderate (possibility exists that subsurface sites may be located in the future) or low potential (featureless topography and known areas of landscaping) for Native Alaskan resources.

3.5.4 History of CAFS

The CAFS property was originally purchased by the Department of the Interior in 1949 for use as a gunnery range for the Alaskan Air Command. The CAFS played a key role in the defense of the U.S. during the Cold War-Era. CAFS is one of only three BMEWS sites of its kind; others were constructed in Thule, Greenland, and Fylingdales, England. Construction of the microwave radar facilities at CAFS began in 1958 and the station became operational in 1961.

The Old Tech Site, primary area for the LRDR, has been evaluated as potential Cold War assets (USAF, 2013a). An inventory and evaluation of Cold War-era properties conducted by Argonne National Laboratory in 1995 identified eight buildings (101, 102, 104, 105, 106, 735, 736, and 737) as potentially eligible for listing in the NRHP (Northern Land Use Research, Inc., 1995). No other properties on CAFS were determined to have "exceptional importance" under Criterion G of the National Register.

The mechanical radar structures (BMEWS) ceased operation in 2001 (USAF, 2013a). Because the radar would no longer be in use, structures associated with the radar were planned to be dismantled and demolished (USAF, 2001a). Based on findings of the previous inventory surveys, consultation with the Alaska SHPO identified the need for a Memorandum of Agreement (MOA) and Historic American Engineering Record documentation to ensure steps be taken to save historically significant items in the context of Cold War operations. The MOA was signed by all stakeholders as of 24 May 2004.

The MOA described mitigation requirements to preserve the history of the Old Tech Site prior to demolition (USAF, 2015a). In accordance with the MOA, the USAF curated certain items from the Old Tech Site complex in order to preserve the historical significance of equipment and operations during the Cold War environment. Once all mitigation activities addressed in the MOA were completed, documentation and submissions were submitted and were approved by the SHPO. Through mutual agreement, the MOA dated 24 May 2004, was terminated on 12 June 2007.

The demolition of the Old Tech Site BMEWS radar and structures has not been completed to date, but as described in Section 2.2.1.1, demolition of these facilities are planned to be conducted prior to or in conjunction with the LRDR construction activities. Although the demolition is being addressed under a separate action and EA (USAF, 2001a), as defined in the ICRMP (USAF, 2015a), CAFS must notify the Alaska SHPO of proposed demolition schedules as soon as they are known and also contact the office after demolition is complete. This notification will allow the SHPO to update the Alaska Heritage Resource Survey database.

In addition, CAFS and the Nenana Native Council entered into a Comprehensive Agreement (signed by CAFS on 12 December 2008 and the Nenana Native Council on 2 January 2009)

which requires CAFS to provide timely notification of proposed activities or project that may have the potential to affect protected tribal resources, tribal rights, or Indian lands. This Comprehensive Agreement also provides for NEPA coordination required by Executive Order (EO) 13175 Consultation and Coordination with Indian Tribal Governments and other Executive Orders and federal policies. In accordance with the requirements of the Comprehensive Agreement, CAFS will provide the Native Council notifications and the opportunities to review NEPA documentation including EAs (CAFS, 2009). In the case of this LRDR EA, CAFS sent a letter notifying the Nenana Native Council of the Proposed Action in January 2016. A copy of the letter is provided in Appendix A. In addition, an availability notification memorandum for the draft LRDR EA was forwarded to the Nenana Native Council by CAFS prior to the release of this document for public review.

3.6 ENVIRONMENTAL JUSTICE

On 11 February 1994, President Clinton issued EO 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations (USEPA, 2014a). The purpose of the EO 12898 is to avoid the disproportionate placement of adverse environmental, economic, social, or health effects from Federal Proposed Actions and policies on minority and low-income populations.

The first step in analyzing this issue is to identify minority and low-income populations that might be affected by implementation of the Proposed Action or its considered alternatives. Demographic information on ethnicity, race, and economic status is provided in this section as the baseline against which potential environmental justice effects can be identified and analyzed. The socioeconomic ROI for the Proposed Action is defined as the Boroughs of Denali and Yukon-Koyukuk. This ROI was selected because it includes the borough in which CAFS is located and the nearest high populations city, Fairbanks, AK.

The evaluation of environmental justice impacts from a Proposed Action includes the geographic distribution of minority populations, low-income populations by poverty-status, community health, and consumption patterns of populations that principally rely on a subsistence style of living. Available mitigation measures and those that would be implemented are also part of the review and analysis.

This approach is consistent with the USEPA's objectives concerning environmental justice, which include "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (USEPA, 2012).

3.6.1 Data Sources

Using the U.S. Census Bureau's (Census) American Factfinder (U.S. Census, 2014), USEPA's EJView and EJSCREEN (USEPA, 2013a; USEPA, 2013b), and Alaska Department of Public Health and Social Services (ADH) data and statistics (ADH, 2013), CAFS and surrounding areas were assessed to identify low income or minority populations. Minority populations included in the census were identified as American Indian or Alaska Native; Hispanic or Latino; Asian or Pacific Islander; African American; Native Hawaiian; or other/multiple races. For purposes of this environmental justice analysis, low-income was considered the same as income below the typical poverty level. According to data published by U.S. Department of Health and Human Services, the 2015 "poverty level" for an individual in Alaska is $14,580 (Federal Register, 2015). For each additional person in a household, there is a determined poverty level that is incrementally increased from the individual level. For a family of four people, the poverty level in 2015 is $29,820 (Federal Register, 2015).

The analysis of low income populations generally used data at the state, county, and Census tract and/or Census block group level. However, due to the area's isolation and low population, limited datasets were available; therefore, the Borough (Alaska county) data were emphasized in this evaluation. The proposed construction sites were compared to locations of these potential populations in the area.

3.6.2 Minority Populations

Generally, to qualify as a minority area, the locale in question would have to include a population in which: (a) minority groups comprise at least 50 percent of the community; or (b) the proportion of minority groups is profoundly greater than that of the general population or other comparable geographic area, such as another nearby community, county, or the state. The Denali Borough (the borough in which CAFS is located) contains four main communities: Anderson, Clear (CAFS), Cantwell, and Healy, as well as a number of smaller settlements. The area is sparsely populated, with a borough-wide total population of 1,921 (U.S. Census, 2014). According to CAFS's General Plan and visual evidence from aerial map views, CAFS is located in a rural area within a forested area. Anderson is the nearest town, located approximately 4 miles to the north; Healy is approximately 30 miles to the south; and Cantwell is approximately 65 miles to the south (USAF, 2015a). The northern and southern boundaries of the base are heavily wooded, whereas the western and eastern boundaries trace the Nenana River and George Parks Highway, respectively. Evidence of local minority groups that would meet the above criteria for "minority populations" was not found in Census or USEPA data.

Minorities comprised 11.6 percent of the total population of Denali Borough; in all of Alaska, minorities comprised 35.9 percent of the state's population (www.denaliborough.govoffice.com). The nearest town, Anderson, is comprised of a 12.2 percent minority population. A neighboring Borough, Yukon-Koyukuk, the southern border of which lies approximately 2.5 miles north of

CAFS, had a total population of 5,547, of which 78.2 percent consisted of minority groups (USEPA, 2013a). The nearest town to CAFS that lies within the Yukon-Koyukuk Borough is Nenana, approximately 20 miles to the north, and reports a total population of 435 and a 43.9 percent minority population (U.S. Census, 2014). Table 3.6-1 summarizes the minority population data for the Cities of Anderson and Nenana, the Denali and Yukon-Koyukuk Boroughs, and the State of Alaska.

Table 3.6-1 Summary of Minority Populations

Population	City of Anderson[(1)]	Denali Borough[(2)]	Yukon-Koyukuk Borough	City of Nenana[(3)]	State of Alaska
Minority Population	12.2%	11.6%	78.2%	43.9%	34.9%
Notes: [(1)]City of Anderson is located in the Denali Borough. [(2)]CAFS is located in the Denali Borough. [(3)]City of Nenana is located in Yukon-Koyukuk Borough. Sources: U.S. Census, 2014; USEPA, 2013a; USEPA, 2013b; ADH, 2013					

Comparing this data to the minority population qualifications, it is evident that the town of Anderson, with a 12.2 percent minority population, would not qualify as an affected minority population. Conversely, the Yukon-Koyukuk Borough would qualify as a minority area. The nearest Yukon-Koyukuk Borough town with a qualifying minority population is Nenana.

3.6.3 Low Income Populations

Low-income populations located in the Proposed Action area were defined using the annual statistical poverty thresholds from the Census' Current Population Reports, series P-60 on Income and Poverty. As defined by EO 12898, a community can be considered either "a group of individuals living in geographic proximity to one another, or a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effect" (USEPA, 2012).

As previously mentioned, a review of CAFS's General Plan (USAF, 2013a) and visual evidence from aerial maps indicated that CAFS is located in a thinly populated rural area which is heavily forested. Based on Census research, only borough data were available to assess the percentage of low income populations. Evidence of disproportionately large concentrations of low income populations was not found in Census or other data. Approximately 20.5 percent of people in the Denali Borough have incomes of more than $50,000 per year (U.S. Census, 2014), well above the individual poverty level of $14,580.

The percentage of all people in the Denali Borough with incomes below poverty level was 11.4, comparable to the statewide percentage of 9.9. For families, the poverty level percentage was 1.0 in the Denali Borough, lower than the 6.8 percent value for the state. In the Yukon-Koyukuk Borough, the percentage of all people and all families with incomes below poverty level was 24.2 and 19.2, respectively (U.S. Census, 2014). Both values were substantially higher than those at the state level. Table 3.6-2 summarizes the low income population data for the Denali and Yukon-Koyukuk Boroughs and the State of Alaska.

Table 3.6-2 Summary of Low Income Populations

Low Income Population	Denali Borough	Yukon-Koyukuk Borough	State of Alaska
Individuals	11.4%	24.2%	9.9%
Families	1%	19.2%	6.8%
Notes: CAFS is located in the Denali Borough. Sources: U.S. Census, 2014; USEPA, 2013a; USEPA, 2013b; ADH, 2013			

The data presented in Table 3.6-2 indicates that the overall percentage of people with incomes below poverty level in the vicinity of CAFS was roughly equivalent to the percentage in the state, but appeared to trend slightly higher in Yukon-Koyukuk Borough. As previously indicated, Yukon-Koyukuk Borough includes one of the larger cities nearest to the Project site, Nenana, in which 15.5 percent of all people were below poverty level (U.S. Census, 2014).

3.6.4 Subsistence Populations

Often, individuals or groups of people who rely on natural resources for food and/or income, or live at a subsistence level, may be associated with very low income areas. Information about these groups and individuals was not identified in Census, State, Borough, or other population data. Based on socioeconomic data and information reviewed, no populations or local groups in CAFS vicinity are known to principally rely on fish, wildlife, or other natural resources for subsistence.

3.6.5 Community Health

Community health was evaluated for Denali and Yukon-Koyukuk Boroughs primarily using county and state health department information that was supplemented with information from USEPA's EJView database. ADH compiles borough health profile information, which indicates the statistics for Denali and Yukon-Koyukuk Boroughs as shown in Table 3.6-3.

Table 3.6-3 Community Health Indicators for Denali and Yukon-Koyukuk Boroughs

Denali Borough	Yukon-Koyukuk Borough
No health insurance: 24.5% total, adolescents under 18 years 5.9%	No health insurance: 39.4% total, adolescents under 18 years 19.5%
50% causes of death being cancer, leading causes being malignant neoplasms, trachea, bronchus, lung and breast cancer	44.2% causes of death being cancer, leading causes being malignant neoplasms, colon, lymphoid, trachea, bronchus, lung and breast cancer
20 resident deaths (2011 through 2013); leading causes include: malignant neoplasm, heart disease, lung cancer	174 resident deaths (2011 through 2013); leading causes include malignant neoplasm, heart disease, influenza and/or pneumonia, unintentional injuries, non-transport accidents
Sources: ADH, 2013; CDC, 2013; U.S. Census, 2014 (based on data from 2011 to 2013)	

Health Data. According to available Centers for Disease Control and Prevention (CDC) data specific to Alaska, 28.4 percent of adults are obese, 37.7 percent are overweight, and 21.5 percent smoke (CDC, 2013). This is comparable to national data, where 28.3 percent of adults are obese and 35.5 percent are overweight; however, smoking trends are slightly higher in the boroughs compared to national data, where 17.8 percent smoke. Therefore, it is concluded that low-income and minority populations in Alaska likely have health trends that are comparable to the rest of the U.S.

The percentage of uninsured adults and adolescents under 18 years in the U.S. in 2013 was 20.4 and 6.5, respectively. In the Denali Borough, approximately 25 percent of adults and 6 percent of adolescents under 18 years have no insurance (see Table 3.6-3). In the Yukon-Koyukuk Borough, approximately 39 percent of adults and 20 percent of adolescents under 18 years have no insurance. This indicates there is a slight disadvantage for health insurance accessibility to those in Denali Borough, particularly for adults. Comparatively, Yukon-Koyukuk Borough exhibits a significantly higher rate of uninsured individuals, indicating that health insurance accessibility is a concern.

According to data from the CDC and ADH summarized in Table 3.6-3, Denali Borough averaged roughly 6 deaths per year between 2011 and 2013, half of which were caused by cancer. Of the total population, this equals less than 1 percent. Similarly, Yukon-Koyukuk Borough averaged 58 deaths per year, less than half of which were caused by cancer, equaling 1.04 percent of the total population. 2013 national data indicated that the death rate is approximately 0.8 percent, the majority of which were caused by heart disease and cancer. It is concluded that the Boroughs are not experiencing a higher trend in deaths (CDC, 2013).

Exposure to Toxic Releases. USEPA's EJSCREEN includes environmental data about the Denali Borough and reports human and environmental health-related information to the USEPA

under various monitoring programs. The data identify existing emission sources within an approximately 4-mile radius around CAFS, and can provide a general indication of the residents' potential exposure to emission-related health issues. The data indicates that most emission sources are associated with CAFS (USEPA, 2013a):

- 3 monitoring sites in addition to CAFS reporting hazardous waste generation.
- 0 monitoring sites with reported air emissions in addition to CAFS.
- 0 monitoring sites reporting water discharges in addition to CAFS.
- 0 monitoring sites reporting release of toxics in addition to CAFS.

One release of toxics report from CAFS revealed a sulfuric acid spill in 1994, which drained into CAFS's decommissioned power plant reject ditch, allowing CAFS to contain and remediate the release onsite. Otherwise, there have been no other records or significant reports of emissions or releases to USEPA in the vicinity of CAFS which would expose pollutants, generating negative health impacts to nearby low-income and minority populations.

The National Air Toxics Assessments (NATA) is USEPA's ongoing comprehensive evaluation of air toxics in the U.S. The USEPA developed the NATA as a screening tool for State and local agencies to prioritize pollutants, emission sources, and locations of interest in order to gain a better understanding of risks. NATA provides estimates of the risk of cancer and other serious health effects from inhaling air toxics in order to inform of emission source locations which are of potential concern in terms of contributing to the population risk (USEPA, 2013a).

The NATA-determined health risks for the Region around CAFS are included in Table 3.6-4. A higher percentile is a more positive indicator for the metric of interest.

Table 3.6-4 NATA-Determined Health Risks

Area	Cancer Risk (Persons per Million)	Neurological Hazard Risk	Respiratory Hazard Risk
Denali Borough	13.86 (68.3 Percentile	0.02 (82.1 Percentile)	0.28 (71.1 Percentile)
Yukon-Koyukuk Borough	13.72 (77.4 Percentile)	0.02 (86.3 Percentile)	0.38 (71.5 Percentile)
Alaska	30.52 (17.3 Percentile)	0.05 (50 Percentile)	0.96 (19.2 Percentile)

Notes: Values are derived from 2005 NATA Cancer Risk Estimates and Non-Cancer Hazard Index Scores. Percentiles are ranking of counties and states from 0 (lowest) to 100 (highest).
Source: USEPA, 2013a

The data derived from NATA indicate that the boroughs, and those that reside within, have a significantly lower cancer, neurological and respiratory hazard risk than the overall risks of Alaska, likely based on the isolation from the more heavily populated and industrialized areas in Alaska.

3.7 GEOLOGY & SOILS

The ROI for potential impacts related to geology and soils would be the area of the Proposed Action within CAFS.

3.7.1 Geology

CAFS is located in the Yukon Region of interior Alaska near the southern boundary of the Tanana-Kuskokwim Lowland (USGS, 1999a). The Lowlands are a broad, relatively flat valley, filled with glacial meltwater outwash. The outwash is a wedge-shaped fan, sloping downward from the south (the source of the outwash) to the north, the direction of flow of the Nenana River. The Nenana River provided a well-defined terminal moraine and deposited coarser gravels in an arc making up the inner fan closest to the breach and deposited medium gravels in a middle fan further out. CAFS is situated on the east half of the fan and is covered with many interlaced sinuous channels, terraces and banks that formed during glacial meltwater outwash deposition. Local elevations of these features differ from 2 to 6 ft. The elevation of the LRDR site (Old Tech Site) is approximately 600 ft above MSL (USGS, 1976). The sediments deposited by the Nenana River consist primarily of medium to coarse granite and conglomerate gravel, covered by sandy gravel, sand, and silt. These sediments can be several hundred feet thick (USAF, 2015a).

3.7.2 Seismicity

The boundary between the Tanana Valley and Alaska Range foothills is very abrupt and is marked by the Denali Fault, located approximately 60 miles south of CAFS. This active fault can generate earthquakes as great as an 8.1 magnitude on the Richter Scale (USGS, 1999b). CAFS is located in Seismic Zone 3 (USAF, 1992). Lateral thrust motion along the fault in recent millennia has been approximately 1 inch per year. This is an area where earthquakes normally range from a 5.5 to 6.5 magnitude (a seismic event of VIII on the Modified Mercalli Scale). Moderate damage can occur in normal structures, while damage is slight in well-built structures. There have been 32 earthquakes with a magnitude of 5.5 or greater since 1904 within a 100-mile radius of CAFS. Seven of these quakes have occurred since 1990 (USGS, 2004). On 3 November 2002, an earthquake with a magnitude of 7.9 was centered approximately 75 miles southeast of CAFS and ruptured 180 miles of the Denali Fault.

3.7.3 Soils

Soils on CAFS are of an unknown age, but have weathered in place with few, if any, geomorphic rejuvenating events or processes since the Pleistocene glaciation. Silty soils generally occur in areas dominated by deciduous forest (aspen and birch); these soils vary from 2.5 to 6 ft deep and are underlain by a sandy gravel horizon varying from 6 to 30 ft thick. Areas dominated by spruce are generally covered by a peat layer 0.5 ft thick over a silt horizon that varies from 2.5 to 4.5 ft

in depth. Under this horizon are horizons of sand, silt, and gravel combinations (USAF, 2013a). Silty soils at the installation are generally well drained, although drainage may be impeded in some areas by intermittent pockets of permafrost. Frost and permafrost related problems are not typically encountered in this area due to the presence of coarse-grained, well-drained soils (USAF, 2013a). No potential permafrost areas have been identified at the proposed project areas.

Soils on CAFS have a low potential for water erosion. Erosion is also minimized by vegetative cover and low annual precipitation. The potential for wind erosion is low, unless the vegetation and organic layer are removed. The pH of the soil in well-drained sites (i.e., silty soils) is 5.0 to 6.0. In poorly drained sites (i.e., peat), the pH of the surface is 4.0 to 5.5 and the subsoil is 5.0 to 6.0 (USAF, 2013a). The low pH limits the soil development process and potential recovery from human impacts.

Compaction, and its effect on permeability, varies according to soil type. Silty soils (United Classification of ML) are moderately compressible and have low to medium permeability after compaction. Sandy silt soils (United Classification of SC) are slightly to moderately compressible and have low permeability after compaction. Well-graded gravel and sand (United Classification of GW) are only slightly compressible and are highly permeable after compactions. The soils in the vicinity of both Alternative1-Site 3A and Alternative 2-Site 3A, (Old Tech Site) have been modified by grading and compaction during construction of the Old Tech Site, but are generally silty.

Some soils at CAFS have been affected by previous site activities which resulted in contamination to soil at several locations. To address contaminated soils an Installation Restoration Program (IRP) has been implemented (USAF, 1993). The details of this program and IRP sites related to the LRDR project are described in detail in Section 3.8.

3.8 HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

Hazardous materials are defined as any items or agents (biological, chemical, physical) which have the potential to cause harm to humans, animals, or the environment, either by themselves or through interaction with other factors. A hazardous material can be a solid, liquid, gas, or combination with toxic, flammable, reactive, or corrosive characteristics. These materials are regulated at CAFS by laws and regulations administered by the USEPA, the Occupational Safety and Health Administration, the U.S. Department of Transportation, and the DoD. The State of Alaska regulates hazardous materials in 18 ACC 75.080 Title 18, Chapter 75, Article 2.

Hazardous waste materials are characterized in accordance with Federal regulation 40 CFR Part 261. Once waste materials are identified as being hazardous the waste must then be managed in accordance with 40 CFR Parts 262-264. These standards outline the requirements for storage,

transport, disposal, and associated manifesting for differing types of waste. USAF installations address management of hazardous materials and wastes in accordance with AFI 32-7086 *Hazardous Materials Management*, which complies with AFI 32-4002 *Hazardous Material Emergency Planning and Response Program*.

Hazardous materials must be disclosed to personnel in accordance with the Occupational Safety and Health Act (OSHA) 29 CFR 1910.1200 hazardous communication (HazCom) standards. The materials are to be labeled and stored in accordance with the HazCom and USEPA Resource Conservation and Recovery Act 40 CFR Parts 264/265 requirements.

Responsible personnel who sign shipping papers or manifests for hazardous materials must attend specialized transportation training in accordance with DoD Regulation 4500.9-R, Part II, Chapter 204. Handlers, who do not sign shipping papers, only receive general awareness, function specific, safety, and security training as indicated in the DoD Regulation.

Waste minimization policies are used to recycle materials when feasible to reduce the volume, quantity, or toxicity of the waste as outlined in 40 CFR Part 266. Non-chemical military munitions are specifically addressed in 40 CFR Part 266.205.

The ROI for potential impacts related to hazardous materials and wastes would be the area of the Proposed Action within CAFS.

3.8.1 Hazardous Materials

A Hazardous Waste Management Plan (HWMP) was prepared for CAFS in 2015 (BAE, 2015a). The HWMP outlines an approach to reduce the use of hazardous materials, the generation of solid and hazardous waste, and releases of pollutants into the environment. Hazardous materials used regularly at CAFS include products used for cleaning and maintenance of buildings and machinery. These materials include solvents, paints, cleaners, motor oils, gasoline, coolants, and hydraulic fluids. Bulk storage and distribution at CAFS are handled in the designated hazardous storage facility Base Supply Building 250.

Small quantities of cleaning products are stored at points of use in well-marked containers and spill control storage cabinets. Herbicides, pesticides, and fertilizers are also used throughout the installation and are stored in accordance with the HWMP (BAE, 2015a).

Expanding upon the HWMP, the Spill Management Plan was developed and addresses the reporting, training, and procedures to follow in the event of a hazardous materials spill. The plan also lists the locations of all petroleum product tanks, categorizes the contents and quantities, and outlines periodic inspection and documentation procedures (BAE, 2015b).

Many of the buildings were constructed during the 1950-60s and contain ACM such as insulating products, roofing, siding, and floor tiles. An installation ACM survey was conducted in 1984 and

determined that asbestos will be encountered in all buildings except for those recently constructed. ACM activities are managed by the installation operation and maintenance contractor. Pre-demolition ACM surveys are conducted on an as-needed basis in accordance with applicable regulations (USAF, 2013a; BAE, 2015d).

Due to the age of existing structures, all painted surfaces must be assumed to contain Pb. A LBP survey has not been conducted for CAFS; however, CAFS has a LBP Management Plan in place to guide renovation efforts. Pre-renovation or demolition LBP surveys are performed on an as-needed basis in accordance with applicable regulations (USAF, 2013a; BAE, 2015d).

In 2002, a survey was conducted to identify asbestos and lead in the BMEWS facility prior to planned demolition of the BMEWS (USAF, 2002a).

Most of the electrical transformers and equipment containing PCBs at CAFS have been either taken out of service, drained and refilled with non-PCB oil, or replaced with non-PCB equipment. Lighting fixture ballasts and small capacitors which could contain PCBs may still be in use; therefore, all structures slated for demolition or renovation undergo a PCB survey (USAF, 2013a, BAE, 2015d).

3.8.2 Hazardous Waste

CAFS is considered by the USEPA a conditionally exempt small quantity generator of hazardous waste because it generates less than 100 kilograms per month. CAFS HWMP focuses on the management of all hazardous waste generated, stored, or treated throughout the installation. Identification of waste procedures, waste locations and quantities, training requirements for waste handlers, and accumulation point managers are also contained in the HWMP (BAE, 2015a).

Materials categorized as hazardous are containerized in point-of-use storage locations. When the storage containers are full they are moved to a central accumulation point at Building 250. A licensed contractor then disposes of the wastes in accordance with applicable regulations (BAE, 2015a).

3.8.3 Installation Restoration Program

The USAF established the IRP in compliance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) which was amended by the Superfund Amendments and Reauthorization Act. These regulations were implemented to identify, monitor, and remediate hazardous waste sites at federal facilities (USAF, 1993). Twenty-four IRP sites have been identified at CAFS. Sixteen of these sites have been officially closed (USAF, 2013a). Of the remaining eight IRP sites, none would be impacted by the construction and operation of the LRDR under either alternative.

3.9 HEALTH & SAFETY

The evaluation of occupational health and safety considers actions or operations which could affect the well-being of construction workers, facility workers, the general public, and the environment. Activities are assessed for potential safety risks that could occur during construction, operation, maintenance, and testing. Risks are characterized prior to the initiation of actions, documented, and relayed to affected parties, then continually updated throughout the activity as additional safety risks are identified. All actions are observed by a responsible party with the authority to stop procedures until risks are prevented and mitigated. The ROI for potential impacts to health and safety would be the areas associated with the Proposed Action, including adjacent land uses and adjacent airspace. The population of concern for the Proposed Action consists of the people directly involved with the Proposed Action and its activities.

Some typical risks that would be associated with the construction of the LRDR include fires, explosions, electrocution, overhead and lifting hazards, trips and falls, equipment hazards, dermal contact and inhalation of toxic materials, extreme cold, confined space entry, and trenching activities. Each LRDR construction activity would be evaluated and documented in a formal Job Hazard Analysis (JHA) in accordance with OSHA and Alaska Occupational Safety and Health guidelines. For the LRDR project, construction Contractors would prepare and implement JHA and Safety Plan documentation to ensure safe working conditions during construction activities in accordance with applicable guidelines.

Operational risks associated with an LRDR type system include radiation hazards from telecommunications equipment and potential exposures to radio frequency (RF) electromagnetic energy. RF analyses would be performed to establish safe distances from RF generating equipment in accordance with the Institute of Electrical and Electronics Engineers (IEEE) standard C95.3-2002 (IEEE, 2002) and USAF Instruction 48-109 for EMR occupations and environmental health programs (USAF, 2014b). In addition, CAFS has established a program, *Radiation Safety Program Instruction* (USAF, 2007b), that assigns radiation safety responsibilities to ensure all personnel, including escorted and unescorted visitors, do not encroach onto restricted areas. For the current and existing radar system at CAFS (e.g., SSPARS), see Figure 2.1-1, an RF analysis has been provided and RF safety zones have been established (MDA, 2012). For the LRDR system, a preliminary analysis has been completed in regards to health and safety issues and is discussed in detail in Section 4.9.

In addition to personnel safety, RF and EMR can also have impacts to aircraft and result in airspace issues. For the LRDR system, a preliminary analysis has been completed in regards to the effects of RF and EMR on aircraft and airspace and is discussed in detail in Section 4.3.

3.10 LAND USE

Land use is described as the human use of land resources for various purposes, including economic production, natural resource protection, or institutional uses. Land uses frequently are controlled by management plans, policies, ordinances, and regulations that determine the uses that are permissible or protect specially designated or environmentally sensitive areas (e.g., prime farmland, coastal zones, national parks, historic properties). Planning departments at the local and municipal levels typically designate land uses for specific areas, which describe the permitted development activities that are acceptable for the area, such as agricultural, residential, commercial, and industrial. The ROI for potential land use impacts would be the areas associated with the Proposed Action, including adjacent land uses and lies entirely within the boundaries of CAFS.

It should be noted that work involving the demolition and reclamation of the BMEWS site and the existing power plant have been addressed in previous environmental review proceedings and would be implemented under a separate action as discussed in Section 2.2.1.1.

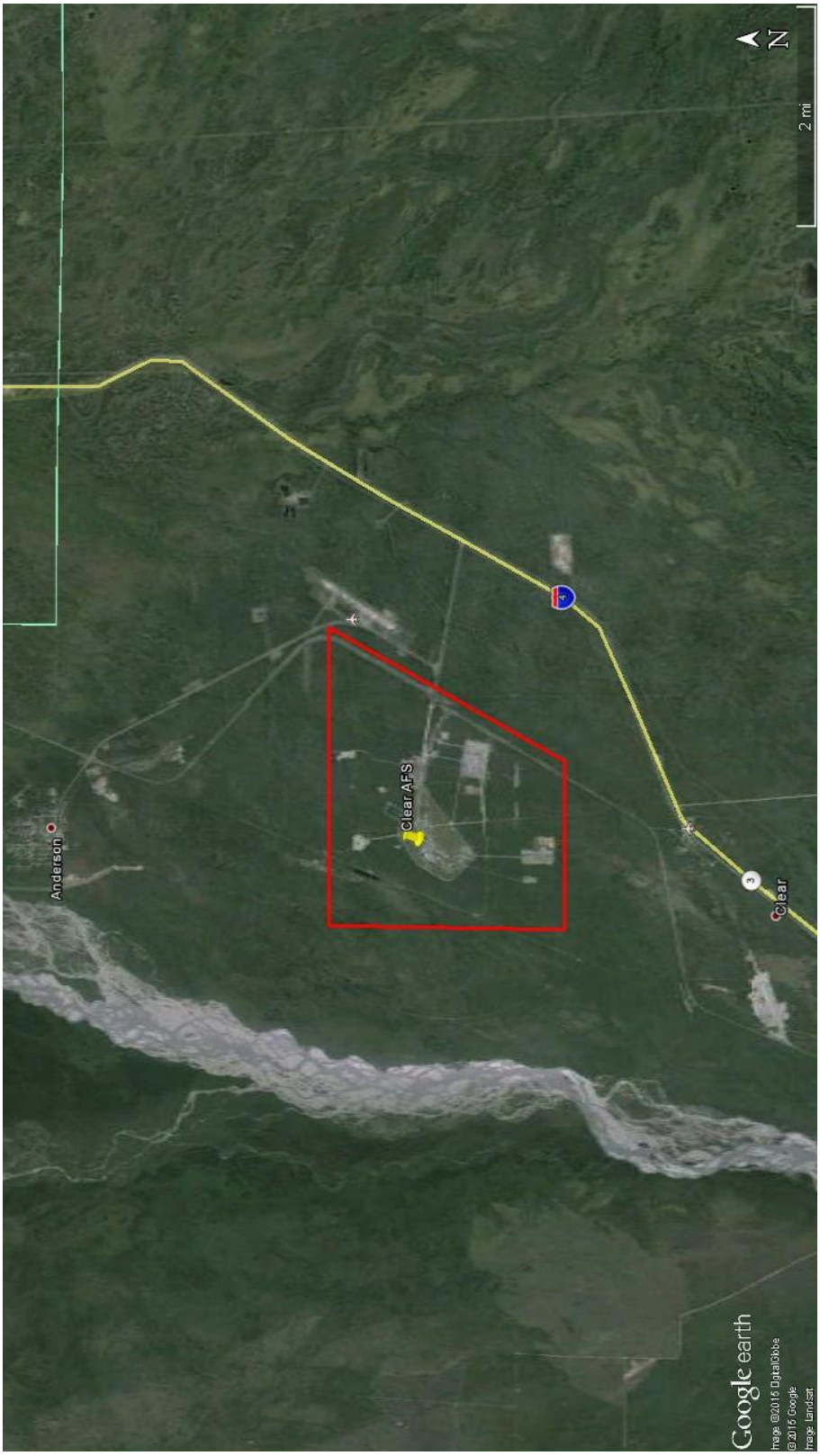
3.10.1 Land Use of Site and Vicinity

CAFS encompasses 11,438 acres in the Denali Borough of Alaska, most of which is undeveloped (NMBC, 2012). The developed portion of CAFS consists of approximately 350 acres and is divided into four main areas: the Composite Area, where most administrative, recreational and living quarters are located; the Old Camp Area, where civil engineering, maintenance shops and security police offices are located; the SSPARS site, which is used to detect missile launches as well as to track moving objects through space; and the Old Tech Site, where the BMEWS radars, radar support buildings and power plant are located (NMBC, 2012).

CAFS is bordered to the east by the George Parks Highway (Alaska State Highway 3), to the north by the community of Anderson, and to the west by the Nenana River. The area around CAFS is shown on Figure 3.10-1. The Alaska Mountain Range is located to the south. CAFS is accessed from the George Parks Highway, which connects Anchorage, AK, and Fairbanks, AK. Fairbanks is approximately 56 miles northeast of CAFS.

The community of Anderson, AK, is the nearest residential community to CAFS and is located approximately 4 miles to the north. Anderson has a population of 275 people and provides schooling, trash pickup, water and sewer, and other basic services to its residents (AAK, 2015). The unincorporated community of Clear, AK, is located approximately 3 miles to the south, but has very limited services. These two communities are home to mainly CAFS military employees and their families. No other residential areas are within 15 miles of CAFS.

Figure 3.10-1 Map of CAFS Surrounding Area



Source: Google Earth (2015).

The majority of the land on CAFS should be considered forest land, generally referred to as coniferous, deciduous, and mixed wood forests, as well as regeneration/young forests where commercial timber has been removed. The exception would be the land contained within the fenced portions of CAFS and developed for military operations, which would include the LRDR site and Man Camp. Some employees of CAFS may use the wooded area for recreational purposes such as hiking and fishing in the nearby lake.

CAFS is surrounded by public lands, with the Denali National Park approximately 30 miles to the south of CAFS. The surrounding area is managed as public lands and available for recreational purposes (PL, 2015).

3.10.2 Land Use Plans and Policies

The proposed project was reviewed to determine its consistency (or lack thereof) with applicable land use plans, policies, and guidelines. Typically, instances in which a project is inconsistent with applicable plans must be resolved via: (1) changes in the project design; (2) changes in the installation development plan(s); (3) a variance from installation development plans; or (4) denial/cancellation of the project.

3.10.2.1 Land Development

Land use and development at CAFS is governed by several established installation-specific land management and environmental protection plans, policies and procedures. The plans that would have the greatest potential to influence the development of the LRDR project include the 2013 Installation Development Plan (USAF, 2013a); the ICRMP (USAF, 2015a); the INRMP, (USAF, 2015b); and the 1993 IRP (USAF, 1993) which are summarized in the following paragraphs.

CAFS Installation Development Plan (USAF, 2013a). According to the Installation Development Plan (USAF, 2013a), the purpose and function of CAFS is to support the mission of the 13th SWS, which is to provide early warning of enemy sea-launched and intercontinental ballistic missiles. CAFS also provides space surveillance data on orbiting objects.

The General Plan and Installation Development Plan are used to guide the short- and long-range developments of CAFS and is comprised of several interrelated programs that govern installation management. These programs include the following:

- Infrastructure. Describes the installation components that support day-to-day mission of CAFS and the 13th SWS, their condition, and capacity to accommodate future development. Includes information on real estate and facilities, utilities, transportation infrastructure and services, and the airfield.
- Environment. Describes existing environmental conditions on the installation and characterizes potential environmental impediments to future development.

- Opportunities and constraints. Identifies natural and man-made constraints to future development on the installation, as well as opportunities for certain acceptable uses and facilities.
- Land use. Describes existing land uses on the installation and defines the four distinctive developed areas: Composite Area, Old Camp Area, Old Tech Site, and Solid State Phased Array Radar System. Future land use plans are also addressed.

ICRMP (USAF, 2015a). The ICRMP is a decision document that is used to address cultural resource management actions and compliance activities. It defines the policies and procedures for managing CAFS cultural resources relative to mission and operational processes, including installing new facilities. It does not include any locale- or activity-specific constraints on development but rather, calls for a process to address potential cultural resource impacts.

INRMP (USAF, 2015b). The INRMP is a decision document that is used to address natural resource management actions and compliance activities. It defines the policies and procedures for managing CAFS natural resources relative to mission and operational processes, including installing new facilities. It does not include any locale- or activity-specific constraints on development but, rather, calls for a process to address potential natural resource impacts.

IRP (USAF, 1993). The DoD's Environmental Restoration Program (AFI 32-7020), requires installations to identify, confirm, quantify, and remediate suspected problems associated with past hazardous disposal sites. CERCLA provides USEPA with the authority to inventory, investigate, and clean up uncontrolled or abandoned hazardous waste sites. Areas that may be contaminated by hazardous materials or wastes through spills or leaks are being investigated and cleaned up through the IRP, which is the USAF's CERCLA-based environmental restoration program. Additional details on the IRP program and associated sites that may be affected by the LRDR project are presented in Section 3.8.3.

3.10.2.2 Land Use Constraints

There are no constraints to CAFS mission and mission planning associated with land uses in the immediate vicinity of CAFS, because the area is surrounded by approximately 11,000 acres of undeveloped land. This land is primarily used for recreational and open space activities.

Beyond CAFS boundaries there are constraints on all sides. To the north, the CAFS is bordered by the city of Anderson, which supports a variety of commercial, residential and government uses, as well as a small airport (Anderson Airport). Private property and Alaska Railroad property borders CAFS to the south. The Nenana River forms the western boundary and therefore, represents a constraint to expansion of the CAFS boundary. The George Parks Highway forms the eastern border of CAFS (USAF, 2015b).

3.11 NOISE

Noise is defined as undesired sound (ANSI, 2013). Sound is generated by the propagation of energy in the form of pressure waves. Being a wave phenomenon, sound is characterized by amplitude (sound level) and frequency (pitch). Sound amplitude is measured in decibels (dB). The dB is the logarithmic ratio of a sound pressure to a reference sound pressure. Typically, 0 dB corresponds to the threshold of human hearing.

Frequency is measured in hertz, (Hz) (cycles per second). Most sound sources (except those with pure tones) contain sound energy over a wide range of frequencies. A person with normal hearing can hear frequencies ranging from 20 Hz to 20,000 Hz. At typical sound pressure levels, the human ear is more sensitive to sounds in the middle and high frequencies (1,000 to 8,000 Hz) than sounds in the low frequencies. Various weighting networks have been developed to simulate the frequency response of the human ear. The A-weighting network was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting network emphasizes sounds in the middle to high frequencies and de-emphasizes sounds in the low frequencies. Any sound level to which the A-weighting network has been applied is expressed in A-weighted decibels, dBA.

The ROI for potential noise impacts from site preparation and construction would be within 2,000 feet of the Proposed Action. This area was selected because noise from site preparation and construction activities would not likely exceed 60 dBA outside of this distance. The ROI for potential noise impacts from operation activities would be the area immediately bordering the Proposed Action security fencing.

Ambient noise conditions for CAFS are described in the following sections.

3.11.1 Site and Surrounding Noise Conditions

Ambient noise conditions at CAFS are typical of a commercial or industrial facility. Noise sources include the existing power plant, heating and air conditioning equipment associated with CAFS facilities, and vehicular traffic. In general, existing CAFS acoustical conditions can be considered similar to noisy or very noisy urban residential areas, as shown in Table 3.11-1, depending on proximity to noise sources.

Table 3.11-1 Typical Daytime Residual (Background) Sound Levels in Various Types of Communities

Type of Community	Typical Daytime Residual (Background) Sound Pressure Level
Very Quiet Rural Areas	31 to 35 dBA
Quiet Suburban Residential	36 to 40 dBA
Normal Suburban Residential	41 to 45 dBA
Urban Residential	46 to 50 dBA
Noisy Urban Residential	51 to 55 dBA
Very Noisy Urban Residential	56 to 60 dBA
Adjacent Freeway or Major Airport	>> 60 dBA
Source: Adapted from USEPA 1971.	

Noise conditions in the surrounding area are typical of sparsely populated, rural areas. Noise sources include wind, swaying trees, and vehicular traffic, with contributions from insects during the summer seasons. Existing noise conditions in the surrounding area can be considered similar to very quiet rural to quiet or normal suburban residential areas, as shown in Table 3.11-1, again, depending on proximity to noise sources.

3.11.2 Sensitive Noise Receptors

The nearest noise-sensitive residential neighbors to the LRDR facility are located in Clear and Anderson, AK, approximately 3 miles south and 4 miles north, respectively. Neither Clear nor Anderson have codes or ordinances that limit sound levels, although Anderson does have a general nuisance ordinance, (Anderson, 2015), that prohibits “unnecessary or unusual noise,” as well as some noisy activities, such as nighttime pile-driving or operating a combustion engine without a muffler. USEPA guidelines indicate that environmental sound levels should generally be limited to a day-night average sound level of 55 dBA in residential outdoor areas (USEPA, 1974). The day-night average level is the A-weighted equivalent sound level for a 24 hour period with an additional 10 dB imposed on the equivalent sound levels for night time hours of 10 pm to 7 am. Based on discussions with installation personnel, CAFS has not received any noise complaints from neighbors, including during operation of the decommissioned coal-fired power plant.

3.12 SOCIOECONOMICS

The ROI evaluated for the LRDR project was defined as including the boroughs of Denali, Yukon-Koyukuk, Fairbanks North Star, Southeast Fairbanks, and Matanuska-Susitna. This Region was selected because it includes all adjacent boroughs to the Denali Borough (the borough which CAFS is located) and the nearest high population city, Fairbanks, AK. These are

the areas in which social and economic activities would most likely be affected by the Proposed Action and alternatives.

3.12.1 Population

The Region has been steadily increasing in population since Denali Borough was first established in 1990. Since that time, the Region has grown by 52.5 percent, due largely to the increase of people occupying the area just north of Anchorage, AK.

Table 3.12-1 presents the Region's population trends by borough. On a percentage basis, Matanuska-Susitna Borough is the fastest growing in the Region, but it has only the second largest total population in the Region. Fairbanks North Star Borough, which includes Fairbanks, AK, is the largest borough in the Region.

Table 3.12-1 Population Trends by Borough in the Region

Borough	Population			% Change in Population	
	1990	2000	2010	1990-2010	2000-2010
Denali	1,764	1,893	1,826	3.5%	-3.5%
Yukon-Koyukuk	6,714	6,551	5,588	-16.8%	-14.7%
Fairbanks North Star	77,720	82,840	97,581	25.6%	17.8%
Southeast Fairbanks	5,913	6,174	7,029	18.9%	13.8%
Matanuska-Susitna	39,683	59.322	88,995	124.3%	50.0%
Region	**131,794**	**156,780**	**201,019**	**52.5%**	**28.2%**
Source: U.S. Census, 2010a.					

The populations of the five largest Municipalities in the Region are provided in Table 3.12-2. As shown in Table 3.12-2, approximately 16 percent of the Region's population lives in the City of Fairbanks. The Alaska Department of Labor and Workforce Development expects the Region to grow by 57 percent by 2042 (AKDLWD, 2012).

Table 3.12-2 Five Largest Municipalities in the Region (2010)

City	2010 Population
Fairbanks	31,535
Wasilla	7,831
Palmer	5,937
North Pole	2,117
Houston	1,912
Source: U.S. Census, 2010a.	

3.12.2 Housing

Based on 2010 census data, there were a total of approximately 20,513 vacant housing units in the Region, 970 of which were located in the Denali Borough (see Table 3.12-3). These 970 units represented 57.5 percent of the 1,686 total housing units in Denali Borough. This would suggest that Denali Borough may hold a surplus of housing which could potentially serve the needs of temporary (construction) and/or operation personnel.

Table 3.12-3 Denali Borough Housing Characteristics (2010)

General Housing Data	2010 Census	% of 2010 Total	2000 Census	% of 2000 Total	Change from 2000 to 2010
Total Housing Units	1,686		1,351		24.8%
Occupied	716	42.5%	785	58.1%	-8.8%
Vacant	970	57.5%	566	41.9%	71.4%
Owner-Occupied	493	29.3%	511	37.8%	-3.5%
Renter-Occupied	223	13.2%	274	20.3%	-18.6%
Median Value of Owner-Occupied Units	$192,500		$108,300		77.7%
Median Gross Rent	$837		$635		31.8%
Source: U.S. Census, 2010b.					

The number of housing units borough-wide grew 24.8 percent between 2000 and 2010 and the vacancy rate increased. The number of renter occupied units decreased during the same period.

The median value of owner-occupied housing in Denali Borough ($192,500) increased 77.7 percent over the 2000 census median value for an owner occupied home. Compared with the Alaska median ($241,800), the Region is still less expensive for the purchase of an owner-occupied home than the average Alaskan owner-occupied home.

Table 3.12-4 lists the housing characteristics for the Fairbanks North Star Borough. The Fairbanks North Star Borough is the nearest neighboring borough to CAFS in the Region that has a major population center. Due to the higher population and greater availability of amenities in the Fairbanks North Star Borough, the likelihood of workers commuting from the borough would be higher than the other boroughs in the Region.

Table 3.12-4 shows that 5,342 out of the 20,513 vacant housing units in the Region are located in the Fairbanks North Star Borough. In the 2010 census, there were 41,783 housing units in Fairbanks North Star Borough of which 12.8 percent were vacant. Approximately 36.0 percent of all housing units were renter-occupied, which means that there may be rental housing opportunities for commuters to the LRDR facility. The number of housing units borough-wide

grew 25.5 percent over a decade and the vacancy rate increased, while the number of renter occupied units decreased. The median value of owner-occupied housing in Fairbanks North Star Borough ($212,500) increased by 60.1 percent over the 2000 census median value for an owner occupied home. Compared with the Alaska median ($241,800), the Region is still less expensive for the purchase of an owner-occupied home than the average Alaskan owner-occupied home.

Table 3.12-4 Fairbanks North Star Borough Housing Characteristics (2013)

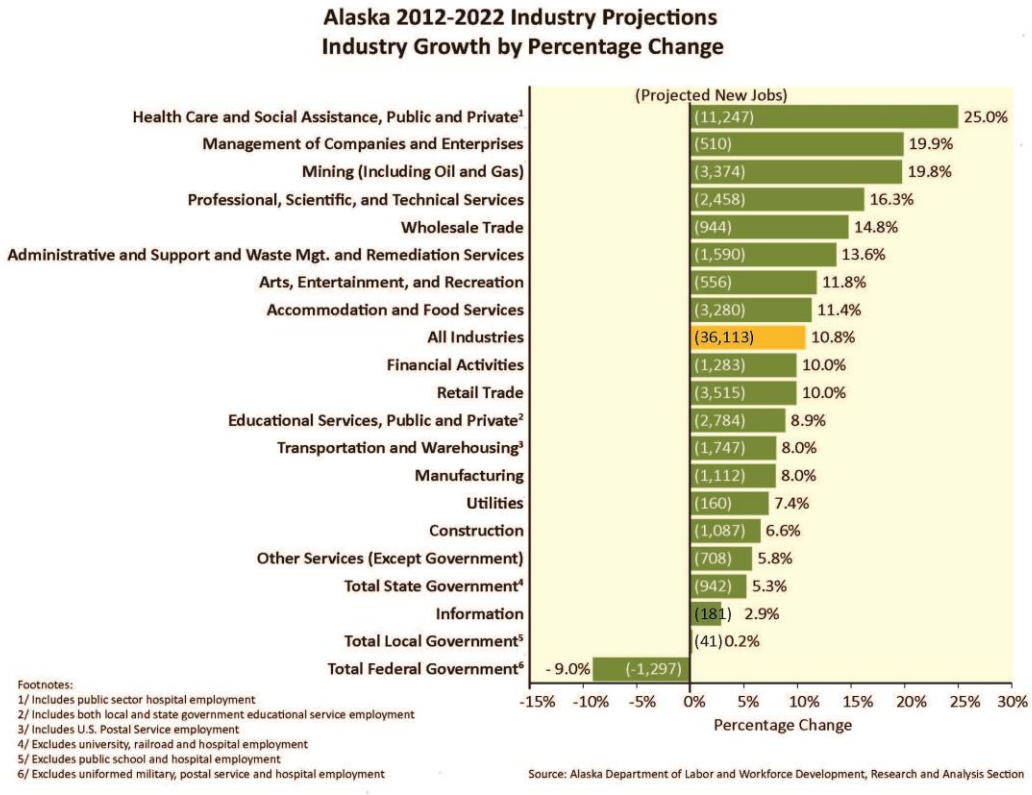
General Housing Data	2010 Census	% of 2010 Total	2000 Census	% of 2000 Total	Change from 2000 to 2010
Total Housing Units	41,783		33,291		25.5%
Occupied	36,441	87.2%	29,777	89.4%	22.4%
Vacant	5,342	12.8%	3,514	10.6%	52.0%
Owner-Occupied	21,410	51.2%	12,298	36.9%	74.1%
Renter-Occupied	15,031	36.0%	13,623	40.9%	10.3%
Median Value of Owner-Occupied Units	$212,500		$132,700		60.1%
Median Gross Rent	$1,179		$679		73.6%
Source: U.S. Census, 2010a.					

3.12.3 Employment and Income

Employment in the Region is dominated by educational services, healthcare and social assistance, recreation, and the service industries. The healthcare industry was shown to be the top employer in Alaska at 23.4 percent of all jobs and accounted for an average of 22.1 percent of employment in the Region (U.S. Census, 2010a). Construction employment averaged 9.1 percent of the workforce in the Region, compared to 7.6 percent in the State of Alaska. Employment in the services sector has become an increasingly larger proportion of total employment in the Region, which reflects a nationwide trend. The services sector employed 56,807 in the Region (U.S. Census, 2010a).

As illustrated on Figure 3.12-1, and according to the Alaska Department of Labor and Workforce Development, Alaska is projected to gain 36,113 jobs between 2012 and 2022 for a growth rate of 10.8 percent. The healthcare and social assistance sector is expected to grow the most at a projected 25 percent, followed closely by mining (minus oil and gas) at 24.8 percent (Martz, 2014).

Figure 3.12-1 Alaska 2012-2022 Industry Projections Industry Growth by Percentage Change

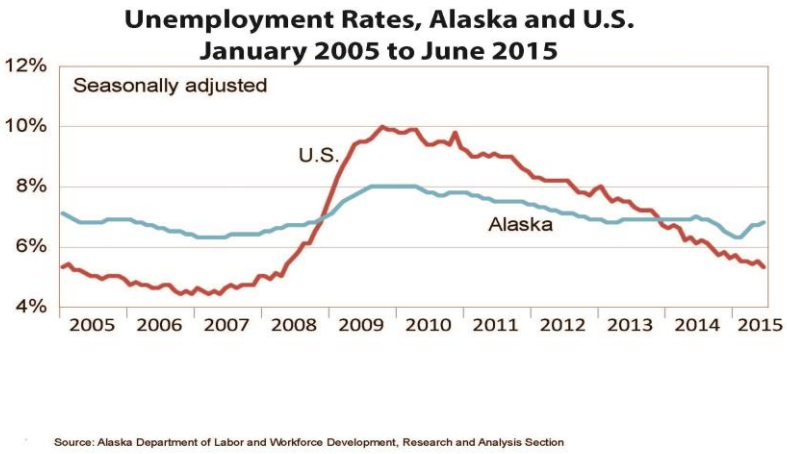


Source: AIF, 2014.

The median age in the Region was shown to be 35.2 years of age, higher than the Alaska average of 33.6 years (U.S. Census, 2010a). Therefore, the aging of the Regional workforce is beginning to be a concern as the Baby Boom generation begins to retire.

Unemployment was generally slightly higher in most of the Region compared to Alaska as a whole. Unemployment in the Region averaged 6.5 percent across all boroughs, higher than the Alaska average of 6.0 percent (U.S. Census, 2010a). Alaska's unemployment rates have stayed fairly consistent (between 6 and 8 percent) when compared to the U.S. average over the same time period, which fluctuated between 4.5 and 10 percent. The overall unemployment of the U.S. was much higher during the peak of the economic recession (10 percent) than Alaska's unemployment rate (8 percent) during the same period. Figure 3.12-2 shows the trends of Alaska and U.S. unemployment from January 2005 through June 2015.

Figure 3.12-2 Unemployment Rates, Alaska and U.S., January 2005 to June 2015



Source: AKDLWD, 2015.

3.12.4 Business and Economy

Alaska's Interior Region includes the Yukon-Koyukuk, Fairbanks North Star, Southeast Fairbanks, and Denali Boroughs. The Interior Region was heavily dependent on the service-providing industries, which filled an average of 40,000 out of 45,500 employment positions. Government employment was the largest sector in the Interior Region with 14,600 out of the 40,000 total employment positions. Many of these government positions were classified as healthcare positions (AKDLWD, 2014). Matanuska-Susitna Borough had 39,190 employment positions, of which the largest employment group was educational services, health care, and social assistance with 9,560 jobs (U.S. Census, 2010a). Both the Interior Region and Matanuska-Susitna Borough (which compose the Region) followed the statewide trend of relying on healthcare service industry positions to maintain a significant portion of the employment for residents.

3.13 TRANSPORTATION

There are a limited number of roadways in Alaska with the majority of highways in the southeastern portion of the state. CAFS is conveniently located along the George Parks Highway, or commonly called Parks Highway, in the interior of Alaska. Parks Highway is officially Alaska State Highway 3 and is a two-lane highway that runs between Anchorage and Fairbanks.

The ROI specifically related to roadway infrastructure and potential traffic impacts associated with the transportation of people and delivery of goods, equipment, and material to the LRDR site includes Parks Highway in the vicinity of CAFS and the roads on the installation. CAFS directly accesses Parks Highway via Clear Road, with the Main Gate to CAFS located approximately 2 miles west of the highway. The only other off-base paved public road in the immediate area is Anderson Road, which intersects Clear Road approximately 1.25 miles from Parks Highway. Anderson Road runs north from Clear Road and accesses the Clear Airport and then terminates at the City of Anderson. An illustration of the roads entering CAFS is presented on Figure 3.13-1.

The on-base road system consists of 8.7 miles of either paved asphalt or aggregate surfaced roadways (USAF, 2013a). The occupied facilities of CAFS are served by approximately 3.4 miles of paved primary and secondary roads. There is approximately 5.3 miles of aggregate surfaced roads that are connected to these paved roads. The primary and secondary roads are two-lane roads and several of the tertiary roads have the width to accommodate two-way traffic. The existing Main Gate has one inbound and one outbound lane, with a gate house separating the two lanes. CAFS existing road network is shown on Figure 3.13-1.

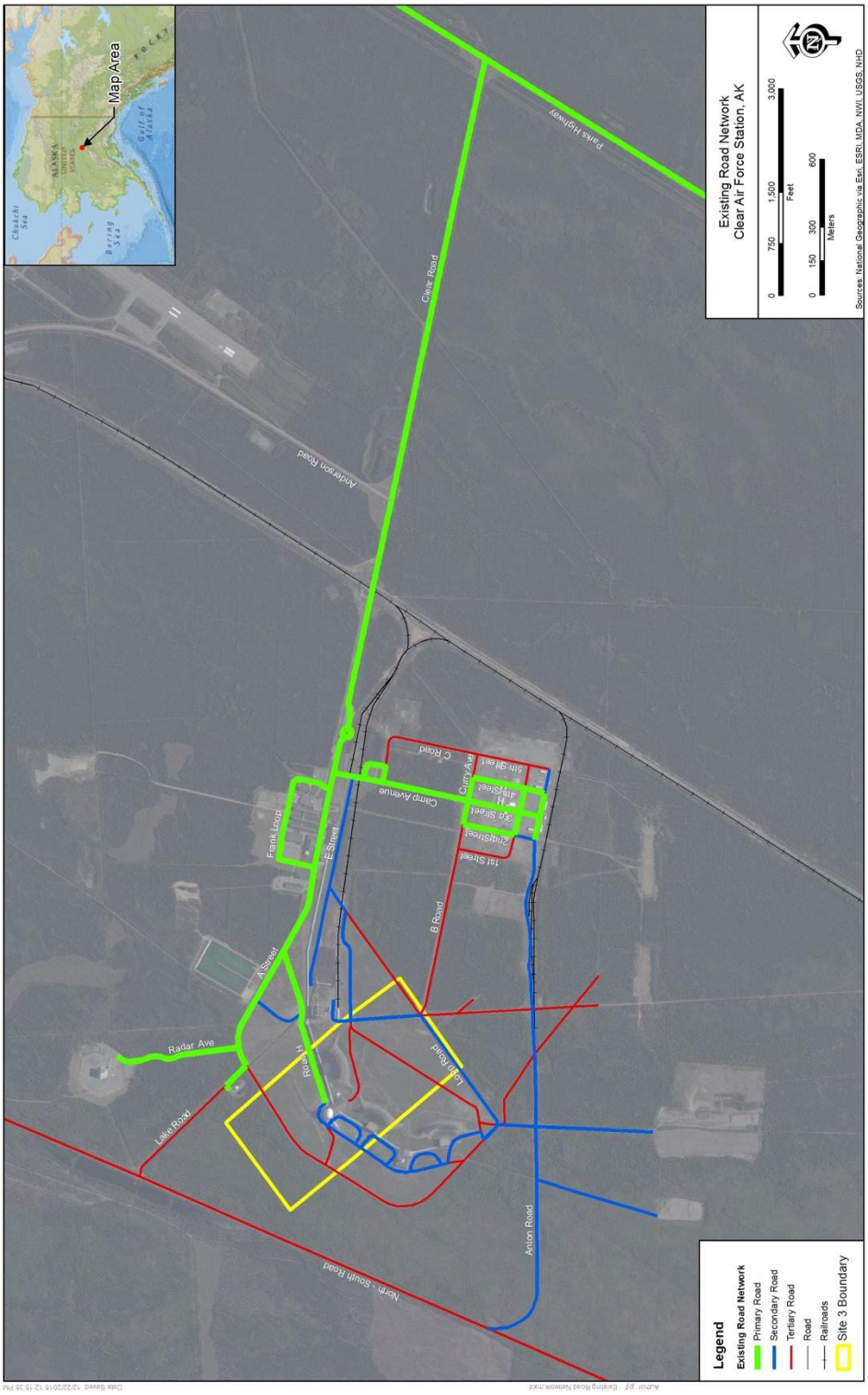
The Alaska Railroad runs north/south within this ROI and traverses CAFS just east of the developed area of the installation. There is an active spur that runs almost parallel to A Street and south of E Street which was used to deliver coal to the existing power plant (USAF, 2013a). An inactive spur is located just north of the active spur; however, it terminates at Camp Avenue. Another inactive spur line runs parallel to and south of Anton Road.

The railroad spur was originally constructed to take deliveries to the Old Tech Site and it might possibly be used for the demolition and removal of facilities at the Old Tech Site. Rail is a possible mode of transportation for equipment and materials during construction of the LRDR site. However, for this EA it was assumed that the majority of equipment and materials would be transported via roadways.

3.14 UTILITIES

Utility systems at CAFS are all USAF-owned and operated through civilian contractors and DoD employees. Primary electric power for the site is provided by GVEA. All other utilities are currently and planned to be retained as, independent of other public or private utility systems due to the remote location of the CAFS. For this analysis, the ROI for utilities focuses on CAFS, but it also includes outside infrastructure servicing the installation.

Figure 3.13-1 Existing Road Network



3.14.1 Electrical Production and Distribution System

Up until the January 2016, electric power had been provided by an onsite coal-fired steam generator plant used for both electrical power generation and installation heating. The existing plant had a power generation capacity of up to 22 MW provided by three 7.5-MW turbine generators, each designed at a capacity of 100,000-pound per hour of steam generation, but only permitted at 85,000 pounds per hour (USAF, 2013a). Due to underutilization, increased maintenance, and operating costs, a decision was made to bring in commercial power from an offsite source (GVEA) for current and future electric demands.

CAFS switched to commercial power in January 2016. Backup power for the primary facilities is provided by a 1.25-MW diesel powered generator and three 3-MW backup diesel-powered generators specifically designated for the SSPARS facility. Because the existing power plant provided central heating to a majority of the onsite facilities, a new boiler heat generating plant has been installed and is now in operation. Central heating of the installation is described further in Section 3.14.7. The LRDR was taken into account for the design of the new commercial electrical distribution system at CAFS.

3.14.2 Water Supply System

All demand for potable and non-potable water at CAFS (cooling and fire protection) is currently met by use of onsite wells (USAF, 2013a). A summary of the wells currently present, their current and former use, rated capacities and average usages are presented in Table 3.14-1.

The primary potable water supply for the Old Camp Area and the Composite Area comes from fourteen deep wells (seven currently used/active and seven formerly used) that are located throughout the installation to provide potable water and cooling water. The treatment and distribution system consists of the primary well rated at 250 GPM and feeds water to five interconnected 1,000-gallon storage tanks at atmospheric pressure. A system of two transfer pumps, each rated at 280 GPM, delivers water from the storage tanks to a 1,990-gallon hydropneumatic tank. The hydropneumatic tank then feeds and delivers the water installation distribution system at an average pressure of 60 pounds per square inch (PSI).

The SSPARS facility (see existing radar location on Figure 2.1-1) has an independent stand-alone water well, treatment, and distribution system.

Table 3.14-1 Water Wells Present at CAFS

Wells	Current/Former Use	Well System /Pump Capacity (GPM)	Current/Former Pump Rate (GPM)
Current Use			
3 wells (set)	Potable Water and Fire Water	1,250 GPM and 1,000 GPM[(1)]	Total @ 80 GPM[(3)]
1 well	Potable Water	20 GPM[(1)]	7 GPM[(3)]
3 wells (set)	Cooling Water and Fire Protection	Pump Capacity Per Well 750 to 1000 GPM[(2)]	Total for 3 wells @ 933 GPM[(3)]
		Total Current Use	1,020 GPM
Formerly Used (Currently Not in Use)			
2 wells (set)	Cooling water	Pump Capacity Rating Per Well 2000 GPM[(2)]	852 GPM[(4)]
2 wells (set)	Cooling water	Pump Capacity Rating Per Well 2000 GPM[(2)]	742 GPM[(3)]
3 wells (set)	Cooling	Pump Rate Per Well 1,200 GPM[(2)]	Total for 3 wells @ 2,254 GPM[(3)]
		Total Formerly Used	3,848 GPM

[(1)]The capacity was listed for the well system (USAF, 2013a).
[(2)]The capacity was based on known pumping rates or pump capacity rates (Golder Associates, 2015).
[(3)]The current pump rate was from an annual average in 2011 (Golder Associates, 2015).
[(4)]The rates listed for wells were based on previous use rates (Golder Associates, 2015).
Sources: Golder Associates, 2015; USAF, 2013a.

Prior to distribution, the water is treated at each source by chlorination and with orthophosphate for corrosion control (USAF, 2013a). The water quality in this area of Alaska is considered high, but is tested daily for chorine levels and monthly for coliform bacteria. No issues have been reported or caused interruption of flow to potable water due to contamination (USAF, 2013a).

In addition to potable water demands, as shown in Table 3.14-1, a significant quantity of current and historic water demands has been attributed to cooling water needs. Based on the information provided in Table 3.14-1, the average total demand of cooling water, including that used for the coal-fired power plant was 4,781 GPM. However, since the coal-fired plant has been recently shut-off and switched over to commercial power (January 2016) this total demand is anticipated to decrease to 933 GPM.

3.14.3 Sanitary Sewer System

The primary sanitary sewage system serves only one of the four areas of CAFS, the Composite Area (USAF, 2013a). Other facilities and areas are served by independent septic systems that discard the effluent through leach fields.

Sanitary sewage from Composite Area facilities is conveyed by gravity flow to the Imhoff tank treatment facility located southeast of the Composite Area and to the north of the eastern boundary of the Old Camp Area. The Imhoff tank was originally designed for a population up to 2,000, which is significantly greater than the 300 plus active personnel currently present at CAFS (USAF, 2013a).

3.14.4 Storm Water Sewer System

The storm water sewer system at CAFS consists of surface drainage, ditches, swales, and culverts to move water from the developed areas of the installation (USAF, 2013a). Surface drainage typical follows topography of the site and it is considered to be slow moving. Most of the major ditches and swales parallel roadways. The surface drainage system is reported to be adequate for most of the year, with the exception of spring melt. During heavy precipitation events, short-term flooding of isolated areas is common.

There are no discharge points from the surface drainage system due to the relatively flat topography of the installation. All storm water is retained in swales and ditches, and shallow ponds until absorbed into the ground. Additional information regarding storm water permitting is provided in Section 3.15.2.

3.14.5 Wastewater Discharge System

An industrial wastewater discharge permit (0231DB005) issued by ADEC regulates the power plant wastewater system (ADEC, 2005). Under this permit, monitoring is required for pH and temperature and these indicators must be maintained under threshold limits. The wastewater is primarily cooling waste generated from the power plant electrical production process and SSPARS. Other than cooling no other treatment is required. The industrial permit also allows a discharge volume of 13.5 million gallons per day (MGD).

CAFS has had a number of primary and secondary industrial wastewater sources. Until recently (January 2016), the primary industrial wastewater source was from cooling water from the existing central heating and power plant. The water usage and eventual discharge from the existing power plant ranged between 1 MGD during the fall and winter and up to 5 MGD in the spring and summer (USAF, 2013a). Because commercial power is now provided and the coal-fired power plant was shut down, this cooling water demand is no longer required. Another discharge source is resides from the SSPARS facility. That facility produces up to an average of 2 MGD of once-through, non-contact cooling water (USAF, 2013a). In addition to these sources,

during previously BMEWS operation an additional average of 6.3 MGD of once-through radar system cooling water was once produced from the Old Tech Site (USAF, 2013a).

During previous and current operations wastewater was ultimately discharged to Lake Sansing. For the former power plant, wastewater was first discharged to a cooling pond that consisting of a lined heat sink of approximately 8 acres. Well water was then added to the recirculating flow from the cooling pond to further lower the temperature prior to re-entering the power plant condensers. The excess flow generated was eventually discharged to a ditch that discharged to Lake Sansing (USAF, 2013a). The cooling water currently being discharged from the SSPARS is discharged to Lake Sansing through a separate underground pipe.

Lake Sansing is a groundwater infiltration area that consists of a 12-acre former gravel pit. Lake Sansing has an uncontrolled shoreline, which allows water levels to adjust with the changes in installation operations and weather conditions.

3.14.6 Solid Waste Disposal

Solid waste generated at CAFS is collected in trash receptacles and metal bins placed throughout the installation and delivered by contract personnel to the Denali Borough Landfill (USAF, 2013a; BAE, 2015e). The Denali Borough Landfill is located to the east side of Parks Highway (Highway 3), approximately 1 mile to the south of the road leading to the installation. Waste products delivered to the Denali Borough Landfill include refuse from normal installation and living activities and sludge extracted from the sewage treatment plant (once or twice a year). Approximately 20 percent of the coal ash is sent to Denali Borough Landfill for use as cover. The remaining coal ash remains onsite in an inert waste monofill. Construction debris is also divided for disposal between the Denali Borough Landfill and the onsite inert waste monofill. In 2008, a modified solid waste disposal permit (No. SWZ01412) for the onsite inert monofill landfill was issued by ADEC which allows for 15 tons per day or 5,500 tons per year of inert waste (USAF, 2013a). The Denali Borough Landfill also has sufficient capacity to serve this area, including provisions for growth in its service area (USAF, 2013b). In conjunction with the solid waste program, CAFS recycles and diverts a variety of items from disposal through the Pollution Prevention Program (BAE, 2015e).

3.14.7 Installation Heating System

Until recently (January 2016), central heating was provided in conjunction with the power production from the existing coal-fired power plant (USAF, 2013a). The existing power plant has been shut down and consisted of three coal-fired boilers that generated steam for use in turbine generators for the electrical power as well as for steam heat throughout the installation. Under normal operating conditions, only one of the three boilers operated to generate enough energy for installation consumption, while a second remained online as emergency backup. The steam heat was provided to the Composite area by a series of above and below ground utilidors.

Since commercial power has been established, the heating needs for the Composite area will be provided by a multiple diesel-fired hot water boiler system that was installed within the Composite Area.

The SSPARS facility is heated electrically.

3.15 WATER RESOURCES

Water resources discussed in this section include groundwater, surface water, and floodplains. The ROI of the Proposed Action is limited to CAFS and the adjacent areas. The majority of the activities related to construction and operation under the Proposed Action and No Action Alternatives would occur in and around the LRDR footprint.

3.15.1 Groundwater

Groundwater at CAFS flows in a northerly direction within in an unconfined aquifer composed of unconsolidated sand and gravel alluvial and glacial outwash deposits (USAF, 2013a). These subsurface unconfined aquifers are abundant and vast in their expanse; generally at a depth of 50 to 70 ft. Unconfined aquifers do not have any impermeable layers above them and are vulnerable to contamination by leaching from infiltrating precipitation. Deeper bedrock aquifers are located near the boundary of glacial till and bedrock at a depth of 100 to 150 ft, although some reports estimate bedrock at a depth of 600 ft (USAF, 2015b). Groundwater discharges approximately 5 miles north of CAFS into Julius and Clear Creeks (USAF, 2015b). Groundwater in the area is recharged from infiltration of the Nenana River, other surface water, and precipitation. The water table is just below the ground surface near the Nenana River, and gradually extends deeper northeastward toward the developed portion of the installation.

Groundwater levels derived from U.S. Geologic Survey (USGS) monitoring wells near the Composite and Old Camp Areas are listed in Table 3.15-1. Groundwater flow is north-northeast, with a water table gradient of approximately 3 ft per mile (USAF, 2005a). The water supply for CAFS is provided by 19 wells that are approximately 150 ft deep. Water quality is very good; chlorination is the only method of groundwater treatment needed for domestic use (including human consumption, food preparation, and fire protection).

Table 3.15-1 Groundwater Levels Near Composite and Old Camp Areas

Location	Date	Water Level (ft bgs)
Near 2nd Street and Curry Avenue	1 September 1958	72.0
Near 2nd Street and Curry Avenue	1 October 1958	74.2
Northeast Old Camp Area	29 August 1988	59.0
0.6 miles north of Composite Area	12 July 1988	45.0
0.4 miles west-northwest of Composite Area	14 July 1988	54.0
Source: USGS, 2005		

There are no nearby (offsite) (within 2 miles) water users and no public utilities near CAFS. All demand for potable and non-potable water is met from onsite wells. Potable and cooling water at CAFS is typically drawn from wells between depths100 ft to 150 ft bgs. A summary of the primary water supply wells for CAFS is presented in Table 3.14-1. Based on the findings of a recent aquifer evaluation, due to the heterogeneous, unconfined aquifer of moderately high transmissivity that appears to be present at CAFS, the aquifer below CAFS appears to have the potential to support a single water supply well that could produce 4,000 GPM, with better potential at an extended depth (i.e., 200 ft bgs) of currently installed wells (Golder Associates, 2015). However, to confirm this finding, a field aquifer test including installation of test and observation wells and pump testing was recommended (Golder Associates, 2015).

As described in Section 3.14.2, CAFS owns and operates onsite domestic water treatment facilities with only chlorination treatment needed for domestic use (including human consumption, food preparation, and fire protection). No issues have ever been reported that have caused interruption of the flow of potable water due to contamination (USAF, 2013b).

Protection of underground water sources from contamination is maintained by the State of Alaska and is regulated by the Safe Drinking Water Act.

3.15.2 Surface Water

CAFS lies within the Tanana River basin and is drained to the north by the Nenana River, a major tributary to the Tanana River that forms the western boundary of the installation (USAF, 2013b). The Nenana River is glacier-fed, silty, and turbid, and experiences major seasonal water-level fluctuations. The river gradient decreases just upstream from CAFS and as it flows closer to CAFS, is characterized by broad, slow-moving flow and braided channels. No natural streams, ponds, or lakes exist at CAFS.

Other surface water at CAFS consists of the man-made surface drainage system of ditches, swales and culverts; Lake Sansing; the cooling pond; several unnamed tributaries; and several natural retention and detention ponds (USAF, 2013a). There are no known private water supply intakes in streams within 15 miles of CAFS and no municipal intakes on the Nenana River or Tanana Rivers within 150 miles of CAFS (USAF, 1999).

Two man-made water bodies, Lake Sansing and the decommissioned coal-fired power plant cooling pond, are located on CAFS (USAF, 2013a). Lake Sansing, which is an old 12-acre gravel pit excavated in the late 1950s, received cooling water discharges via an open channel from the former power plant and the Old Tech site during operation of the BMEWs, and currently receives cooling water from the SSPARS facility via underground piping. Lake Sansing has no natural outlet; therefore, all flow into the lake either evaporates or infiltrates. The cooling pond was a formerly used lined heat sink of approximately 8 acres that received warm

water from the former power plant. The cooling water from the cooling pond was circulated internally and primarily returned back into the system via an underground piping system.

There are no discharge points (outfalls) from the system at the SSPARS due to the relatively flat topographic character of CAFS. All storm water is retained in small swales, ditches, and/or shallow ponds until absorbed into the ground.

In the Composite area, storm water runoff is not diverted away from facilities. The grade around buildings and in parking areas does not direct runoff to the surrounding storm water conveyance facilities. This causes standing water in the parking areas, earthen ditches, and open areas from the time snow melts until the ground thaws or the water evaporates. Manual pumping using a sump pump is necessary in extreme conditions in these areas.

Section 402 of the Clean Water Act (CWA), requires all facilities that discharge pollutants from any point source into waters of the U.S. (WOUS) to obtain a National Pollutant Discharge Elimination System (NPDES) permit. In 2008, USEPA transferred NPDES primacy through Alaska's Pollutant Discharge Elimination System (APDES) Program, 18 AAC 83, and in 2009 authority over the Multi-Sector General Permit (MSGP) was assumed by ADEC.

CAFS was authorized to discharge storm water to WOUS by APDES General Permit Number AKR05CC6. However, based upon the *Storm Water Drainage Survey* (USAF, 2011dc the *Analysis of Storm Water Permit Requirements and Recommendation* (USAF, 2011d) report and the determination that Lake Sansing is not a "water of the U.S (WOUS)" it was determined that there is no discharge of storm water to waters of the U.S. from industrial activities at CAFS. Therefore, CAFS submitted a Notice of Termination for coverage under the MSGP in August 2011, with written documentation that CAFS does not discharge storm water to WOUS. CAFS storm water runoff is managed in accordance with the Storm Water Runoff management Plan (USAF, 2015e).

3.15.3 Floodplains

EO 11988 (Floodplain Management) as amended by EO 13690 (Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input) requires Federal agencies to protect values and benefits of floodplains and reduce risks of flood losses by not conducting or allowing activities within floodplains, unless there is no other practicable alternative (USAF, 2013b). The 100-year floodplain of the Nenana River is restricted to the westernmost portion of CAFS in undeveloped areas. Approximately 1,100 acres, or 10 percent of the undeveloped acreage of the installation, is within the Nenana River floodplain. The Proposed Action site is located approximately 2.5 miles east of the 100-year floodplain of the Nenana River.

3.16 WETLANDS

Wetlands are defined by the U.S. Army Corps of Engineers (USACE) and the USEPA based on the presence of wetland vegetation, wetland hydrology, and hydric soils with certain land area considerations. The USACE regulatory definition of a wetland is "[t]hose areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (Environmental Laboratory, 1987).

Wetlands and other surface water features meeting certain criteria are generally considered WOUS. The presence of wetlands, as well as shape, type of habitat, and other features are determined through a wetland delineation as outlined in the 1987 USACE Wetland Delineation Manual (1987 Manual) (Environmental Laboratory, 1987). WOUS, including wetlands, are regulated under Section 404 of the CWA. Regional differences in climate, geology, soils, hydrology, plant and animal communities, and other factors are important to the identification and functioning of wetlands, but cannot be adequately addressed in a nationwide manual.

Therefore, Regional Supplements to the 1987 Manual were developed as part of a nationwide effort to address regional wetland characteristics and improve the accuracy and efficiency of wetland-delineation procedures. The determination that a wetland is subject to regulatory jurisdiction under Section 404 of the CWA or Section 10 of the Rivers and Harbors Appropriation Act (RHA) of 1890 (33 USC 401, et seq.) must be made independently of procedures described in the Regional Supplement. The Alaska Regional Supplement is the applicable manual used in combination with the 1987 manual to identify and delineate wetlands for CAFS under consideration in this EA. However, a determination that a wetland is subject to regulation under the CWA - a Jurisdictional Determination is made independently of the delineation and is a separate process.

The ROI for potential impacts related to wetlands would be the area of the Proposed Action within CAFS and surrounding areas where wetlands could be adversely affected. This region is entirely within the CAFS.

3.16.1 Regulatory Framework

The USACE regulatory program is one of the oldest in the federal government, having originated in the 19th century with the RHA of 1890 (33 USC 401, et seq.), which established protection of waters used for commerce. The basic mission of the regulatory program is "…to protect the nation's aquatic resources, while allowing reasonable development through fair, flexible and balanced permit decisions".

In 1972, amendments to the Federal Water Pollution Control Act added what is now known as Section 404 authority (33 USC 1344) to the program. The USACE is authorized to issue permits, after notice and opportunity for public hearings, for the discharge of dredged or fill material into WOUS at specified disposal sites. Selection of such sites must be in accordance with guidelines developed by the USEPA in conjunction with the Secretary of the Army; these guidelines are known as the 404(b)(1) guidelines. The discharge of all other pollutants into WOUS is regulated under Section 402 of the Act (more commonly known as the NPDES). The Federal Water Pollution Control Act was further amended in 1977 and given the common name of CWA, and was again amended in 1987 to modify criminal and civil penalty provisions and to add an administrative penalty provision. Section 404 of the CWA authorizes the Chief of Engineers to issue permits for the discharge of dredged or fill material into the WOUS (33 USC 1344). The selection and use of disposal sites is to be in accordance with guidelines developed by the USEPA Administrator in conjunction with the Secretary of the Army, as published at 40 CFR Part 230. The Chief of Engineers must consider the economic impact on navigation and anchorage of a permit approval or rejection in reaching his decision. The USEPA Administrator can deny, prohibit, restrict or withdraw the use of any defined area as a disposal site whenever it is found, after public notice and an opportunity for a public hearing, and after consultation with the Secretary of the Army, that the discharge of materials into disposal areas would have an unacceptable adverse effect on aquatic resources (40 CFR Part 230).

Wetlands are regulated under Section 404 of the CWA and EO 11990 (Protection of Wetlands). The USFWS Region 9 oversees Wetland Management Districts in Alaska to provide wetland areas needed by waterfowl in the spring and summer for nesting and feeding. The USACE regulates those wetlands that are considered WOUS. Section 10 of the Rivers and Harbors Act of 1899 requires approval before any work in, over, or under navigable WOUS, or work that affects the course, location, condition, or capacity of such waters. Typical activities requiring authorization under Section 10 include:

- Construction of piers, wharves, breakwaters, jetties, weirs, marinas, ramps, floats, intake structures, and cable or pipeline crossings.
- Work such as dredging or disposal of dredged material.
- Excavation, filling or other modifications to navigable WOUS.

Section 404 of the CWA requires permit authorization to discharge dredged or fill material into the WOUS, including wetlands. Typical activities requiring authorization under Section 404 include:

- Discharging fill or dredged material in WOUS, including wetlands.
- Site development fills for residential, commercial, or recreational projects, including mechanized land clearing.

- Construction of breakwaters, levees, dams, dikes and weirs.
- Placement of riprap and road fills.

In general, any person, firm, or agency, including any government agency, planning to place structures or conduct work in navigable WOUS, or deposit dredged or fill material in WOUS, must first obtain a permit from the USACE.

The types of USACE permits includes: Nationwide Permits (NWPs), Letters of Permission, Region General Permits, and Individual Permits (IPs).

Nationwide Permits. NWPs authorize specific activities in areas under USACE's Regulatory jurisdiction. These activities are minor in scope and must result in no more than minimal adverse impacts, both individually and cumulatively, to aquatic habitats. Individuals wishing to perform work under a NWP must ensure their project meets all applicable terms and conditions, including the Regional conditions specific to Alaska. If the conditions cannot be met, a Regional general permit or IP would be required.

Letters of Permission. Letters of permission are a type of permit issued through an abbreviated processing procedure. It includes coordination with federal and state fish and wildlife agencies as required by the Fish and Wildlife Coordination Act, and a public interest evaluation but without the publishing of an individual public notice [33 CFR 325.2(e)(1)]. The letter is an expedited IP process, where a decision to issue does not require a full public review. Applications that qualify as letters of permission are categorically excluded under the USACE implementing regulations for the NEPA (33 CFR Part 325 Appendix B). An EA or Environmental Impact Study is not legally mandated for letters of permission. However, this does not exempt the USACE from complying with other laws, such as the ESA and the CWA, when issuing a letter of permission.

Regional General Permits. Regional permits are issued by the Alaska District engineer for a general category of activities where the activities are similar in nature and cause minimal environmental impact, both individually and cumulatively.

Individual Permits (IPs). IPs are issued following a full public interest review of an individual application for an Army permit. A public notice, usually lasting 30 days, is distributed to all known interested persons. The permit decision is generally based on the outcome of a public interest balancing process, where the benefits of the project are weighed against the detriments. The 404(b)(1) Guidelines allow the USACE to permit only the least environmentally damaging practicable alternative. A permit usually would be granted unless the proposal is found to be contrary to the public interest or fails to comply with the USEPA's 404(b)(1) Guidelines.

3.16.2 Wetlands at CAFS

CAFS is located on a broad glaciofluvial outwash plain comprised of sandy gravel (USAF, 2013a). The plain is irregularly stratified with well and poorly graded coarse sand (USAF,

2005a). Because of the permeability of the soil, relatively few naturally occurring lakes or ponds occur in the Region. CAFS contains no natural streams, ponds, or lakes, and is only occasionally marshy in small surface area deposits of sandy silt (USAF, 2005a).

A National Wetlands Inventory (NWI) was completed for CAFS installation by the USFWS in 1999, mapping 1,091 acres of potential wetlands within CAFS (USFWS, 2015). The inventory was prepared in accordance with Classification of Wetlands and Deepwater Habitats of the U.S. (Cowardin et al., 1979) using high altitude aerial photographs and based on observed vegetation, visible hydrology, and geography. A wetland delineation was conducted by the USACE in the SSPARS project area in August 2011 (USACE, 2011a), finding no wetlands around the SSPARS facility perimeter (MDA, 2012). The SSPARS facility is located north of the proposed LRDR facility near the Old Tech Site. An approved jurisdictional determination was also completed by the USACE in 2015 (USACE, 2015a), finding that no jurisdictional wetlands or other waters are present in the LRDR project area. The waters present, consisting of a ditch and a tributary ditch, were found to be intrastate and isolated, with no known connection to interstate or international commerce.

Constructed waterbodies present in the developed portion of CAFS include Lake Sansing and the power plant cooling pond near the center of the installation, consisting of a total of approximately 22 acres. Discharges from these waterbodies are to groundwater through infiltration (USAF, 2013a). These waterbodies are isolated from natural aquatic systems and likely are not jurisdictional under Section 404 of the CWA.

Approximately 700 acres of riverine wetlands are adjacent to the Nenana River and Lost Slough, approximately 4 miles west of the proposed LRDR site. Riverine wetlands include all wetlands and deepwater habitats contained within the banks of rivers, streams, and excavated drainage ditches. The remaining wetland acreage at CAFS, approximately 350 acres, is classified as palustrine (marshy) and includes unconsolidated bottom, emergent marsh, shrub, scrub-shrub; shrub/herbaceous fen, forested, forested riparian, and shrub riparian wetland types (MDA, 2012). Wetlands identified by aerial photography at CAFS are Palustrine scrub-shrub (broad-leaved deciduous/needle-leaved evergreen) and Palustrine forested open water (needle-leaved evergreen).

Palustrine scrub-shrub wetlands (PSS1/4B) are dominated by a scrub form of Black Spruce; this is the most abundant wetland type at CAFS (USAF, 2005a). In some areas, the Black Spruce is mixed with Tamarack. The depth to permafrost is generally less than 20 inches. Most sites have a large cover of low shrubs including Labrador Tea, Northern Mountain Cranberry (*Vaccinium vitis-idaea*), Bog Blueberry, and Prickly Rose (*Rosa acicularis* subsp. *sayi*) (USAF, 2005a).

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4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

This section is organized by resource element in the same order as introduced in Section 3.0. For each resource element, the analysis methods are described and project-specific impacts are then discussed relative to the construction and operation of Alternative 1-Site 3A and Alternative 2-Site 3B; and the No Action alternative. Unless otherwise noted, the following discussion applies to potential impacts that would result from activities described in Section 2.0 of this document. Cumulative impacts for each resource for each alternative are described in Section 4.17.

The assessments defined in this section are based on the evaluation of potential impacts, especially significant impacts, to the human environment at CAFS because of the Proposed Action or the no action alternative. As defined in 40 CFR 1508.14 (CEQ regulations), the human environment is interpreted to include natural and physical resources, and the relationship of people with those resources. The level of detail provided for each particular resource is commensurate with the level of potential impact to that resource from each of the alternatives considered. Where appropriate, relevant regulatory requirements associated with the resource are described. Impacts are identified as either short-term (i.e., during construction) or long-term (i.e., during the operation life of the Proposed Action). Impacts are further identified as either significant, less than significant, or no impact/no effect.

The concept of "significance" used in this EA includes consideration of both the context and the intensity or severity of the impact, as defined by 40 CFR 1508.27. Severity of an impact could be based on the magnitude of change, the likelihood of change, the potential for violation of laws or regulations, the context of the impact (spatial and/or temporal), and the resilience of the resource. Significant adverse impacts are effects that are substantial and should receive the greatest attention in decision-making. Should a potential significant impact be identified, mitigation recommendations would be identified that, if implemented, would reduce the level of identified impacts to acceptable, less-than-significant levels. Insignificant impacts include those impacts that result in little or no effect on the existing environment.

For this EA, no significant impacts were identified, thus no mitigations were recommended. Best management practices (BMPs) routinely implemented by MDA or the USAF for projects with construction and operation activities have been identified. Although some BMPs are required by permit or regulations, BMPs are generally considered good engineering practices that are used to reduce potential adverse impacts; however they are not considered to be mitigation.

4.2 AIR QUALITY

This section addresses the approach taken in conducting the impact analyses and the potential air quality impacts caused by the construction and operation of the structures and components of the

Alternative 1-Site 3A, Alternative 2-Site 3B, the impacts from the No Action alternative, and the potential measures that could be undertaken to mitigate the air quality impacts. The construction and operation of the Proposed Action Alternatives would result in air emissions within the Denali Borough.

4.2.1 Analysis Methods

The significance of impacts to air quality is based on federal, state, or local pollution regulations or standards. A significant impact would be a violation of standards, or an exposure of sensitive receptors to excessive quantities of criteria pollutants and fugitive dust. However, ultimately the emissions from the Proposed Action would be limited by current air permitting regulations that are promulgated by the USEPA and ADEC. Compliance with these regulations would be demonstrated during the air permitting process required prior to undertaking any such project in Alaska.

Air permitting for the Proposed Action would be conducted at a later time but prior to construction and operation. Because the actual permitting would be done later, this analysis has been conducted to determine air quality impacts from the Proposed Action, based on estimating the expected air emissions during construction and operation of the Proposed Action and comparing them to the existing air quality emissions in the Denali Borough.

4.2.1.1 General Conformity

The CAA requires Federal agencies to ensure that their actions (i.e., license, permit, or approval) conform to the applicable SIP which protects air quality. The purpose of the conformity regulation is to ensure that Federal actions 1) do not interfere with the SIP; 2) do not cause or contribute to new violations of the NAAQS; and 3) do not impede the ability to attain or maintain the NAAQS over time. The SIP is a plan that provides for implementation, maintenance, and enforcement of the NAAQS, and includes emission budgets and control measures designed to attain (for non-attainment areas) and maintain (for attainment and maintenance areas) the NAAQS. 40 CFR Part 93, Subpart B, requires that a federal action undergo a general conformity determination for actions occurring in non-attainment or maintenance areas[2] where a Proposed Action's emissions of the non-attainment or maintenance pollutant or its precursor(s) would equal or exceed emission thresholds set forth in the regulation.

The Proposed Action would be constructed entirely within the Denali Borough, which is designated by USEPA as in attainment with all criteria pollutants. As such, the conformity

[2] For areas that were previously non-attainment but have since attained the NAAQS, USEPA requires as part of the re-designation process that states develop a 10-year plan (i.e., SIP) to ensure maintenance (or continued attainment) of the NAAQS. During this 10-year period these re-designated areas are known as maintenance areas.

emission thresholds do not apply and a general conformity analysis is not required for the Proposed Action-related emissions. Correspondence with ADEC confirming that no general conformity analysis is required is provided in Appendix B.

4.2.1.2 Methods of Estimating Air Emissions during Construction

The following key factors are typically considered in assessing the type and significance of construction-related air quality impacts:

- Construction activities (types, durations, etc.).
- Construction schedule.
- Construction equipment and vehicles (types, number, duration of operation, miles driven, etc.).

Each of these factors was reviewed in evaluating the air quality impacts from the Proposed Action. Their contributions to the air quality analysis and any respective assumptions that were used in the analysis are further described in the following paragraphs.

The USAF Conformity Applicability Model (ACAM), Version 5.02 (USAF, 2015d) model was used in this analysis to estimate both the combustion-related emissions as well as the fugitive dust-related emissions from construction of the Proposed Action. The ACAM model was used because it has the capability to develop an air emission estimate based on certain simplified assumptions regarding a preliminary construction schedule, preliminary construction equipment list, and the total acreage disturbed. Air quality calculations are provided in Appendix B.

<u>Emission Types</u>

Generally, emissions of criteria pollutants (i.e., PM10, PM2.5, NO_x, SO_2, VOC, and CO) and greenhouse gases (GHGs) (i.e., mostly carbon dioxide [CO_2]) during construction activities would be expected from one of two processes: (1) combustion of fuels in engines which propel or otherwise operate mobile or stationary construction equipment; and (2) fugitive dust activities which entrain particles into the air through the disturbance and movement.

The project-specific air emissions from combustion of fuels in mobile engines (both on-road and non-road) during construction would be primarily driven by the following construction activities:

- Construction workers traveling to and from the construction site.
- Trucks that deliver dirt and construction materials to the construction site.
- Trucks that travel to and from the construction site, hauling waste materials to a local disposal site of materials.
- Operation of heavy equipment such as cranes, bulldozers, and scrapers.
- Use of support vehicles to transport materials around the construction site.

- Operation of other miscellaneous mobile fossil-fuel combustion sources such as generators necessary for construction activities.

Fugitive dust emissions would be generated from project construction activities (in the form of direct PM10 and PM2.5 emissions) in the immediate vicinity of the construction area. In general, the levels of fugitive dust released would depend on the type of construction activity, the level of activity conducted, the weather during the construction activity, and the composition of the soil disturbed. In more project-specific terms, the fugitive dust emissions during construction would be primarily caused by the following construction activities:

- Tree clearing.
- Ground clearing, grading, and excavation.
- Bulk handling of materials such as spoils, backfill, and aggregate.
- Entrainment from the movement of vehicle tires over paved and non-paved surfaces.

Potential air emissions from the Proposed Action can be further categorized as being either direct or indirect. Both direct and indirect emissions are those emissions of criteria pollutants and precursors that are initiated by the federal approval of implementation of the Proposed Action and are reasonably foreseeable. Direct emissions are those that occur at the same time and place as Proposed Action. Air emissions resulting from operation of construction equipment, stationary emission sources (i.e., generators, air compressors, etc.), and other construction activities that occur at the construction site for the Proposed Action would all be considered direct emissions.

Indirect emissions are those emissions that occur at a different time or place as the location of Proposed Action. Indirect air emission resulting from construction activities generally include construction worker vehicles, trucks that deliver dirt and construction materials to the construction site, and trucks that transport waste materials from the construction site to an offsite disposal site. These types of construction activities have the potential to occur away from the site and also impact the Regional air quality. The emission estimates contained in this report for construction includes both indirect and direct emissions.

Effects of Construction Schedule on Emissions Estimates. The construction of the Proposed Action under both Alternative 1-Site 3A and Alternative 2-Site 3B would occur over approximately a 5.5-year period. Site preparation activities, such as tree and brush clearing, Man Camp preparation, road improvements/widening needed for construction, utilities, and most of the ground disturbing activities (i.e., grading) would be expected to commence during April 2017 and continue through September 2017. The construction phase of the project (i.e., building foundations, erection of structures, and final build-out) would be expected to overlap with some of the site preparation activities and continue until the Proposed Action would reach initial capability. The emissions analysis used the construction schedule presented in Figure 2.2-3.

Construction Equipment. A preliminary equipment list was created for the purpose of developing an air emission estimate for the construction of the Proposed Action. Table 4.2-1 contains the preliminary equipment list, which is based on previous projects conducted at CAFS and projects completed by the MDA that are similar to the Proposed Action. The preliminary construction list includes an inventory of the construction equipment (i.e., type and amount) and hours per day that the construction equipment would expect to operate to perform work. This preliminary equipment list and the assumptions above were used as input into the ACAM model to estimate both the combustion and fugitive dust source emissions that might occur from site preparation and construction activities.

4.2.1.3 Methods of Estimating Air Emissions during Operation

The following key emission sources and factors were considered in assessing the type and significance of operation-related air quality impacts:

- LRDR power plant that would include emergency power generators.
- Boilers installed within the MCF to provide heat to the LRDR-related facilities.
- Staff vehicles.
- Operation schedule.
- Fuel storage tanks.

The respective contributions of these factors to the project's air quality analysis and any respective assumptions that were used in the analysis are further described in the following paragraphs.

Emission Types

Air emissions from operation of the Proposed Action can be categorized as being either direct or indirect emissions. Air emissions resulting from operation of the power plant, heating boilers, and fuel storage tanks at CAFS would all be considered direct emissions.

Indirect air emissions resulting from operation activities would include operational staff vehicles that occur outside the boundaries of the Proposed Action. These types of construction activities would have the potential to occur away from the Proposed Action site, as the staff traverse the area to their respective residences.

Table 4.2-1 Preliminary Construction Equipment List Used for the Construction Air Emissions

Equipment List [1]	Site Preparation [2]		Construction – 2017 [3]		Construction - 2018[3]		Construction – 2019, 2020[3]		Construction - 2021[3]	
	No.	Hrs/ Day	No.	Hrs/ Day	No.	Hrs/ Day	No.	Hrs/ Day	No.	Hrs/ Day
Aerial Lift	0	0	1	8	3	10	3	10	0	0
Air Compressor	2	10	5	8	5	10	5	10	0	0
Bore/Drill Rigs	2	10	1	8	1	10	1	10	4	8
Cement Mixer	0	0	3	8	1	10	1	10	0	0
Concrete Saw	0	0	3	8	2	10	2	10	0	0
Crane	0	0	2	8	4	10	4	10	0	0
Crawler Tractor	2	10	2	8	4	10	4	10	1	8
Crushing Equipment	1	10	1	8	1	10	1	10	1	8
Dumper/Tender	2	10	1	8	1	10	1	10	0	0
Excavator	5	10	2	8	1	10	1	10	0	0
Forklift	0	0	0	0	3	10	3	10	0	0
Generator Set	1	10	2	8	2	10	2	10	2	8
Grader	2	10	1	8	1	10	1	10	1	8
Off-Highway Truck	5	10	3	8	2	10	2	10	0	0
Other Construction Equipment	1	10	2	8	2	10	2	10	1	8
Material Handling Equipment	1	10	1	8	1	10	1	10	0	0
Pavers	0	0	1	8	3	10	3	10	1	8
Paving Equipment	0	0	1	8	3	10	3	10	1	8
Plate Compactor	2	10	1	8	0	0	0	0	0	0
Pressure Washers	1	10	1	8	1	10	1	10	0	0
Pump	4	10	4	8	6	10	6	10	0	0
Roller	7	10	2	8	1	10	1	10	1	8
Rubber Tired Dozers	1	10	1	8	1	10	1	10	0	0
Rubber Tired Loaders	1	10	3	8	8	10	8	10	1	8
Scrapper	3	10	1	8	1	10	1	10	1	8
Surfacing Equipment	0	0	1	8	1	10	1	10	0	0
Tractor/Loaders/Backhoes	3	10	2	8	2	10	2	10	1	8
Trencher	2	10	2	8	1	10	1	10	0	0
Welder	0	0	2	8	6	10	6	8	2	8

Notes:
[1]The preliminary construction equipment list used for the construction air emission analysis is based on the previous projects conducted at CAFS and projects completed by MDA similar to the Proposed Action.
[2]Site preparation activities for the construction emission estimate are assumed to commence during April 2017 and continue through September 2017.
[3]Construction activities would commence during July 2017 and continue through September 2021.

LRDR Power Plant (LPP). Commercial electrical power taken from the grid and supplied by offsite public power generation sources would be the primary source of power for the mission facilities, mission-support buildings, LRDR-specific support facilities, and other associated equipment. However, the LRDR and other structures associated with the Proposed Action require backup power to ensure continuous operation abilities for national security purposes. The backup power would be supplied by up to eight 3.6-MW reciprocating internal combustion engines (RICE). The purpose of the backup RICE would be to provide power to the LRDR facility in the event that offsite power is physically lost or at times when there is the potential for offsite power to be lost.

Installation of two 3 MBtu/hr and two 6 MBtu/hr diesel-fired boilers within the MCF that would generate heat for the LRDR mission facilities and mission-support buildings and structures on an as-needed basis is also included. A 7 MBtu/hr diesel-fired boiler would be installed to provide heat to the civil engineering complex addition and dormitory that would be constructed for LRDR operational staff.

It is important to note that the air permitting effort that would ultimately authorize the installation of the backup RICE and comfort heating boilers and ensure compliance with all federal and state air permit regulations would be conducted prior to construction of the Proposed Action. The permitting assessment would determine the categorization of the engines (i.e., emergency, non-emergency) as defined by the federal National Emissions Standards for Hazardous Air Pollutants and New Source Performance Standards (NSPS) regulations that cover these types of engines and would determine the number of hours annually each engine would be allowed to operate. The permitting assessment would also determine any regulations that may be applicable to the diesel-fired comfort heating boilers.

The following bullets provide the major assumptions that were used to estimate emissions for the RICE engines and diesel-fired comfort heating boilers that would be included in the Proposed Action.

- The 3.6 MW engines would be categorized as emergency engines (i.e., subject to, and therefore not exempt from, the applicable NSPS).
- The RICE engines would each operate a maximum of 500 hours per year, inclusive of all actual emergencies, emergency-related operations (i.e., maintenance and readiness testing), and non-emergency operations allowed by USEPA's regulations.
- The 3.6-MW engines would be subject to the emission standards for Tier 2 engines manufactured after 2010 and greater than 900 kilowatts, as prescribed in 40 CFR 89.112(a). The use of Tier 2 engines for emergency applications is valid and conservative because Tier 2 emissions are greater than the Tier 4 emission standards applicable to non-emergency engines.
- The comfort heating boilers would be permitted to operate up to 8,760 hours per year.

- The air emissions estimate for the comfort heating boilers is based on emission factors for boilers with a heat input of less than 100 MBtu/hr from USEPA's AP-42.
- The SO_2 emission estimates use ultra-low sulfur fuel oil with sulfur content of no more than 0.0015 percent.
- GHG emission factors for the engines and boilers are based on emission factors contained in Tables C-1 and C-2 of 40 CFR 98, Subpart C.

Mobile Vehicles. During operation, various types of mobile vehicles would emit air pollutants during operational activities. The expected mobile vehicle activities would primarily include staff arrivals and dismissals. The estimated emissions from the types of mobile vehicles and activities for the operation of the Proposed Action were developed using emission factors derived from the ACAM model, which uses emission factors from USEPA's MOVES model (USEPA, 2014b). The emissions estimate for the mobile vehicles assumes that the staff would live at the CAFS dormitory and travel from CAFS to Fairbanks during their days off or for other purposes. The assumption is that a total of 67 military, civilian, and contractor support maintenance personnel would make the trip 8 times per month. The roundtrip distance from CAFS to Fairbanks is assumed to be 150 miles. The vehicle types were assumed to be divided equally between 50 percent passenger cars and 50 percent light-duty trucks all fueled by gasoline. The emission factors and inputs described above were used to create an estimate of the staff vehicle emissions for each annual period of operation.

Fuel Storage Tanks. Air emissions from storage tanks are created by breathing and working loss activities. Breathing losses are produced by pressure variations that occur as the temperature of the stored fuel changes based on ambient conditions. Working losses occur due to the filling of the storage tank or as liquid is withdrawn from the storage tank.

Each of the backup RICE would have its own dedicated 1,200-gallon maximum capacity fuel storage day tank. Two additional 200-gallon fuel storage day tanks would be installed for the group of comfort heating diesel boilers planned for the LRDR. Three larger fuel storage tanks (each 50,000 gallons) would also be built to store fuel for the backup RICE and boilers for longer term operations. The fuel storage tanks and associated fuel loading operations to fill the tanks would be fugitive sources of VOCs.

The ACAM model was used to estimate potential fugitive VOC emissions from the day storage tanks and larger fuel storage tanks (USAF, 2015d).

Schedule of Operation Activities. This analysis assumes that the operation of the LRDR LPP generators and boilers needed for heating purposes of LRDR related structures would begin during April 2020, and that the heating boiler for the new dormitories and civil engineering complex would become operational during October 2021. The operation of the LRDR would be 24 hours per day for each day of the year.

4.2.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.2.2.1 Construction

Emission Sources

The emission sources that apply to Alternative 1-Site 3A are presented Section 4.2.1 except for the following:

Construction Site Disturbance. The construction footprint for Alternative 1-Site 3A would be expected to require approximately 38.9 acres. The amount of acres disturbed would include a construction lay-down area, Man Camp, and area needed for LRDR related structures. This analysis assumes that the entire acreage for Alternative 1-Site 3A above would be graded. In reality, however, some of the acreage would not be graded or not require construction activities, a factor which further supports this analysis as representing the upper bounds of the actual expected air emissions.

Emissions Estimates

Construction Equipment. The criteria air pollutant and GHG emissions from construction equipment during the construction of Alternative 1-Site 3A were estimated based on the inputs and assumptions discussed in Section 4.2.1.2 pertaining to construction activities, preliminary construction schedule, and preliminary equipment list, as wells as acreage disturbed during construction.

The ACAM model was used to estimate both fugitive dust and combustion-related source emissions from construction equipment during the site preparation and construction phases of the project (USAF, 2015d). The ACAM model uses emission factors for non-road construction equipment that are specific to the Denali Borough from USEPA's Motor Vehicle Emission Simulator (MOVES) model (USEPA, 2014b).

Worker Vehicles. Construction workers traveling to and from the site would emit criteria pollutants and GHGs in the Denali Borough and Region surrounding the Alternative 1-Site 3A. During each month of construction, the number of construction workers and site activation personnel would vary depending on the phases of the project, as well as the construction activities that are conducted. The emissions analysis for the construction worker vehicles included the following conservative assumptions:

- Construction workers would live at the man camp during the entire construction period.
- Construction workers would travel from CAFS to Fairbanks during their days off or for other purposes. The assumption is that the construction workers would make a roundtrip from CAFS to Fairbanks 8 times per month for the duration of site preparation and

construction activities. The roundtrip distance traveled per roundtrip is assumed to be 150 miles.

- The number of construction workers traveling to the site would vary over time. The analysis assumes the number of workers during the 5-year period of construction of the Proposed Action would be as follows:
    - 145 workers during 2017.
    - 199 workers during 2018.
    - 407 workers during 2019.
    - 330 workers during 2020.
    - 129 workers during 2021
- The construction worker vehicle types would be divided between 50 percent passenger cars and 50 percent light-duty trucks that would be fueled by gasoline.

The fugitive dust and combustion-related source air emissions from construction equipment for Alternative 1-Site 3A are provided in Table 4.2-2 for each year of construction.

Mobile emission factors used to estimate the emissions from construction worker vehicles are from the ACAM model, which uses emission factors for mobile on-road vehicles that are specific to the Denali Borough from USEPA's MOVES model (USEPA, 2014b). The emission factors were used along with the other inputs described above to create an estimate of the construction worker vehicle emissions. The air emissions estimated from construction worker vehicles are provided in Table 4.2-2 for each year of construction.

Haul/Delivery Trucks. During site preparation and construction activities, there would be on-road trucks that remove construction waste materials from the construction site and deliver them to an offsite location, as well as deliver cut and fill material and construction materials needed for certain construction activities. For on-road haul/delivery trucks, the analysis assumed the following:

- During 2017 the on-road haul/delivery truck would make 4,375 trips per year.
- During 2018 through September 2021 the on-road haul/delivery truck would make four trips each day of construction activities.
- The on-road haul/delivery trucks would travel a roundtrip distance of 20 miles for each trip.

Similar to the analysis of construction worker vehicles presented above, the emission factors used to estimate the emissions from the on-road truck activities are from the ACAM model which uses emission factors for heavy-duty trucks from USEPA's MOVES model. The emission factors for the on-road truck were used along with the other inputs described above to create an estimate of on-road truck emissions. The air emissions estimated from the on-road haul/delivery trucks is provided in Table 4.2-2 for each year of construction.

The construction activities for Alternative 1-Site 3A would have an unavoidable short-term impact on air quality. Emissions from the exhaust of construction equipment and construction worker vehicles and fugitive dust from the movement of construction equipment and construction activities would be generated during the course of construction. Table 4.2-2 includes the estimated emissions of criteria air pollutants and GHG created during the construction phase. The assumptions and methodology to calculate the air emissions from construction equipment, worker vehicles, and on-road trucks that remove construction waste materials, as well as delivery of dirt and construction materials, are discussed in Section 4.2.1.2.

In order to understand how the emissions presented above might impact the area's air quality, an evaluation of the existing area's emissions is necessary. As previously indicated, the Proposed Action at CAFS would be located within the boundaries of the Denali Borough, AK. The criteria pollutant and CO_2 equivalent (CO_2e) emissions for Denali Borough are provided in Table 4.2-3. The annual emissions data for the Denali Borough is from the National Emission Inventory (NEI) databases for the year 2011 (USEPA, 2013c). For comparison purposes, Table 4.2-3 also contains the maximum annual emissions for each pollutant that was presented in Table 4.2-2 as compared to Alternative 1-Site3A. Although there would be emissions that would occur outside of the Denali Borough due to worker vehicle commutes and delivery of equipment and materials, the magnitude of such emissions and associated impacts would be much smaller compared to the Denali Borough emissions.

As shown in Table 4.2-3, the maximum annual emissions estimated for criteria pollutants and CO2e from the construction of Alterative 1-Site 3A at CAFS would be a small percentage of the existing total emissions currently emitted within the Denali Borough. The emissions of PM10 presented in Table 4.2-3 would be mostly associated with site grading activities that generate fugitive dust emissions during the 2017 annual period. Mitigation techniques to control fugitive dust released during grading activities could be employed to reduce PM10 impacts if necessary during actual construction. Overall, the air quality impacts from the construction of Alternative 1-Site 3A would be localized and temporary and would be expected to be small for each year of construction. Overall, the air quality impacts from construction of Alternative 1-Site 3A would not be expected to be significant.

Table 4.2-2 Estimated Annual Air Emissions from Construction Activities – Alternative 1-Site 3A

Emission Activity [(1)(2)(3)]	Annual Period [(4)]				
	2017	**2018**	**2019**	**2020**	**2021**
			VOC (tons)		
Construction Equipment	7.24	9.34	8.61	8.04	1.35
Worker Vehicles	0.92	1.51	2.79	2.06	0.61
On-Road Haul/ Delivery Trucks	0.07	0.02	0.02	0.02	0.01
Total Annual Emissions	**8.2**	**10.9**	**11.4**	**10.1**	**2.0**
			CO (tons)		
Construction Equipment	33.51	45.98	45.02	44.56	9.26
Worker Vehicles	9.49	16.09	30.53	23.13	6.83
On-Road Haul/ Delivery Trucks	0.23	0.07	0.07	0.06	0.05
Total Annual Emissions	**43.2**	**62.1**	**75.6**	**67.7**	**16.1**
			PM10 (tons)		
Construction Equipment	143.94	3.26	2.88	2.57	0.37
Worker Vehicles	0.03	0.06	0.10	0.08	0.02
On-Road Haul/ Delivery Trucks	0.03	0.01	0.01	0.01	0.004
Total Annual Emissions	**144.0**	**3.3**	**3.0**	**2.6**	**0.4**
			PM2.5 (tons)		
Construction Equipment	2.49	3.26	2.88	2.57	0.37
Worker Vehicles	0.03	0.05	0.09	0.07	0.02
On-Road Haul/ Delivery Trucks	0.02	0.01	0.01	0.01	0.004
Total Annual Emissions	**2.5**	**3.3**	**3.0**	**2.6**	**0.4**
			NO_x (tons)		
Construction Equipment	50.24	63.23	57.45	52.56	8.52
Worker Vehicles	0.88	1.39	2.45	1.73	0.51
On-Road Haul/ Delivery Trucks	0.73	0.22	0.20	0.18	0.14
Total Annual Emissions	**51.8**	**64.8**	**60.1**	**54.5**	**9.2**
			CO_2e [(5)] (metric tons)		
Construction Equipment	7,739	9,872	9,821	9,848	1,967
Worker Vehicles	632	1,124	2,230	1,753	518
On-Road Haul/ Delivery Trucks	134	44	4	43	32
Total Annual Emissions	**8,495**	**11,040**	**12,055**	**11,644**	**2,518**
			SO_2 (tons)		
Construction Equipment	41.84	17.72	17.72	17.72	0.02
Worker Vehicles	0.004	0.01	0.01	0.01	0.004
On-Road Haul/ Delivery Trucks	0.001	0.0004	0.0004	0.0004	0.0003
Total Annual Emissions	**41.8**	**17.7**	**17.7**	**17.7**	**0.03**

Notes:
(1)The annual air emissions of criteria pollutants for construction equipment include both fugitive dust and combustion-related emissions from non-road type construction equipment.
(2)The annual emissions for worker vehicles are based on the maximum number of construction workers expected to commute to and from CAFS LRDR site for the construction of the Proposed Action.
(3)The annual emissions from on-road trucks represents the activities for heavy-duty trucks that 1) remove debris and construction waste from CAFS LRDR site to an offsite location and 2) deliver dirt and construction-related materials to CAFS LRDR site.
(4)The preliminary schedule assumes that the start of site preparation activities would commence during April 2017 and would last into September 2017. The construction activities would commence during July 2017 and continue until September 2021.
(5)The air emissions of CO_2e equivalents are provided in metric tons per year. The air emissions of criteria pollutants are provided in tons per year.

Table 4.2-3 Comparison of Criteria Pollutant and CO_2e Air Emissions from Construction of Alterative 1-Site 3A and Existing Air Emissions within the Denali Borough

Location	Emissions (tons)						
	VOC	CO	PM10	PM2.5	NO_x	CO_2e	SO_2
Denali Borough [(1)]	61,125	261,919	25,703	21,334	2,661	2,536,377	2,175
Maximum Annual Emissions During Construction Alternative 1-Site 3A[(2)]	11.4	75.6	144	3.3	64.8	12,055	41.8
Percentage of Construction Emissions to Denali Borough Emissions	0.02	0.03	0.56	0.02	2.44	0.48	1.92

Notes:
[(1)]Annual air emissions for Denali Borough are from USEPA's NEI database representing the 2011 annual period. The annual air emissions for criteria and GHGs provided in the table include air emissions resulting from natural events, in addition to more typical combustion and fugitive dust source emissions.
[(2)]Maximum annual construction emissions for Alterative 1-Site 3A are the maximum emission values for each air pollutant from Table 4.2-2.

Considerations for GHG. Table 4.2-2 shows the estimated annual emissions of CO2e expected during construction of Alterative 1-Site 3A at CAFS. The annual emissions of CO2e included in this analysis are generated by operation of non-road construction equipment, worker vehicles that would commute to and from CAFS, and non-road trucks that would transport materials to and from CAFS for construction of Alterative 1-Site 3A. The CEQ has published guidance indicating at what magnitude GHG emissions from a project warrant a quantitative analysis (CEQ, 2014). The CEQ has provided a reference point of 25,000 metric tons of CO2e on annual bases, which indicates which projects are large enough to warrant a full quantitative GHG emission analysis. The estimated CO_2e annual emissions from construction of Alterative 1-Site 3A at CAFS are below 25,000 metric tons indicating the minor nature of the project's GHG impacts and further that a full quantitative emissions analysis of GHG is not required.

4.2.2.2 Operation

During each year of operation for Alternative 1-Site 3A, stationary and mobile sources (both combustion and non-combustion) would emit both criteria and GHG air pollutants from operation activities described in Section 4.2.1.3. The air pollutant emissions from operation of the Proposed Action would be a long-term impact on an on-going annual basis. Table 4.2-4 shows the estimated air emissions that would be expected during operation of Alternative 1-Site 3A. The assumptions and methodology to calculate the air emissions from the stationary sources (i.e., RICE engines, comfort heating boilers), staff vehicles, and fuel storage tanks are discussed in Section 4.2.1.3.

Just as with construction phase emissions and in order to understand how the emissions presented above might impact the area's air quality, an evaluation of the existing area's emissions is necessary. As previously indicated, Alternative 1-Site 3Aat CAFS would be entirely located within the boundaries of the Denali Borough, AK. The criteria pollutant and CO_2e emissions for the Denali Borough are provided in Table 4.2-5. The annual emissions data for Denali Borough is from the NEI databases for the year 2011 (USEPA, 2013c). For comparison purposes, Table 4.2-5 also shows the maximum annual emissions for each pollutant from Table 4.2-4 as compared to operation of the Proposed Action. Although there would be emissions that occur outside of the Denali Borough due to staff vehicles and delivery of equipment and materials, the magnitude of such emissions and associated impacts would be much smaller compared to the Denali Borough emissions.

As shown in Table 4.2-5, the maximum annual emissions estimated for criteria pollutants and CO_2e from the operation of Alternative 1-Site 3A at CAFS are a small percentage of the existing total emissions currently emitted within the Denali Borough. Overall, the air quality impacts from the operation would be expected to be minor for each year of operation.

Additionally, the Proposed Action would be required to obtain all required air construction and operation permits from the ADEC at a later date that would not only authorize construction and operation of the emission sources for the Proposed Action, but would be crafted to ensure compliance with state and federal air quality regulations. Specifically, the air permitting process required by the CAA and the state's air regulations is designed to prevent the degradation of the local and regional air quality. The air permits that may be required would ensure the Proposed Action would not significantly impact the air quality related to the NAAQS and AAAQS or conflict with any local or regional air quality management plans. Due to the nature of the air emissions for the Proposed Action and the air quality regulations that would ultimately be applicable to the emissions sources, the impacts related to the operational phase of the Proposed Action would be expected to be small and not significant.

Additionally, the Proposed Action would be required to obtain all required air construction and operation permits from the ADEC at a later date that would not only authorize construction and operation of the emission sources for the Proposed Action, but would be crafted to ensure compliance with state and federal air quality regulations. Specifically, the air permitting process required by the CAA and the state's air regulations is designed to prevent the degradation of the local and regional air quality. The air permits that may be required would ensure the Proposed Action would not significantly impact the air quality related to the NAAQS and AAAQS or conflict with any local or regional air quality management plans. Due to the nature of the air emissions for the Proposed Action and the air quality regulations that would ultimately be applicable to the emissions sources, the impacts related to the operational phase of the Proposed Action would be expected to be small and not significant.

Table 4.2-4 Estimated Annual Air Emissions from Operation of Alternative 1-Site 3A

Emission Activity [1][2]	Annual Period [3]		
	2020	**2021**	**2022**
		VOC (tons)	
Power Plant and Heating Boilers	76.30	101.75	101.79
Staff Vehicles	0.31	0.42	0.42
Fuel Storage Tanks	0.23	0.31	0.31
Total Annual Emissions	76.8	102.5	102.5
		CO (tons)	
Power Plant and Heating Boilers	43.83	58.71	59.55
Staff Vehicles	3.52	4.70	4.70
Fuel Storage Tanks	0	0	0
Total Annual Emissions	47.3	63.4	64.2
		PM10 (tons)	
Power Plant and Heating Boilers	3.09	4.22	4.49
Staff Vehicles	0.01	0.02	0.02
Fuel Storage Tanks	0	0	0
Total Annual Emissions	3.1	4.2	4.5
		PM2.5 (tons)	
Power Plant and Heating Boilers	2.55	3.42	3.49
Staff Vehicles	0.01	0.01	0.01
Fuel Storage Tanks	0	0	0
Total Annual Emissions	2.6	3.4	3.5
		NO_x (tons)	
Power Plant and Heating Boilers	84.82	114.22	117.57
Staff Vehicles	0.26	0.35	0.35
Fuel Storage Tanks	0	0	0
Total Annual Emissions	85.1	114.6	117.9
		CO_2e [4] (metric tons)	
Power Plant and Heating Boilers	16,234	22,783	26,196
Staff Vehicles	267	356	356
Fuel Storage Tanks	0	0	0
Total Annual Emissions	16,501	23,139	26,552
		SO_2 (tons)	
Power Plant and Heating Boilers	0.169	0.237	0.272
Staff Vehicles	0.002	0.003	0.003
Fuel Storage Tanks	0	0	0
Total Annual Emissions	0.17	0.24	0.28

Notes:
[1]The annual emissions for vehicles are based on the maximum number of staff expected to travel to and from CAFS LRDR site for the operation of the Proposed Action.
[2]The preliminary schedule assumes that operation would commence during April 2020.
[3]The annual air emissions estimated for 2022 is representative of a full year of operation of the Proposed Action and does not include any concurrent future projects and as such represents emissions from all remaining years of operation until decommissioning. During October 2021 the analysis assumes that the 7 MBtu/hour boiler for the additional dorm and civil engineering complex will become operational.
[4]The air emissions of carbon dioxide equivalents are provided in metric tons per year. The air emissions of criteria pollutants are provided in tons per year.

Table 4.2-5 Comparison of Criteria Pollutant and CO_{2e} Air Emissions from Operation of Proposed Action and Existing Emissions within the Denali Borough

Location	Emissions (tons)						
	VOC	CO	PM10	PM2.5	NO_x	CO_2e	SO_2
Denali Borough [(1)]	61,125	261,919	25,703	21,334	2,661	2,536,377	2,175
Maximum Annual Emissions During Operation [(2)]	102.52	64.25	4.51	3.50	117.93	26,552	0.28
Percentage of Operation Emissions to Denali Borough Emissions	0.17	0.02	0.02	0.02	4.43	1.05	0.01

Notes:
[(1)]Annual air emissions for the Denali Borough are from USEPA's NEI database representing the 2011 annual period. The annual air emissions for criteria and GHGs provided in the table includes air emissions resulting from natural events, in addition to the more typical combustion and fugitive dust emissions.
[(2)]Maximum annual operation emissions for CAFS LRDR Proposed Action are the maximum emission values for each air pollutant from Table 4.2-4.

Visibility Impacts to Class I Areas. The Denali National Park, which is a visibility protection area, as defined by the State of Alaska, is located approximately 20 miles south of CAFS. As the Denali National Park is within 50 kilometers (31 miles) of CAFS, the future air permitting process for the Proposed Action may require an analysis of the impacts of visibility-impairing pollutants (e.g., PM10, SO_2, NO_x) emitted from the emissions sources upon the Class I Area receptors. The visibility impact analysis may include visibility screening modeling that would determine whether the air emissions from the Proposed Action would adversely impact the Denali National Park. The procedures that would be required for an initial visibility screening modeling would be determined by consulting with ADEC and with the Federal Land Manager for the Denali National Park.

However, air quality impacts to the Denali National Park are not expected to be significant during operation of the Proposed Action considering the infrequent operation and dispersion characteristics of the emergency engines. The air emissions from the generators will be emitted at a low release height, which in air quality models typically maximizes the dispersion of visibility pollutants to ground based receptors close to the emission source (i.e., near the CAFS property boundary). Considering the statements above, the distance to the Denali National Park,

and the estimated air emissions of PM_{10}, SO_2, and NO_x displayed in Table 4.2-5 for the operation of the Proposed Action, it is not anticipated that the air emissions from the Proposed Action would significantly impact the visibility at Denali National Park.

Considerations for GHG. Table 4.2-4 provides the estimated annual emissions of CO_2e expected during operation of the Proposed Action at CAFS. The CEQ has published guidance indicating at what magnitude GHG emissions from a project warrant a quantitative analysis (CEQ, 2014). The CEQ has provided a reference point of 25,000 metric tons of CO_2e on annual bases, which indicates which projects are large enough to warrant a full quantitative GHG emission analysis. The estimated annual emissions from operation of the Proposed Action at CAFS are estimated to be slightly above 25,000 metric tons during 2022 and future years of operation, indicating that a full quantitative emissions analysis of GHG may be required. Appendix B contains the air emission calculations containing the quantitative GHG analysis that was conducted for operation of the Proposed Action.

As discussed in Section 3.2.1, climate change is expected to affect air temperatures, soil temperatures, and precipitation in Alaska and at CAFS. Because the GHG emissions from the Proposed Action are only one percent of the total Denali Borough GHG emissions and less than 0.1 percent of the State of Alaska GHG emissions, the climate changes predicted for Alaska over the next 50 years will not be significantly impacted by the Proposed Action. In addition to the evaluation of impacts and climate change due to GHGs as a result of the Proposed Action, as defined by the CEQ's Draft GHG Guidance (CEQ, 2014), impacts and increases in vulnerabilities from climate changes on the Proposed Action should also be considered in NEPA evaluations. Because the proposed LRDR and associated facilities would not be constructed in a floodplain or area potentially affected by sea level rise there would not be any anticipated effects to the LRDR from flooding. Also potential changes to air temperature and precipitation would be well within the design specifications and construction standards applicable to the LRDR. Consequently there would be no expected impacts to the LRDR from the effects of climate change at CAFS.

4.2.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

4.2.3.1 Construction

The methods for estimated air emission during construction and the emission sources for Alternative 2-Site 3B would be the same as those described for Alternative 1-Site 3A described in Section 4.2.2. For Alternative 2-Site 3B, in general the air emissions during construction would be same as those described in Section 4.2.2.1 except for the construction site disturbance. The construction footprint for Alternative 2-Site 3B is expected to require approximately 51.7 acres. The amount of acres disturbed for Alternative 2-Site 3B is larger in comparison to

Alternative 1-Site 3A, because the need to remove additional trees. Table 4.2-6 shows the estimated annual air emission from construction of Alternative 2-Site 3B.

As shown in Table 4.2-7, the maximum annual emissions estimated for criteria pollutants and CO_2e from the construction of Alternative 2-Site 3B at CAFS are a small percentage of the existing total emissions currently emitted within the Denali Borough. Overall, the air quality impacts from the operation would be expected to be minor for each year of operation.

4.2.3.2 Operation

The air emissions generated during operation of Alternative 2-Site 3B would be same as those for Alternative 1-Site 3A presented in Section 4.2.2.2.

4.2.4 Potential Impacts of the No Action Alternative

Under the No Action Alternative, the Proposed Action would not be constructed or operated and there would be no air emissions associated with construction or operation. The existing coal plant boilers and associated diesel generators, coal ash collection and storage system, and coal crusher facility, will be shut-down whether the Proposed Action is constructed or not. The air emission levels under the No Action alternative would be from the emission sources that are currently contained in CAFS Title V permit (ADEC, 2012).

4.2.5 Mitigation

4.2.5.1 Construction

There would be no significant impacts to air quality from construction of Alternative 1-Site 3A or Alternative 2-Site 3B. No mitigations are proposed or recommended. BMPs including techniques to reduce air quality impacts from emission sources during construction would be considered by MDA as necessary. Examples of such measures could include maintaining equipment in working order, applying dust inhibitors (e.g., water or surfactant sprays), revegetation of disturbed areas, proper maintenance of construction vehicles and equipment, etc.

4.2.5.2 Operation

There would be no significant impacts to air quality from operation of Alternative 1-Site 3A or Alternative 2-Site 3B. The emission sources under both alternatives would be required to obtain the appropriate air permits and operate in accordance with all state and federal air quality regulations, which would ensure that air quality impacts would not significantly impact the local and regional air quality. Any specific measures to be used would be determined during the project's air permitting process. BMPs followed during design would address any air quality issues.

Table 4.2-6 Estimated Annual Air Emissions from Construction Activities – Alternative 2-Site 3B

Emission Activity [(1)(2)(3)]	Annual Period [(4)]				
	2017	**2018**	**2019**	**2020**	**2021**
			VOC (tons)		
Construction Equipment	7.24	9.34	8.61	8.04	1.35
Worker Vehicles	0.92	1.51	2.79	2.06	0.61
On-Road Haul/ Delivery Trucks	0.07	0.02	0.02	0.02	0.01
Total Annual Emissions	**8.2**	**10.9**	**11.4**	**10.7**	**2.0**
			CO (tons)		
Construction Equipment	33.51	45.98	45.02	44.56	9.26
Worker Vehicles	9.49	16.09	30.53	23.13	6.83
On-Road Haul/ Delivery Trucks	0.23	0.07	0.07	0.06	0.05
Total Annual Emissions	**43.2**	**62.1**	**75.6**	**67.7**	**16.1**
			PM10 (tons)		
Construction Equipment	190.54	3.26	2.88	2.57	0.37
Worker Vehicles	0.03	0.06	0.10	0.08	0.02
On-Road Haul/ Delivery Trucks	0.03	0.01	0.01	0.01	0.004
Total Annual Emissions	**190.6**	**3.3**	**3.0**	**2.6**	**0.4**
			PM2.5 (tons)		
Construction Equipment	2.49	3.26	2.88	2.57	0.37
Worker Vehicles	0.03	0.05	0.09	0.07	0.02
On-Road Haul/ Delivery Trucks	0.02	0.01	0.01	0.01	0.004
Total Annual Emissions	**2.5**	**3.3**	**3.0**	**2.6**	**0.4**
			NO_x (tons)		
Construction Equipment	50.24	63.23	57.45	52.56	8.52
Worker Vehicles	0.88	1.39	2.45	1.73	0.51
On-Road Haul/ Delivery Trucks	0.73	0.22	0.20	0.18	0.14
Total Annual Emissions	**51.8**	**64.8**	**60.1**	**54.5**	**9.2**
			CO_2e [(5)] (metric tons)		
Construction Equipment	7,728	9,872	9,821	9,848	1,967
Worker Vehicles	632	1,124	2,230	1,753	518
On-Road Haul/ Delivery Trucks	134	44	4	43	32
Total Annual Emissions	**8,495**	**11,040**	**12,055**	**11,644**	**2,518**
			SO_2 (tons)		
Construction Equipment	41.84	17.72	17.72	17.72	0.02
Worker Vehicles	0.004	0.01	0.02	0.01	0.004
On-Road Haul/ Delivery Trucks	0.001	0.0004	0.0004	0.0004	0.0003
Total Annual Emissions	**41.8**	**17.7**	**17.7**	**17.7**	**0.03**

Notes:
(1)The annual air emissions of criteria pollutants for construction equipment include both fugitive dust and combustion-related emissions from non-road type construction equipment.
(2)The annual emissions for worker vehicles are based on the maximum number of construction workers expected to travel to and from CAFS LRDR site during each year of construction of the Proposed Action.
(3)The annual emissions from on-road trucks represents the activities for heavy-duty trucks that 1) remove debris and construction waste from CAFS LRDR site to an offsite location and 2) deliver dirt and construction-related materials to CAFS LRDR site.
(4)The preliminary schedule assumes that the start of site preparation activities would commence during April 2017 and would last into September 2017. The construction activities would commence during July 2017 and continue through September 2021.
(5)The air emissions of CO_2e equivalents are provided in metric tons per year. The air emissions of criteria pollutants are provided in tons per year.

Table 4.2-7 Comparison of Criteria Pollutant and CO_2e Air Emissions from Construction of Alterative 2-Site 3B and Existing Air Emissions within the Denali Borough

Location	Emissions (tons)						
	VOC	CO	PM10	PM2.5	NO_x	CO_2e	SO_2
Denali Borough [(1)]	61,125	261,919	25,703	21,334	2,661	2,536,377	2,175
Maximum Annual Emissions During Construction of Alternative 2-Site 3B [(2)]	11.4	75.6	790.6	3.3	64.8	12,055	41.8
Percentage of Construction Emissions to Denali Borough Emissions	0.02	0.03	0.74	0.02	2.44	0.48	1.9

Notes:

[(1)]Annual air emissions for Denali Borough are from USEPA's NEI database representing the 2011 annual period. The annual air emissions for criteria and GHGs provided in the table include air emissions resulting from natural events, in addition to more typical combustion and fugitive dust source emissions.

[(2)]Maximum annual construction emissions for Alterative 2-Site 3B are the maximum emission values for each air pollutant from Table 4.2-6.

4.3 AIRSPACE

4.3.1 Analysis Methods

To determine potential impacts, the analysis focused on the review of the types of activities that would occur and their location, and the significance of the resource in that location.

4.3.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.3.2.1 Construction

Construction activities associated with Alternative 1-Site 3A would have no impacts on airspace.

4.3.2.2 Operations

Controlled and Uncontrolled Airspace. Operation of the LRDR has the potential for RF interference with commercial aircraft electronic systems. The effects of RF interference can be temporary disruption of normal system function, a reduction in the life of the impacted electronic equipment, or failure and permanent damage of the affected system. FAA defines the peak and average electromagnetic environments that any aircraft system needed for the safe conduct of

flight must operate in and/or recover normal operation from to obtain airworthiness certification; these limits are 3,000 and 200 V/m, respectively (14 CFR Part 23, Appendix J). The maximum safe separation distance from LRDR to the FAA peak value is 1.1 nm, which is well within the confines of CAFS (MDA, 2016). The maximum safe separation distance for the average FAA value is 8.8 nm slant range from the radar; this is well outside the physical confines of CAFS. Table 4.3-1 lists EMR standards of interest and safe separation distances.

Table 4.3-1 Electromagnetic Radiation Standards of Interest for LRDR

EME Parameter - Main Beam Illumination	Maximum Allowable Level	Safe Separation Distance[(3),(4)]
	(Volts/meter)	nm (kilometers)
FAA High Intensity Radiated Field (HIRF, peak)	3,000[(1)]	1.1 (2.0)
FAA High Intensity Radiated Field (average)	200[(1)]	8.8 (16.3)
DoD HERF (fueling operations)	4,342[(2)]	0.8 (1.5)
DoD HIFR (rotary and fixed wing, peak)	4,220[(2)]	0.8 (1.4)
DoD HIFR (rotary and fixed wing, average	455[(2)]	3.9 (7.2)
HERO SAFE (electrically initiated ordnance, peak UNRESTRICTED)	12,667[(2)]	0.3 (0.5)
HERO SAFE (electrically initiated ordnance, average UNRESTRICTED)	1,533[(2)]	1.1 (2.1)
HERO SAFE (electrically initiated ordnance, peak RESTRICTED)	2,500[(2)]	1.3 (2.4)
HERO SAFE (electrically initiated ordnance, average RESTRICTED)	220[(2)]	8.0 (14.8)

Notes:
[(1)] Source maximum allowable level: 14 CFR Part 23, Appendix J.
[(2)] Source maximum allowable level: DoD, 2010.
[(3)]Safe Separation Distance is the minimum slant range distance at which the particular EMR parameter will not be exceeded (e.g., at distances closer than the SSD the level will be exceeded).
[(4)]Source safe separation distance: MDA, 2016.

The LRDR is a component of the 2020 BMDS, designed to provide persistent tracking and discrimination capability to address imminent and evolving threats to the US Homeland. The LRDR will have a 24/7/365 BMD readiness posture, and will also support secondary missions such as space situational awareness (SSA) and intelligence data collections. While SSA is expected to consume the bulk of LRDR operational time, LRDR can rapidly assume a wartime posture in response to real-world events.

As its primary mission is long range detection and tracking of challenging targets, high intensity radiated fields (HIRF) of RF energy will exist in regions in front of the LRDR array faces.

LRDR will use information about air traffic in the vicinity of the CAFS to ensure that LRDR HIRF impinging on aircraft will not exceed HIRF limits as defined in FAA standards. This will include aircraft flying within the LRDR field of view at all altitudes. There would be no reduction in the amount of navigable airspace, and thus no impacts by LRDR to the controlled and uncontrolled airspace surrounding CAFS.

The National Telecommunications and Information Administration (NTIA) establishes EMC standards for all federal spectrum-dependent systems and assigns and regulates frequencies for all federal users (including military) operating within the U.S. and its possessions. In the DoD, the Under Secretary of Defense for Acquisition, Technology, and Logistics sets policy for acquiring systems that use the EM spectrum and ensures compliance with EM spectrum support procedures. The DoD Chief Information Officer develops overall DoD policy for managing and using the EM spectrum. In the Air Force, the Chief, Information Dominance and Chief Information Officer, (SAF/CIO A6) sets policy for managing EM spectrum use to support the AF mission and exercises control over the frequency management process. SAF/CIO A6 is chartered to represent and defend AF EM spectrum technical interests in committees, groups, and organizations that address EM spectrum management matter, and to negotiate at the departmental, national, and international levels to obtain frequency allocations and assignments to satisfy AF exercises, crises, contingencies, wartime, and day-to-day RF requirements for use of the spectrum. In January 2016, LRDR provided to AFSPC (the LRDR MAJCOM) the initial DD Form 1494. This document contains LRDR design-specific information that enables AFSPC to engage with the Air Force Spectrum Management Office to begin the formal Joint Frequency Equipment Allocation (J/F-12) Process as defined by NTIA. AFSPC may also begin spectrum usage coordination activities with appropriate agencies (Federal Aviation Administration, NOAA, FCC, DoD Area Frequency Coordinators, etc.). Initial contact has been made with FAA and coordination activities will continue in due course of business. There are currently no issues of concern that would result in significant impacts.

Special Use Airspace. The DoD defines EMR effects requirements for DoD systems. Reference document MIL-STD-464C (DoD, 2010), Tables 5 and 6, specify the peak and average values (4,220 and 455 volts per meter (V/m) respectively) for rotary and fixed wing military aircraft. The safe separation distance from LRDR to the peak value is 0.8 nautical miles (nm), which is well within the confines of CAFS. The safe separation distance for the average value threshold is 3.9 nm from the radar.

As described in Section 3.3.2, according to the F-35A Operational Beddown – Pacific Final Environmental Impact Statement, two squadrons of F-35As will be located at Eielson AFB, Alaska in early FY21. Due to their predominantly higher altitude missions, advanced electronics, and speed, the F-35As would primarily use the MOAs, Air Traffic Control Assigned Airspace, and Restricted Areas within the northern portion of Joint Pacific Alaska Range Complex (JPARC), no new airspace is required (USAF, 2016). Since the distance between the

LRDR at CAFS and the closest point in the JPARC is approximately 32 nm, the electromagnetic environment generated by LRDR is not expected to impact on F-35A operations.

Other Airspace Areas. As discussed in Section 3.3.3, there are no other airspace areas within the airspace of CAFS.

En Route Airways and Jet Routes. As described in Section 3.3.4, VOR Federal Airway V-436 runs from Anchorage, AK, to Deadhorse, AK, with waypoints at Talkeetna, Nenana and Chandalar Lake. The leg connecting Talkeetna to Nenana passed directly overhead CAFS, from a base altitude of 8,800 feet MSL to a maximum altitude of 18,000 feet MSL. Above 18,000 feet Jet Route J-125 transits CAFS along the same flight path as V-436. Based on comparable studies of other high-power radar installations, transient aircraft flying along high altitude jet routes within the region of influence would receive minimal RF exposure.

As indicated above, LRDR will use information about air traffic in the vicinity of the CAFS to ensure that LRDR HIRF impinging on aircraft will not exceed HIRF limits as defined in FAA standards. This will include aircraft flying within the LRDR field of view at all altitudes.

Airports and Airfields. Nenana Municipal Airport is located approximately 18 miles north of the proposed site; Clear Airfield is located approximately 1.5 miles east of the proposed site; standard approach and departure procedures would continue unhindered. Existing airfield or airport arrival and departure traffic flows would also not be affected and access to the airfield would not be curtailed.

4.3.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

Impacts to airspace from construction and operation of Alternative 2-Site 3B would be same as those described for Alternative 1-Site 3A in Section 4.3.2.

4.3.4 Potential Impacts of the No Action Alternative

Under the No Action alternative, the project would not be constructed or operated and there would be no impacts for air space.

4.3.5 Mitigation Measures – Alternative 1-Site 3A and Alternative 2-Site 3B

There would be no significant impacts to airspace from operation of Alternative 1-Site 3A or Alternative 2-Site 3B. No mitigations are proposed or recommended.

The following discusses BMPs that may be implemented as good practices. The high energy radiation area is published on aeronautical charts and should be consulted as typically practiced by pilots flying in the area near CAFS. In addition to charting the high energy radiation area notice, information is published in the Airport Facility section of the *FAA Airport/Facility*

Directory (FAA, 2016), and local Notice to Airmen (NOTAMs) are issued. Additionally, flight service personnel brief pilots flying in the vicinity about the high energy radiation area.

LRDR also has specific design features that work in conjunction with a comprehensive RF energy management plan to allow LRDR to meet RF safety and electromagnetic compatibility requirements on and around CAFS.

4.4 BIOLOGICAL RESOURCES

The anticipated environmental consequences or impacts to existing biological resources at CAFS from implementation Proposed Action are described in this section. The discussion includes areas potentially affected by construction of the LRDR and non-mission facilities.

Impacts to biological resources on CAFS would result primarily from construction activities with the alternatives. These activities would include excavation for structure foundations and grading. Construction would affect both vegetation and wildlife, mostly in previously disturbed areas. However, these activities would not lead to degradation of critical habitat or biological health.

4.4.1 Analysis Methods

To assess impacts for this project, the LRDR facility's configuration and the activities associated with its construction and operation were conceptually superimposed on the environmental setting of the project site and the vicinity to determine the type and extent (in terms of magnitude and duration) of impacts on the resource of interest. For the biological resource impact assessment, the analysis focused on the area where construction activities would occur. The plant and animal species known or potentially inhabiting this area were assessed for their relative significance. CAFS INRMP (USAF, 2015b) and a sensitive species survey (Carlson and Gotthardt, 2009) were reviewed to provide data on existing biological resources at CAFS. Also used were two EAs completed at CAFS for unrelated projects (Basewide Facilities EA [USAF, 2005a] and the Beddown EA [MDA, 2012]). Potential biological resources that could be present at CAFS, but not reported in the above-referenced sources, were evaluated using the state wildlife action plan (ADF&G, 2006), IPaC information (USFWS, 2015), and information on surface waters important for fisheries (Johnson and Litchfield, 2015).

4.4.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.4.2.1 Construction

Alternative 1-Site 3A would position the LRDR within the southern portion of Site 3, immediately south of the Old Tech Site (see Figure 2.2-1). The LRDR Man Camp would require new wells for potable water and for fire water, along with a septic leach field.

Approximately 40 acres would be disturbed by project construction under Alternative 1-Site 3A. Most of the construction and demolition projects would occur on previously disturbed land within the portion of CAFS known as the Old Tech Site (see Figure 2.2-2). Plant communities within the project area are not unique or unusual in the Region; rare endemic species present at CAFS are primarily located along the Nenana River and floodplain, well outside the project area. Although there would be some vegetation removal in the project area, the extent of vegetation removal would be the minimum necessary to complete the project and substantial acreage of vegetation would remain intact. Further, ground disturbance has previously occurred and the areas only contain high densities of weedy native and non-native plants, the removal of which would not constitute a significant adverse impact.

Construction would not have a significant impact on wildlife inhabiting CAFS. Wildlife such as Moose, Red Fox, Coyote, Mink, ground squirrels, Snowshoe Hare, Beaver, Muskrat, Canada Goose (*Branta canadensis*), and other bird species, including some migratory bird species during the breeding season, could be temporarily displaced during construction and tree clearing activities. Impacts to these species are not considered significant because these species can relocate in similar habitats within the surrounding area.

No Federal or state-listed species are known to occur on CAFS and no designated critical habitat is present as discussed in Section 3.4. Migratory birds migrating through the area could be startled by noise from construction activities, but significant long-term effects are not expected, because extensive suitable habitat is present outside the construction area.

Conventional BMPs and control measures as listed in Table 4.18-1 would be implemented to ensure impacts to biological resources are kept to a minimum. The amount of vegetation disturbed and trees removed during construction activities would be kept to the minimum amount required.

Aquatic species at CAFS are primarily associated with Lake Sansing, the drainage canal from the cooling pond, and the cooling pond (MDA, 2012). None of these areas is expected to be impacted by construction, so impacts to aquatic species would be limited to effects from sedimentation. Conventional erosion control BMPs as listed in Table 4.18-1 should reduce erosion and sedimentation to non-significant levels and therefore, aquatic wildlife would not be affected.

4.4.2.2 Operation

Operations at the LRDR site under Alternative 1-Site 3A would consist of maintenance of facilities, equipment, and radar. Security patrols around the restricted area perimeter would occur at intervals, with the sensor network providing surveillance between patrols. Other activity outside of structures may include occasional pedestrians or moving vehicles. In winter, snow

removal would occur on roads and sidewalks when snow accumulates. During the growing season, mowing of lawns may occur.

Given the relatively moderate to low level of activity, wildlife using the LRDR site is not likely to be displaced permanently, although some temporary disturbance could occur during some periods of higher traffic activity. Further, long-term disturbance is unlikely since the area has been previously disturbed and does not represent suitable habitat for most wildlife species. Lake Sansing typical water levels may increase over the current elevations due to the increased inflow resulting from the discharge of cooling water from the LRDR facility. Assuming that the cooling water discharge is of suitable water quality, no significant adverse impacts to aquatic resources in Lake Sansing would be expected. In fact, if water elevations do in fact increase, it would likely result in the expansion of the lake surface area and an increase in aquatic habitat. This, in turn, could lead to increases in the diversity and abundance of aquatic species, particularly in the littoral zone. Such changes would be positive.

EMR could harm birds, bat, or other animals that fly directly through the beam of the radar system. These effects have been analyzed by the U.S. Army and Missile Defense Agency in past environmental assessments. The 1993 Ground-Based Radar Family of Radars EA (USASMDC, 1993) analyzed potential impacts to wildlife from EMR, in particular migrating birds that might fly through the radar beams. That analysis concluded that it would be extremely unlikely that a bird, bat, or other flying animal would remain within the most intense area of the beam for any considerable length of time (USASMDC, 1993). In addition to the 1993 EA, additional and further detailed evaluations of the entire range and types of radar used within the BMSD versus potential impacts and effects on migratory birds were conducted as part of the 2007 BMDS Programmatic Environmental Impact Statement (MDA, 2007). Based on the evaluations conducted, the radar system planned for the LRDR system (S-band type with a radar frequency range of 2 to 4 gigahertz (GHz)) would not pose adverse impacts to migrating birds while operating in a surveillance mode.

4.4.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

4.4.3.1 Construction

Alternative 2-Site 3B would position the LRDR within the northern portion of Site 3, immediately north of the Old Tech Site (see Figure 2.2-1). Construction-related, biological impacts resulting from development of Site 3B would be similar to those described for Site 3A, except for the 26 acres of tree clearing under this Alternative. Impacts to vegetation on the southern portion of Site 3B are not considered significant because most vegetation present is composed of species common to the Region or weedy species with little to no conservation value. Removal of trees in the northern portion of Site 3B would reduce the acreage of forest surrounding the developed portion of CAFS, but would not represent a significant reduction of forest on the installation or in the Region overall due to the prevalence of similar habitat in the

area. Displacement of wildlife in the project area would not be considered significant due to the ability of these species to seek similar habitat in the surrounding area.

4.4.3.2 Operation

Biological impacts from operation of Alternative 2-Site 3B would be the same as those described for Alternative 1-Site 3A.

4.4.4 Potential Impacts of the No Action Alternative

If the LRDR were not constructed or operated, biological resources would not be impacted. The existing conditions would prevail and those wildlife and plant species capable of occupying and using the project area would continue to do so.

4.4.5 Mitigation Measures – Alternative 1-Site 3A and Alternative 2-Site 3B

4.4.5.1 Construction

No mitigation would be required for either Alternative 1-Site 3A or Alternative 2-Site 3B. BMPs would be implemented. The following BMPs are typically implemented by MDA and the USAF for construction projects and would be used for the Proposed Action:

- Standard dust suppression techniques and vehicle maintenance programs would be implemented to minimize emissions from fugitive dust and vehicle exhaust.
- Conventional construction site BMPs for soil stabilization and erosion control measures would be implemented to reduce indirect biological resource impacts.
- Vegetation disturbance and tree removal during construction activities would be minimized as feasible. Vegetation clearing or removal would only be to the extent necessary.
- Potential impacts to migratory birds would be avoided by implementing BMPs such as conducting clearing and ground disturbing activities in potentially suitable nesting habitats priors to May 1 or after July. This would render the areas unsuitable breeding migratory birds prior to their arrival and facilitate work during the breeding season without impacts to birds.

4.4.5.2 Operation – Alternative 1-Site 3A and Alternative 2-Site 3B

Because no impacts on biological resources are expected during operation of either alternatives, no mitigation measures for biological resources are proposed. Conventional BMPs implemented to minimize impacts to air quality, water quality, noise, health and safety, and land use would also serve to minimize the potential for significant impacts to biological resources from operation of the LRDR.

4.5 CULTURAL RESOURCES

Excavation, grading, and soil compaction for construction could disturb cultural resources, if present. No substantive impacts on cultural resources would be expected to occur due to the project construction or operation. If unanticipated cultural resources or sites would be encountered during construction or operation, all work would be halted until the sites could be evaluated following procedures outlined in AFI 32-7065.

4.5.1 Analysis Methods

To determine potential impacts to cultural resources, the analysis focused on the types of activities that would occur and their location and the significance of the resource in that location. The ICRMP (USAF, 2015a) and existing data - including past archaeological surveys, maps and previously written environmental documents - were reviewed to determine the location and significance of any cultural resources. A study on the inventory of Cold War properties conducted in 1995 was reviewed for information on the eligibility of properties for listing on the NRHP and their location in relation to the Proposed Actions. The proposed construction sites (including Alternative 1-Site 3A, Alternative 2-Site 3B, the LRDR Man Camp, the LRDR-specific non-mission support facilities, and the improvements to the entry road) were compared to locations of potential cultural resources in the area.

4.5.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.5.2.1 Construction

Construction activities at Alternative 1-Site 3A, Lake Sansing, the LRDR Man Camp, the locations of the LRDR-specific non-mission support facilities, and the location of improvements to the entry road were viewed as having a low potential for encountering historic properties based on previous studies and Agency correspondence. These areas were disturbed for construction of the Old Tech Site in the late 1950's and since then the buildings have undergone modifications. No known Alaskan Native cultural properties have been identified within the boundary of CAFS; therefore, none will be affected by the Alternative 1-Site 3A.

According to the cultural resource studies previously completed, CAFS has no areas that have high potential for prehistoric archaeological resources and is considered to have a low potential for archaeological resources based on topography and previous disturbance. In the previous survey development and reviews at CAFS, the SHPO agreed that there were no significant archeological resources known to occur on CAFS property. In a 23 June 2015 meeting with MDA personnel, the SHPO echoed its previous conclusions that the Proposed Action would not impact cultural resources pending its review of records from earlier surveys, reports, and analyses. A follow-up letter was sent from CAFS in January 2016, notifying SHPO of the upcoming Proposed Action, draft EA determination of "No Adverse Effect", and planned

availability of the Proposed Final EA and unsigned Proposed FONSI. In addition to the letter to SHPO, CAFS also sent a letter in January 2016 notifying the Nenana Native Council of the Proposed Action and planned availability of the Proposed Final EA and unsigned Proposed FONSI. A copy of these letters are provided in Appendix A.

Based on the above factors including SHPO concurrence, no significant impacts to cultural resources would result from construction of Alternative 1-Site 3A. However, should previously undiscovered archaeological resources be uncovered during construction activities, the MDA would follow procedures described in AFI 32-7065, Cultural Resource Management Program, for coordination with CAFS and the Alaska SHPO.

4.5.2.2 Operation

The potential for project-related cultural resource impacts under Alternative 1-Site 3A to occur during operation is small, as no ground disturbing activities should occur as a normal part of operations. It is possible that water levels in Lake Sansing could rise due to additional cooling water discharges associated with the LRDR facility and, if so, expose any archaeological or historic resources that may occur along the shoreline to damage from erosion and other effects. As previously indicated, however, the potential for significant, undiscovered archaeological or historic resources to occur onsite (including around Lake Sansing) is low. As such, the potential for cultural resource impacts due to water level changes in Lake Sansing would be correspondingly low.

In any case, if any culturally significant artifacts are discovered during facility operation, the MDA would follow procedures described in AFI 32-7065, Cultural Resource Management Program, for coordination with CAFS and the Alaska SHPO.

4.5.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

4.5.3.1 Construction

The potential for project-related cultural resource impacts to occur under Alternative 2-Site 3B would be the same as for Alternative 1-Site 3A. However, portions of Alternative 2-Site 3B would be in a previously undisturbed area requiring 26 acres of tree clearing. As discussed for Alternative 1-Site 3A, according to the cultural resource studies previously completed, CAFS has no areas that have high potential for prehistoric archaeological resources and is considered to have a low potential for archaeological resources based on topography and previous disturbance. In the previous survey development and reviews at CAFS, the SHPO agreed that there were no significant archeological resources known to occur on CAFS property. In a 23 June 2015 meeting with MDA personnel, the SHPO echoed its previous conclusions pending its review of records from earlier surveys, reports, and analyses.

Based on the above factors, no significant impacts to cultural resources would result from construction of Alternative 2-Site 3B. However, should previously undiscovered archaeological resources be uncovered during construction activities, the MDA would follow procedures described in AFI 32-7065, Cultural Resource Management Program, for coordination with CAFS and the Alaska SHPO.

4.5.4 Potential Impacts of the No Action Alternative

Under the No Action alternative, the project would not be implemented. Site conditions would not be affected by the project.

4.5.5 Mitigation Measures – Alternative 1-Site 3A and Alternative 2-Site 3B

4.5.5.1 Construction

As indicated above, no significant archaeological resources occur onsite under either alternative, and any significant historic structures onsite have been properly recorded or otherwise mitigated under other on-installation projects. If any existing structures are reused, then any recordation procedures would be followed as prescribed under the previous EAs.

In the event that previously undiscovered archaeological resources are uncovered during construction, the MDA would follow cultural resource protection procedures described in AFI 32-7065, Cultural Resource Management, for coordination with CAFS, Alaska SHPO, and the National Park Service.

No mitigation measures are proposed or deemed necessary.

4.5.5.2 Operation

As mentioned above, if previously undiscovered archaeological resources are discovered under either alternative during operation, the MDA would follow cultural resource protection procedures described in AFI 32-7065, Cultural Resource Management, for coordination with CAFS, Alaska SHPO, and the National Park Service. No mitigation measures are proposed or deemed necessary.

4.6 ENVIRONMENTAL JUSTICE

In order for a low income or minority population to be subject to a significant, disproportionate share of negative impacts from a Proposed Action. High percentages of minority and low income populations would need to be present and within close proximity to the Proposed Action, adverse cultural, economic, or health impacts on these populations would need to occur, and minority and low-income areas would have to bear a disproportionate share of negative impacts from the facility. The project-related construction and operation impacts on local minority and low income populations are described in this section.

4.6.1 Analysis Methods

To assess impacts for this project, the LRDR facility construction and operation activities were evaluated to determine the type and extent (in terms of magnitude and duration) of impacts on local minority and low income populations and whether these populations would be disproportionately affected. As an initial step in the analysis, and as described in detail in Section 3.6, Census data, American Factfinder, USEPA's EJView and EJSCREEN, and Alaska Department of Public Health and Social Services data and statistics were used to identify both minority and low income populations near CAFS.

4.6.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.6.2.1 Construction

Impacts on Minority Populations. Project-related impacts that would have the greatest potential to affect local populations include construction-related noise emission, air pollutant emissions, and traffic. However, no disproportionate, adverse impacts on local minority populations are expected to occur as a result of project construction for a number of reasons. First, these impacts would be mostly restricted to the confines of CAFS. Locations that would be considered minority areas are distant from the project site. Second, the distance between the project and any potential minority areas would be great enough to dissipate the effects listed above. For example, although the Yukon-Koyukuk Borough would be considered a minority area, the Borough border is approximately 2.5 miles from CAFS and the nearest town in that Borough, Nenana, is 22 miles north of the site boundary. The distance between the LRDR project site and the Yukon-Koyukuk Borough by itself makes it unlikely that any minority populations in Nenana or the Yukon-Koyukuk Borough would be affected. Finally, any construction impacts would be temporary in nature and would largely subside when construction is complete. Considering the above factors, no significant, adverse impacts to minority populations are expected.

Impacts on Low Income Populations. The type and extent of potential project-construction related impacts to low income populations in the vicinity of CAFS would be the same as described above for minority populations. Consequently, no significant, adverse impacts to low income populations are expected from operation of the proposed LRDR.

Impacts on Subsistence Populations. No known subsistence level hunting, fishing, or trapping occurs near CAFS. Therefore, no impacts to subsistence populations are anticipated.

Impacts on Community Health. As discussed in Section 3.6.5, the Denali and Yukon-Koyukuk populations experience similar or more positive health trends than that of Alaska and the U.S., with the exception of health insurance coverage. The potential health impacts on local populations from construction of CAFS are expected to be limited to minor noise impacts and

possibly impacts related to the increased emissions and traffic delays associated with worker vehicles and transportation of materials and supplies to the site. These impacts would be temporary and largely limited to the LRDR site and surrounding areas.

Children's Health. Children generally are not present at CAFS, as it is an active military installation. The nearest school to the site is Browns Court School, approximately 3 miles south of the southern boundary line (USEPA, 2013a). The nearest town, Anderson, is 4 miles to the north of CAFS. Healy is approximately 30 miles south of CAFS. Both towns are a considerable distance from the construction site. CAFS construction activities are therefore unlikely to disproportionately impact children living in residences outside the project site or attending schools in the surrounding area.

4.6.2.2 Operation

The potential for negative environmental impacts during operation would largely be minimized through the application of routine operational procedures. No specific populations, including minority, low income, or children, would be disproportionately impacted by operation of the LRDR facility based on the following: 1) low income or minority populations are not in close proximity to the site, 2) during operation, only minor, insignificant negative impacts are expected, and 3) low income and minority populations would not encounter a disproportionate share of any negative impacts from the operation because of (1) and (2) above.

Impacts on Minority Populations. LRDR environmental justice operational impacts would likely be negligible to nonexistent as a result of the permanent LRDR location. This is due in part to the distance between the LRDR project site and the Yukon-Koyukuk Borough which would make it unlikely that any minority populations in Nenana or the Yukon-Koyukuk Borough would be affected. Although impacts such as operation-related air and noise emissions would occur, particularly during testing of the power plant diesel engine-generator sets, they would be most noticeable within the confines of CAFS. Also, such impacts would be temporary, intermittent and of relatively low magnitude so that the general population - as well as minority populations outside of CAFS - would not be significantly affected. Likewise, impacts from increased local operation-related commuter traffic would be of low volume and therefore, would not disproportionately affect the general or minority populations. Consequently, no disproportionate impacts to minority populations are expected from operation of the proposed LRDR.

Impacts on Low Income Populations. The type and extent of potential project-operation related impacts to low income populations in the vicinity of CAFS would be the same as described above for minority populations. Consequently, no significant, adverse impacts to low income populations are expected from operation of the proposed LRDR.

Impacts on Subsistence Populations. No known subsistence level hunting, fishing, or trapping occurs near CAFS. Therefore, no impacts to subsistence populations are anticipated from operation of the proposed LRDR.

Impacts on Community Health. The operation of the LRDR, especially the power plant, has the potential to result in air and noise emissions, sewage releases, (due to additional staff onsite) and chemical releases (from wastewater treatment processes) that could affect public health, including the health of low income and minority populations. Due to the temporary and intermittent nature of air and noise emissions, the low likelihood of sewage releases and chemical releases, and the implementation of appropriate mitigation measures (e.g., noise attenuation equipment; wastewater/sewage treatment processes; chemical storage/management facilities), the potential health impacts on local populations from operation of the proposed LRDR site would be expected to be negligible.

Children's Health. No impacts to children's health are anticipated, as children are not to be expected near the proposed LRDR location.

4.6.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

The environmental justice impacts from construction and operation of Alternative 2-Site 3B would be the same as those for Alternative 1-Site 3A described in Section 4.6.2.

4.6.4 Potential Impacts of the No Action Alternative

Under the No Action alternative, the project would not be implemented. Minority and low income populations would not be affected by the project.

4.6.5 Mitigation Measures Alternative1-Site 3A and Alternative 2-Site 3B

4.6.5.1 Construction

Because no disproportionate environmental justice impacts are expected during construction of either alternative, no environmental justice specific mitigation measures are proposed. Construction BMPs discussed throughout this EA to minimize impacts to air quality, water quality, traffic, ambient noise environment, health and safety, socioeconomics, and land use would serve to minimize the potential for significant impacts to community health in the area around CAFS.

4.6.5.2 Operation

Because environmental justice impacts from operation of either alternative are not expected, no mitigation measures are proposed. Operational BMPs discussed throughout this EA to minimize impacts to air quality, water quality, traffic, ambient noise environment, health and safety,

socioeconomics, and land use would also serve to minimize the potential for significant impacts to community health in the area around CAFS.

4.7 GEOLOGY AND SOILS

Impacts to geological resources would result through clearing, grading and excavation for construction of proposed LRDR facilities; laydown areas and LRDR Man Camp facilities; and construction activities related to the non-mission support facilities.

4.7.1 Analysis Methods

Proposed activities that could influence geological resources were evaluated to determine the type and magnitude of potential impacts. The anticipated changes that could occur if the Proposed Actions were implemented compared to the existing environment and evaluated to determine if significant changes in any existing conditions would occur. The impact of an action on geological resources is significant if it depletes the Regional or local resource, activates a fault, initiates slumping events, or causes an event with irreparable damage or injuries. Impacts to soil are significant if an action accelerates the rate of erosion, or substantially degrades soil characteristics. Impacts would not be significant if a resource is only slightly affected. Reduction of a hazard or erosion potential is a beneficial impact.

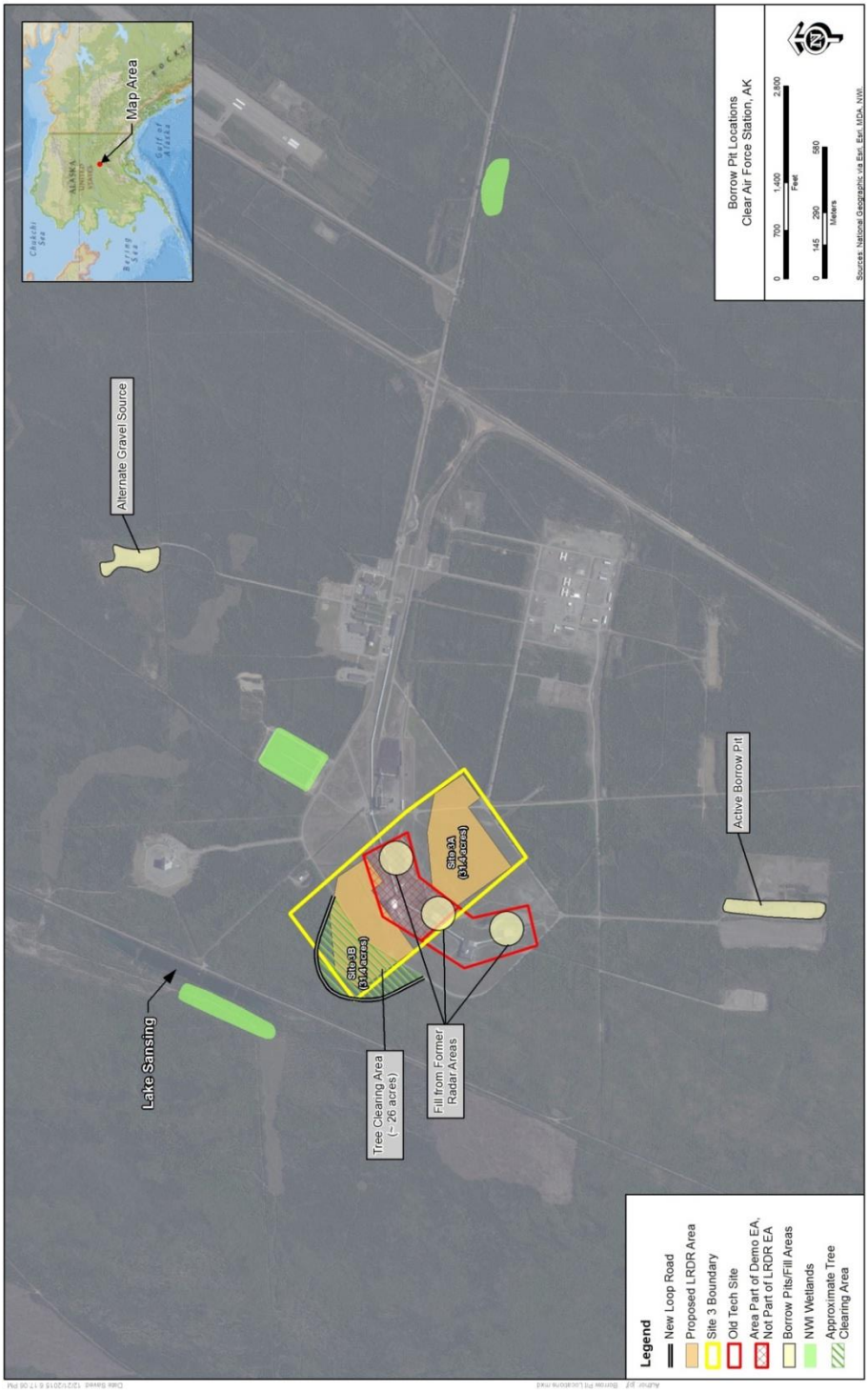
4.7.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.7.2.1 Construction

Approximately 45 acres would be impacted during the Implementation of Alternative 1-Site 3A. Grading impacts to topography would not be significant during the site preparation process; however, existing topography would be slightly modified during site grading to address potential drainage damage concerns at the site. To improve the current drainage conditions at the site, it has been estimated that an average of 6 to 8 ft (average at 7 ft) of fill would be provided throughout the LRDR site (PDC, 2015). For Site 3A, this would require approximately 220,000 cubic yards (cy) of fill. A calculated estimate of 121,460 cy of recoverable soil would be available for the grading and development of site topography from the decommissioning of the previous radar embankments. The fill and borrow source areas are shown on Figure 4.7-1. An estimated 80,000 cy of fill would be required. Several borrow areas on the installation are an available mineral resource; the quality and extent of the sources are unknown (see Figure 4.7-1). Precautions would be taken to avoid subsidence of any graded or fill material to avoid creating sinkholes or areas of poor drainage.

Any fill material would be tested to ensure proper engineering characteristics and would be properly compacted to ensure stability of the surface and to reduce the potential for erosion. The potential for erosion by precipitation and runoff is slight due to nearly level land (slopes are approximately 0.5 percent). Wind erosion could potentially be severe when the vegetation and

Figure 4.7-1 Onsite Fill and Borrow Source Areas



organic layer are removed from soil. With implementation of BMPs, impacts to soil from grading, clearing and/or grubbing would not be expected to be significant. BMPs such as minimizing the construction footprint to the extent possible, daily watering and revegetating exposed soil at the site as soon as possible, or soil stabilization when conditions warrant, would reduce any impacts to the soil.

Excavations would generally be approximately 6 to 8 ft deep with some areas up to 15 ft deep. Grading and excavations would slightly modify the topography to improve drainage in limited areas.

Depending on the final design of the LRDR, borings up to 30 ft deep could be required for piers to support the facilities and associated buildings. The underlying geological layers could be impacted from a depth of 8 to 30 ft, but not significantly. As discussed in Section 3.7, the material underlying soils is mainly unconsolidated alluvium to a depth of several hundred feet. This alluvium is a source of groundwater, which is used at the installation for domestic and industrial uses. Using groundwater as the water supply for the project's cooling and facilities and LRDR Man Camp could possibly impact the underlying alluvium to 500 ft bgs. Groundwater depths at CAFS range from 55 to 65 ft bgs. Typical water wells at CAFS are 150 ft deep. Boring in the alluvium would not significantly impact the hydrogeologic properties of this layer.

However, if a spill of a liquid or soluble hazardous material would occur during construction activities, it could be transmitted to the groundwater through the gravel and sand alluvium. Measures would be taken to prevent spills of hazardous materials and if any spills occur, they would be cleaned up promptly to prevent potential contamination of the underlying aquifer in accordance with the HMWP. Thus, impacts to geological resources would not be significant. Discussions of additional impacts to site hydrological resources are provided in Section 4.15, Water Resources.

As discussed in Section 3.7.2, the Denali fault is approximately 60 miles south of CAFS. The installation is located in Zone 3 for potential earthquake damage with slight to moderate damage anticipated from any seismic event (USAF, 1992). Expected magnitudes from seismic activities could range of 5.5 to 6.5 on the Richter Scale (VIII on the Modified Mercalli Scale). All new facilities would be constructed in accordance with the requirements of UFC 3-301- 01 *Structural Engineering* and UFC 3-310-04 *Seismic Design for Buildings*. Therefore, impacts from seismicity would not be assumed to be significant.

Though not expected to be prevalent at the installation, permafrost, perennially frozen ground is common in the Region. Permafrost could be hazardous when it lies under proposed new facilities because soils could be susceptible to frost heave, or upward movement of facility foundations due to freezing of the surrounding soil. With implementation of BMPs and conducting a detailed permafrost and moisture assessment, impacts to soil from grading, clearing, and grubbing would not be significant.

There are no IRP sites within the planned project area (USAF, 2013a). If any contamination occurs to soil or geology, or is discovered, during construction activities, remediation according to State and Federal standards would be provided.

4.7.2.2 Operations

Ongoing operations at the LRDR facilities would have impacts to the geology and soils similar to construction, but would be more limited. Limited ongoing erosion control and vegetative provisions would be in place and implemented. Proper hazardous material handling procedures would be in place to prevent spills of hazardous materials and if any spills would occur, they would be cleaned up promptly to prevent potential contamination of the underlying aquifer. Frost heave would be monitored.

4.7.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

4.7.3.1 Construction

Impacts to geology and soils associated with construction of Alternative 2-Site 3B would be the same as those described for Alternative 1-Site 3A in Section 4.7.2.1, except for the following.

Approximately 57 acres would be impacted by Alternative 2-Site 3B, including approximately 26 acres of tree clearing. Grading impacts to topography would not be significant during the site preparation process; however, existing topography would be slightly modified during site grading to address potential drainage damage concerns at the site. To improve the current drainage conditions at the site, it has been estimated that an average of 6 to 8 ft (average at 7 ft) of fill would be provided throughout the LRDR site (PDC, 2015). For Alternative 2-Site 3B, this would require up to 359,350 cy of fill. A calculated estimate of 121,460 cy of recoverable soil would be available for the grading and development of site topography from the decommissioning of the previous radar embankments. An estimated 235,890 cy of fill would be required. The fill and borrow source areas would be that as for Alternative 1-Site 3A and are shown on Figure 4.7-1.

4.7.3.2 Operations

Impacts to geology and soils associated with operation of Alternative 2-Site 3B would be the same as those described for Alternative 1-Site 3A in Section 4.7.2.

4.7.4 Potential Impacts of the No Action Alternative

If the LRDR facilities are not constructed, the geology and soils at the proposed site would not be impacted**.**

4.7.5 Mitigation Measures – Alternative 1-Site 3A and Alternative 2-Site 3B

There would be no significant impacts to geology or soil. Therefore, no mitigations would be required or are proposed. BMPs would be used to address potential impacts.

4.8 HAZARDOUS MATERIALS AND HAZARDOUS WASTE MANAGEMENT

Hazardous materials are used on a routine basis at CAFS and would not change with the installation of the LRDR. The construction and operation of the LRDR facility would involve the same hazardous materials as those described in Section 3.8. No new hazardous materials would be introduced.

4.8.1 Analysis Methods

Existing management and action plans were reviewed to assess the potential impact of the activities involved with the LRDR installation. These plans include CAFS HWMP (BAE, 2015a), Spill Management Plan (BAE, 2015b), and IRP (USAF, 1993).

4.8.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.8.2.1 Construction

The existing CAFS HWMP plan requires that all outside Contractors provide a list of hazardous materials and associated Safety Data Sheets (SDSs) which would be used during the performance of their work (BAE, 2015a). A HazCom Program for the site would need to be established during the initial planning stages of construction. At least one member of the construction team would be responsible for the enforcement of the Hazardous Material and Waste (HazWst) Management Program at the site. A controlled HazWst storage area with containment pallets for drums, containment cabinets, spill containment equipment, etc., during construction would be established and secured by the Contractor’s HazWst Manager.

The operation and maintenance of motorized vehicles during the construction of the LRDR facility would involve the same types of materials and wastes that are currently in use and generation at the installation motor pools. All fuels, oils, solvents, coolants, and wastes associated with motorized equipment would be stored and managed in accordance with the Construction HazCom program. Waste disposal would be provided directly by the Construction Contractor and coordinated with CAFS HWMP.

Paints, coatings, and solvents used during construction would need to be addressed in the Contractor’s HazWst management program and stored and staged in the Contractor’s HazWst storage area.

ACM or LBP would not be allowed to be brought onsite during construction of the LRDR under Alternative 1-Site 3A or supporting Man Camp installations.

4.8.2.2 Operations

LRDR facilities are subject to restricted area security procedures and would require a designated HazCom Manager to enforce a site specific health and safety plan while also addressing HazWst concerns within these restricted areas. This LRDR HazCom manager would be responsible and coordinate the delivery and disposal of all hazardous materials with CAFS HWMP manager. SDSs would be the responsibility of the LRDR HazCom Manager who would provide access to the SDSs at all locations where hazardous materials would be used and stored.

The amounts of hazardous materials which would be used during LRDR operation would be minimal and would consist of motor pool materials such as compressed gases, lubricants, oils, fuels, and solvents. Routine building maintenance and cleaning would require the use of paints, pesticides, and cleaning products as are already being used throughout the installation. Spill response kits and fire extinguishers would be made available at all storage areas.

The LRDR installation would have new emergency diesel generators including a fuel storage system. This system would include several below-grade storage tanks which would be double-walled, welded steel tanks with epoxy-coated interiors that would be placed in concrete vaults. The supply piping to the generators would be in double walled underground piping equipped with a leak detection system. A remote tank fill station would be provided within a containment basin. The addition of these tanks would not increase the effective storage capacity of the facility above the threshold of 420,000 gallons of refined petroleum product. Although the tanks at CAFS would continue to be regulated by USEPA and State Fire Marshall requirements, the tanks would not be regulated by the ADEC under AAC Title 18, Chapter 75, Oil, and Hazardous Substances Pollution Control (BAE, 2015b). These new tanks and associated fill systems would be integrated into the existing CAFS Spill Management Plan involving routine inspection.

Hazardous wastes generated would be stored temporarily within the LRDR secure area prior to transfer to CAFS main hazardous waste storage facility for disposal or recycling. This hazardous waste stream would reflect maintenance activities currently occurring at the motor pool and used by building services. Waste materials would consist of paints, solvents, oil, lubricants, antifreeze, and batteries.

The potential for accidental release of hazardous materials would be very limited during the operation of the LRDR. The largest amount of material which could be spilled would involve motor pool and electrical generator fuels which would be subject to routine inspection as dictated in the Spill Management Plan. The double containment and leak detection systems installed on the fuel delivery system would provide early detection to mitigate a large scale release. Other hazardous motor pool materials, such as oils and antifreeze, would be present in smaller

quantities. Spills would be responded to immediately in accordance with CAFS existing response plans resulting in minimal impact on personnel or the environment.

Mitigation concerns would be minimized during normal operations by adhering to the policies and procedures outlined in the installation-wide CAFS HWMP and Spill Management Plan. DoD safety procedures have been in place for a long time in dealing with the transport, handling, and storage of fuel for military systems. Therefore, adherence to these existing DoD procedures will mitigate potential exposures.

4.8.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

Hazardous materials and hazardous waste management impacts associated with construction and operation of Alternative 2-Site 3B would be the same as those described for Alternative 1-Site 3A in Section 4.8.2.

4.8.4 Potential Impacts of the No Action Alternative

If the LRDR facility is not constructed or operated, there would be no potential for the release of ACM, LBP, PCBs, or used oils during demolition of existing structures. There would also be no potential release of diesel fuel from the new storage facility and associated piping. No environmental impacts would occur if the LRDR facility is not installed.

4.8.5 Mitigation Measures - Alternative 1-Site 3A and Alternative 2-Site 3B

No significant impacts from hazardous materials and hazardous waste management have been identified for the construction and operation of the LRDR project under either alternative. No mitigations relating to hazardous materials and hazardous waste management would be required. BMPs would be followed including implementation of existing plans and procedures, or modifying them if required, for the LRDR facilities.

4.9 HEALTH & SAFETY

The proposed LRDR activities at CAFS would not significantly increase health and safety impacts. Existing safety policies are in place to prevent risks for new operations but would be assessed and modified as needed to incorporate the operation of new missions.

4.9.1 Analysis Methods

For the LRDR project, it has been assumed that construction contractors would prepare and implement JHA and Safety Plan documentation to ensure safe working conditions during construction activities in accordance with applicable guidelines. Because this documentation would be prepared and implemented as part of the construction activities, no further health and safety analysis for construction activities would be required.

For the operations for the LRDR project, a preliminary analysis was performed to quantify the RF safety zones and resulting impacts to the working area around the planned LRDR locations (MDA, 2015). Although the details of the specific radar unit to be used has not been completed (e.g., Radar Contractor not selected and equipment not established), the analysis conducted (defined as follows) provided conservative initial results regarding RF safety for the LRDR project.

The following is a summary of the preliminary RF assessment conducted (MDA, 2015a):

> Based on the potential locations of the LRDR sites (Sites 3A and 3B located inside the current Old Tech Site [see Figure 2.1-1 for reference]), the two key areas assessed where site personnel could be exposed to LRDR RF energy included the perimeter road that runs around the Old Tech Site and the roof top of the adjacent existing radar facility [referred to as the UEWR or SSPARS].
>
> For the perimeter road, the analysis was done specifically for the section northwest of existing Building 102/103 and at distance of approximately 400 meters (m) (1300 ft). With an assumed minimum allowable LRDR main beam elevation of 2 degrees, at an elevation of 2 m above ground level the expected maximum RF power density is well below the RF Controlled Area standard of 100 Watts per square meter. Therefore, the anticipated method of RF Safety implementation at this location would consist of a combination of main beam elevation control plus posted signage along the road commensurate with an RF Controlled Area.
>
> The analysis was also performed for the rooftop of the UEWR, the SSPARS Building 800. This point of interest is approximately 35 m (115 ft) above ground level at a ground distance from LRDR of 1,120 m (3,675 ft). Preliminary indications are that RF power density level at this point will not exceed the RF Controlled Area safety standard of 100 Watts per square meter with the LRDR main beam at 2 degrees elevation, although this level could be exceeded if the beam is pointed at a lower elevation. Similar to RF Safety provisions for the perimeter road, RF Safety implementation in this location will be a combination of LRDR main beam elevation control plus posted signage on the UEWR roof commensurate with an RF Controlled Area. The minimum allowable LRDR main beam elevation towards UEWR would be based on actual field measurements of the as-built system during LRDR integration.
>
> Although any impacts should be mitigated based on previously described RF safety provisions, several items should be noted regarding the RF safety limits, measurement results obtained, and concept of operations. The Maximum Permissible Exposure (MPE) is frequency dependent and averaged over a specific time period. For S-band (the LRDR frequency band) the MPE is 100 Watts per square meter averaged over any contiguous 6-minute period. This standard would allow the 100 Watts per square meter limit to be exceeded (up to a defined maximum) as long as the power density averages to 100 Watts per square meter over the 6-minute interval. Also note that the worst case MPE at any specific point of interest would occur when the radar beam is stationary and radiating

maximum power in that specific direction. The LRDR RF Safety mitigation software would include full knowledge of the surrounding environment and be designed to not allow power density to exceed the allowable levels of a controlled environment through a combination of modulating the transmit power and/or moving the main beam. This is standard operating procedure for DoD land-based radars, and LRDR would be in full compliance with all applicable RF safety standards.

Once the specific radar system is known (Radar Contractor selected and specific equipment for application determined), a follow-up analysis would be provided to confirm the results of the preliminary analysis and establish the specific RF safety zones based on the specific equipment provided.

In addition to the analysis defined above, to implement responsibilities related to the RF safety, CAFS has an established program, CAFS *Radiation Safety Program Instruction* (USAF, 2007b) that assigns radiation safety responsibilities to ensure all personnel, including escorted and unescorted visitors, do not encroach onto restricted areas.

Therefore, based on the preliminary analysis of the LRDR system and implementation of the existing RF safety procedure, no significant health and safety impacts would occur due to the operation of the LRDR project.

4.9.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.9.2.1 Construction

A Construction Health & Safety Program (CHSP) for the site would be established during the initial planning stages of construction. This CHSP would incorporate all aspects of existing CAFS safety and health policies, new Job Hazard Analyses and Safety Plan procedures applicable to work being conducted.

Construction activities would impact existing CAFS operations with additional vehicle traffic and deliveries which would increase vehicle accident risks slightly. Establishing alternative time and route patterns would reduce the potential risk for these types of equipment related concerns.

Fuels, paints, coatings, and solvents used during construction would be addressed in the Contractor’s CHSP with associated SDSs for all materials, and stored and staged in the contractor’s HazWst storage area. Spill response and prevention would be coordinated with the existing CAFS Spill Management Plan (BAE, 2015b).

The CHSP would reflect all existing CAFS fire protection and medical emergency services procedures. Any additional protective measures deemed necessary would be identified and coordinated with CAFS prior to the initiation of activities such as confined space entry rescue and other critical high risk actions.

Overall construction activities of the LRDR project would not result in significant health and safety impacts due to the implementation of Contractor and installation health and safety planning documents.

4.9.2.2 Operation

LRDR facilities would be subject to restricted area security procedures and would require a designated HazCom manager to enforce a site specific health and safety plan addressing HazWst concerns within these restricted areas. This LRDR HazCom manager would coordinate the delivery and disposal of all hazardous materials with the CAFS HWMP manager. SDSs would be the responsibility of the LRDR HazCom manager who would post the SDSs at all locations where hazardous materials would be used and stored.

Hazardous materials which would be used during LRDR operation would be minimal and would consist of motor pool materials such as compressed gases, lubricants, oils, fuels, and solvents. Routine building maintenance and cleaning would require the use of paints, pesticides, and cleaning products as are already being used throughout the installation. Spill response kits and fire extinguishers would be made available at all storage areas.

The LRDR installation would have new emergency diesel generators including a fuel storage system. This system would include several below-grade storage tanks which are double-walled, welded steel tanks with epoxy-coated interiors and would be placed in concrete vaults. The supply piping to the generators would be in double-walled underground piping equipped with a leak detection system. These new tanks would be integrated into the existing CAFS plans involving routine inspection. Confined space entry and rescue procedures would be implemented into all subsurface inspections as necessary.

Safe distance zones determined by the RF analysis would be established once final Radar Contractor and equipment have been established. These new zones would be identified and documented in the existing CAFS *Radio Frequency Radiation Safety Program Instruction* (USAF, 2007b).

Overall operation of the LRDR project would not result in significant health and safety impacts due to the assessment of hazards, and establishment and implementation health and safety procedures.

4.9.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

Health and safety impacts associated with construction and operation of Alternative 2-Site 3B would be the same as those described for Alternative 1-Site 3A in Section 4.9.2.

4.9.4 Potential Impact of the No Action Alternative

If the LRDR facility is not installed, there would be no impact on health and safety.

4.9.5 Mitigation Measures - Alternative 1-Site 3A and Alternative 2-Site 3B

No significant health and safety impacts were identified for either Alternative 1-Site 3A or Alternative 2-Site 3B and mitigations would not be required. BMPs including establishment and implementation health and safety procedures would be followed during construction and operation of the project under both alternatives.

4.10 LAND USE

4.10.1 Analysis Methods

The evaluation considered whether the Proposed Action would result in direct impacts (e.g., conversion of natural forest to industrial facility) or indirect impacts (e.g., relocation a facility to a different area on the installation to accommodate the LRDR components) via the following conditions:

- Conflict with existing land uses on surrounding properties in the area;
- Conflict with local and Regional land use plans applicable to project areas; or
- Conversion of existing land uses from one type to another.

The analysis was largely based on existing, available resources, including CAFS *Installation Development Plan* (USAF, 2013a), CAFS ICRMP (USAF, 2015a), the IRP (USAF, 1993), CAFS INRMP (USAF, 2015b), and the EA for the "*New Mission Beddown and Construction, CAFS, AK*," (MDA, 2012). Information obtained during a 22 July 2015, site visit was also used to confirm and supplement these resources.

All potential land use impacts would largely be contained within the CAFS fence line.

4.10.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.10.2.1 Construction

Land Use Impacts. As shown on Figure 2.2-2, Alternative 1-Site 3A would be located in a previously disturbed area of the base compound. The location has been cleared of trees in the past and would involve minimal, temporary preparation before construction crews could begin soil disturbing activities. Temporary impacts caused by construction equipment (dust and noise pollution) would end once construction ceases. Although new facilities would be constructed on the site and it would be unavailable for other purposes (e.g., recreation, green space, residential housing, etc.), its use (i.e., military/defense development) would remain consistent with current

patterns and with the mission of CAFS. Therefore, no significant, adverse land use impacts would occur.

The LRDR Man Camp would be located on previously disturbed land of the base compound and thus would not result in a change in land use. There would be a need to disturb soil to install infrastructure, but the land use impacts from this work would be minimal and temporary and would not affect existing land use patterns or be inconsistent with CAFS mission.

The repair of the Clear Road and the construction of the LRDR-specific non-mission facilities would not result in significant land use impacts because there would be no substantive conversion of existing land use activities or physical attributes.

Construction of the LRDR infrastructure and buildings would not require any substantive relocation or modification of any operating activities or facilities.

Consistency with Land Use Plans and Policies. Construction activities associated with the LRDR would be consistent with land use management plans and policies in effect at CAFS. A review of CAFS *Installation Development Plan*, the INRMP, the ICRMP, and the IRP did not reveal any provisions or locations with which the LRDR construction or operation would conflict. In fact, the LRDR project as a whole is consistent with the mission of the 13th SWS and CAFS.

In addition, it is unlikely that project construction activities would conflict with any land use and management plans of surrounding area because impacts associated with the LRDR facility, if any, (such as visual impacts, noise impacts, fugitive dust, etc.) would be largely restricted to the confines of CAFS. Consequently, substantive conflicts with offsite land management and land use plans and policies would not be expected.

4.10.2.2 Operation

Once construction is complete, the LRDR facility would include national defense operations, facilities, and activities that would be consistent with past and current operations and facilities at CAFS. All facilities and operations would be restricted to CAFS proper. Consequently, no significant impacts to land use on CAFS or in the surrounding vicinity would occur.

No significant visual impacts would result from the project. The nearest community is located approximately 4 miles away from CAFS and would not experience any view of the newly constructed LRDR.

During operation, the Man Camp would likely be closed and removed as there would not be a need to accommodate the additional workforce required for the construction phase. Consequently, no post-construction impacts from the Man Camp would occur during operation

Operation of the LRDR facility would be consistent with land use management plans and policies in effect at CAFS. Based on review of CAFS *Installation Development Plan*, INRMP, ICRMP, and IRP, there are no constraints from CAFS on land use associated with the LRDR facility. Further, the operation of the LRDR facility would be consistent with the mission of the 13th SWS and CAFS.

It is unlikely that project operation would conflict with any land use and management plans of surrounding area because impacts associated with the LRDR facility (such as visual impacts, noise impacts, fugitive dust, etc.) would be largely restricted to the confines of CAFS. Consequently, conflicts with offsite land management and land use plans and policies would not be expected.

4.10.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

4.10.3.1 Construction

Construction-related land use impacts to Alternative 2-Site 3B would be similar to those described for Alternative 1-Site 3A except as described in this section. Alternative 2-Site 3B is largely located on previously disturbed land. However, Alternative 2-Site 3B would require the clearing of approximately 26 acres of trees beyond the existing developed area at CAFS. The wooded land that is proposed to be cleared (shown on Figure 2.2-5) is owned by CAFS and therefore is not used for public recreational purposes (although some employees of CAFS may use the wooded area for recreational purposes such as hiking and fishing in the nearby lake). Clearing of this area for use as a component of the LRDR facility would not affect CAFS's status as a military defense post, but would permanently eliminate its availability to military personnel as a recreational resource. Overall, however, no significant, project-related impacts to recreational facilities or activities would be expected because: (1) the availability of large expanses of public land in close proximity to CAFS and in the Region would make alternative recreational opportunities readily available; and (2) the use of said property for national defense purposes supersedes its use as a recreational resource.

4.10.3.2 Operation

Land use impacts associated with operation of Alternative 2-Site 3B would be the same as those described for Alternative 1-Site 3A in Section 4.10.2.2.

4.10.4 Potential Impacts of the No Action Alternative

Under the No Action alternative, the LRDR would not be constructed or operated. Site conditions would not be affected by the project. The existing use of the forested portion of Site 3B would continue to be available as natural habitat and as a recreational resource to on-installation personnel.

4.10.5 Mitigation Measures - Alternative 1-Site 3A and Alternative 2-Site 3B

Regardless of the alternative selected for LRDR facilities, all personnel would use BMPs during construction for waste disposal, soil erosion prevention, and spill response that would help minimize impacts on CAFS and surrounding area.

During operation, regardless of the sites selected for LRDR facilities, all personnel would conduct operation and maintenance procedures to help minimize the possibility of any environmental spill incidents. Additionally, BMPs for handling waste, spill response, and any other issues would be used to minimize impacts on CAFS and surrounding areas.

4.11 NOISE

Project construction would typically result in intermittent, short-term noise effects that would be temporary, lasting for the duration of the noise-generating construction activities. Noise-generating construction activities would usually include excavation and grading, utility construction and paving, and frame building. Excavation and grading would normally involve the use of bulldozers, scrapers, backhoes, and trucks. The construction of buildings likely would involve the use of pile drivers, concrete mixers, pumps, saws, hammers, cranes, and forklifts.

Project operation would involve the use of power generators. The noise associated with generators would typically be controlled by using standard silencing packages (mufflers) provided by the manufacturer and routine maintenance and inspection of such systems.

No substantive impacts to ambient noise levels or sensitive receptors would be expected to occur due to the project construction or operation.

4.11.1 Analysis Methods

The evaluation of potential environmental noise impacts considered whether the Proposed Action, conceptually superimposed on the existing ambient noise environment would cause any of the following conditions:

- Changes in ambient noise levels onsite or in the surrounding area.
- Conflict with any applicable noise standards, guidelines, or regulations.

4.11.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.11.2.1 Construction

Construction activities can cause a temporary increase in sound that is well above the ambient level. Table 4.11-1 lists noise levels associated with common types of construction equipment. Construction equipment usually exceeds the ambient sound levels by 20 to 25 dBA in an urban environment and up to 30 to 35 dBA in a quiet suburban area.

Table 4.11-1 Predicted Noise Levels for Construction Equipment

Construction Category and Equipment	Measured Noise Level at 50 feet (dBA)
Clearing and Grading	
Bulldozer	82
Grader	85
Truck	74–81
Roller	80
Excavation	
Backhoe	78
Jackhammer	89
Building Construction	
Concrete mixer	79
Welder	74
Pile driver	101
Crane	81
Paver	77
Source: FHWA 2006	

Individual equipment used for construction activities would be expected to result in noise levels comparable to those shown in Table 4.11-1. Noise from construction activities varies depending on the type of equipment being used, the area that the action would occur in, and the distance from the noise source. To predict how these activities impact adjacent populations, noise from probable equipment was estimated. For example, construction usually involves several pieces of equipment (e.g., bulldozers and trucks) that can be used simultaneously. Under the Proposed Action, the cumulative noise from the equipment, during the busiest day, was estimated to determine the total impact of noise from construction activities at a given distance. Examples of expected cumulative construction noise during daytime hours at specified distances are shown in Table 4.11-2.

Table 4.11-2 Estimated Noise Levels from Construction Activities

Distance from Noise Source (feet)	Estimated Noise Level in dBA
50	90–94
100	84–88
150	81–85
200	78–82
400	72–76
800	66–70
1,200	< 64

These sound levels were estimated by combining the noise from several pieces of equipment and then calculating the decrease in noise levels at various distances from the source. Because sound pressure levels are based on a logarithmic scale they cannot be added directly (OSHA, 2005). Noise attenuation was estimated using the hemispherical radiation from a point source (OSHA, 2005). Point source attenuation is applicable in this situation as the construction equipment is likely to be more or less stationary and grouped together for the duration of construction; unlike line source attenuation used for linear features such as highways.

No significant, construction-related noise impacts would occur at the project sites or in the surrounding area under Alternative 1-Site 3A. LRDR facility construction activities would be audible to on-installation personnel, and could be faintly audible in the communities of Clear or Anderson. However, sound levels would not be expected to be intrusive and any environmental noise impacts from LRDR construction would be temporary. LRDR construction equipment would be outfitted with standard noise control measures, such as mufflers on diesel engine-powered equipment. As much as possible, noisier LRDR construction activities, such as pile-driving, would be limited to daytime hours.

Other than the City of Anderson's general nuisance ordinance, there are no local restrictions or guidelines governing noise emissions. As indicated above, construction activities may be faintly audible in Anderson. However, such levels would not be to the degree that would be expected to result in noise complaints.

4.11.2.2 Operation

Potential new LRDR noise sources would include the LPP, the electrical substation, and general building mechanical systems. During LRDR operation under Alternative 1-Site 3A, these sources would be expected to contribute less overall noise to the environment than the existing coal-fired power plant, which would be taken out of service under a separate action. The most significant new noise sources would be the diesel engines that would be located within the shielded Power Plant building. The shielded building would be expected to significantly reduce the diesel engine environmental noise contribution. As needed, any outdoor diesel engine exhaust stacks would be outfitted with standard noise control, such as silencers, to minimize their environment noise impact.

The overall environmental noise contribution from LRDR facility operation would not be expected to result in day-night average sound levels in excess of the USEPA 55-dBA guideline at the nearest residential properties in the cities of Clear or Anderson. Similarly, on-installation office and dormitory areas would not be exposed to any greater noise impacts than what they have been with the operation of the coal-fired power plant. In fact, the noise impacts would be less because the diesel engines at the power plant would operate only intermittently, as opposed to the steady-state operation of the boilers and related equipment at the existing coal-fired power plant.

The City of Anderson's general nuisance ordinance is the only local restriction governing noise emissions. Operation activities would not be audible in Anderson and would not be expected to result in noise complaints.

4.11.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

Impacts from noise associated with construction and operation of Alternative 2-Site 3B would be the same as those described for Alternative 1-Site 3A in Section 4.11.2.

4.11.4 Potential Impacts of the No Action Alternative

Under the No Action alternative, the project would not be implemented, and the new power plant and LRDR-associated heating, cooling, and ventilation equipment would not be installed. Because the decommissioning of the existing power plant (i.e., elimination of a primary on-installation noise source) is already planned, the No Action alternative would result in lower noise impacts than the Proposed Action.

4.11.5 Mitigation Measures - Alternative 1-Site 3A and Alternative 2-Site 3B

No mitigation for noise would be required under Alternative 1-Site 3A or Alternative 2-Site 3B. Under both alternatives, BMPs would be followed during construction and operation activities to control any noise impacts.

During construction, LRDR construction equipment would be outfitted with standard noise control measures, such as mufflers on diesel engine-powered equipment. As much as possible, noisier LRDR construction activities, such as pile-driving, would be limited to daytime hours.

During operation, the most significant new noise sources would be the diesel engines located within the shielded Power Plant building. The shielded building would be expected to significantly reduce the diesel engine environmental noise contribution. As needed, any outdoor diesel engine exhaust stacks would be outfitted with standard noise control, such as silencers, to minimize their environment noise impact.

4.12 SOCIOECONOMICS

4.12.1 Analysis Methods

For socioeconomics, the evaluation of potential impacts considered whether the Proposed Action would cause any of the following conditions:

- Reduce the desirability of local housing and the residential property values in the Region.
- Population and housing growth in the Region due to an influx of temporary (mostly construction) and permanent (operation) workers and their families.
- Substantial demands on community infrastructure and services.

- Reduce the desirability of local businesses and commercial property values in the Region.
- Induce population influx into the Region by providing new employment opportunities not otherwise anticipated, which may exert pressure on the housing market and public services.

4.12.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.12.2.1 Construction

Population. Project construction would occur over an approximate 5-year time period (2017 through 2022). The number of construction personnel would average 200 personnel with a peak of 350. As discussed in subsequent paragraphs, some (and possibly most) workers would be contracted from outside of the Region. Assuming that all 350 of the workers came from outside the Region, and were accompanied by an average of three people (for an average of 4 persons total), the influx of people into the Region for purposes of construction, it would be approximately 1,400. From a Regional perspective, this would be insignificant, representing less than 1 percent of the total Regional population and less than 1.5 percent of the Fairbanks North Star Borough population. However, from a local perspective, this would be substantial, representing a greater than 75 percent increase in the Denali Borough population (assuming that all would reside in Denali Borough) and a 25 percent increase in the Yukon-Koyukuk Borough population (assuming that all would reside in the Yukon-Koyukuk Borough). This would appear to present the potential for significant impacts on housing, services, and infrastructure. However, it is possible most workers would likely reside at the Man Camp on the installation. As such, family members would be located elsewhere in the Region, likely in the more-populated Fairbanks area. Given the impact on local populations would not be as great as the figures presented above may imply.

Employment and Income. Employment and income impacts would occur from the hiring of construction workers in the Region. For a major construction project such as the LRDR facility, labor would be drawn from throughout the Region and likely beyond. Figure 2.2-3 presents a summary of the jobs anticipated to be created during the various phases of construction. Based on construction personnel estimates provided by the MDA, the highest annual construction workforce is estimated to be 350 workers during FY 2019 and FY 2020.

As described in Section 3.12.3, since 2008, unemployment has historically been one or two percentage points lower in the Region than in the U.S. on average (U.S. Census, 2010a), although the Region was slightly higher than the Alaska average. Due to the relatively low unemployment rates in the region, the LRDR project could experience difficulties recruiting skilled workers from within the Region and may need draw from neighboring locales, such as Anchorage, AK. Additionally, due to construction being a relatively small percentage of employment (6.4 percent in the Interior Region, 11.8 percent in Matanuska-Susitna Borough),

there may not be a large base of skilled workers available in the Region to complete the work by the desired timeframe of 2022.

In the State of Alaska, the annual mean wage of a construction worker ranges from $49,890-$63,590 per year (BLS, 2014). During the peak of the construction at the LRDR site, this would mean $17,461,500-$22,256,500 per year would be made by workers either living in or commuting to the Region. Due to the increased wages being earned in the Region, expenditures by construction workers and contractors locally could indirectly generate additional income and service-based employment in the area.

Housing. Housing requirements for the area surrounding CAFS would be minimal, because a Man Camp would be constructed onsite to house the construction workers during the construction phase. Some workers and/or their families may choose to live offsite. If so, there appears to be adequate vacant housing (see Table 3.12-3) to accommodate the entire construction workforce housing needs in Denali Borough, Fairbanks North Star Borough, and the Region as a whole (assuming that a significant portion of these houses are suitable for living and available for rent or purchase). Consequently, the need for construction housing is not expected to cause a substantial impact to the housing market of the surrounding area (either availability or value of housing).

4.12.2.2 Operation

Population. Project operation would require 67 permanent workers, with most of these likely originating from outside of the Region, and brought in starting in 2020 when operation of the LRDR facility would be initiated. Assuming that all 67 of the workers would come from outside the Region, that all would be accompanied by families (which is a conservative assumption), and that each family averaged 4 people, the influx of operation-related people into the Region would amount to 268.

The Region's population is expected to increase by 33.0 percent by 2027 (U.S. Census, 2010a). Assuming a 2016 (start of construction) population of 201,019 (which would likely be conservatively low - see Table 3.12-1), this would equal an increase of 24,120 (based on a growth rate of 6,030 people per year) and a total population of 225,139 by 2020 (i.e., the date of initial operation, when LRDR workers would be moving in). LRDR workers and their families would represent an insignificant (approximately 0.1 percent) portion of the total Regional population at that point. However, the population impacts would be more substantive from a local perspective. The population increase represented by the workers and their families would amount to an approximate 15 percent increase in the Denali Borough population (assuming that all would reside in Denali Borough) and an approximate percent increase in the Yukon-Koyukuk Borough population (assuming that all would reside in the Yukon-Koyukuk Borough).

Initially, this would appear to present the potential for impacts on housing, services and infrastructure, however, it is anticipated that such impacts would be minor.

Employment and Income. While the economic and employment benefits from construction of the LRDR facility would be positive, they would only provide the greatest effect during a four year period from 2016 through 2020. On the other hand, individual benefits derived via personal income and fringe benefits (such as health insurance) during operations would occur throughout the service life of the LRDR facility. Permanent labor would be drawn from the Region and beyond. Table 4.12-1 summarizes the assumed LRDR operations personnel estimates.

Table 4.12-1 Assumed LRDR Operations Personnel Estimates

Operation Period	Anticipated LRDR Operation Activities	Daily Duration Assumptions
FY 2020 (second half of the year)	Normal Operation	Continuous, round the clock operation, total 67 personnel for entry control and maintenance.
FY 2021 through Indefinite End (year-round)	Normal Operation	Continuous, round the clock operation, total 67 personnel for entry control and maintenance.

Based on the estimates from the MDA, 67 new permanent employees would be added to CAFS to operate the LRDR. This number of new employees would have an impact on demand for local services such as restaurants and healthcare facilities; however, the level of impact would depend on the location that the new employees chose to live. If they live near the facility, then the impact on the local services would be greater due to the smaller number of services available in the less populated area. If the new employees decide to live in a more populated area, (such as Fairbanks, AK), and commute to CAFS, then their impact on local services would not be as large due to the greater amount of services already available for use in the higher population living location.

Housing. When considering the Region, the relatively small number of permanent positions to be filled for the operation of the LRDR facility would not place an onerous burden on housing. As indicated in Section 3.12.2, as of 2010, there were over 5,300 vacant houses in the Fairbanks North Star Borough and nearly 1,000 vacant houses in Denali Borough. Assuming that at least a portion of these houses would be suitable for living, affordable and available for sale, there would appear to be adequate housing available for incoming workers and their families, even if all 67 positions were filled by newcomers.

Further, the Region's population is expected to increase by 33.0 percent by 2027 (U.S. Census 2010a). Assuming a 2016 (start of construction) population of 201,019 (which would likely be conservatively low - see Table 3.12-1), this would equal an increase of 24,120 (based on a growth rate of 6,030 people per year) by 2020 (initial operation, when LRDR workers would be

moving in). LRDR workers and their families (assuming 4 people per family for a total of 268) would comprise approximately 1 percent (268/24,120) of this total increase and approximately 4 percent (268/6,030) of the annual increase. Therefore, the proportion of the housing demand increase represented by LRDR workers would be insignificant and would not add an undue burden to any Regional housing plans.

With the addition of the new dormitory to the LRDR project the potential need for offsite housing and the burden on the Regional housing supply would be reduced.

Business and Economy. The new workforce that the operation of the LRDR requires would place a higher demand on the personal services industry (restaurants, entertainment, groceries, etc.) in the immediate area surrounding CAFS. This demand may even impact the Region if desired services cannot be found by the new employees within the immediate area around CAFS. Overall, however, the operation of the LRDR would result in a relatively small increase in population (67 new positions and their families in a Region with 201,019 people) that would not noticeably increase demands on the Regional services industry, but could substantially impact the demand for more local (e.g., Anderson) services. In either case, the economic impact would be positive.

The operation of the LRDR facility would also require the purchase of various goods and professional services for facility maintenance and upkeep. The demand for such goods and services would likely range from intermittent (e.g., equipment repairs) to continuous (e.g., electric power; phone service) and although positive, would not be of the magnitude that would significantly affect the Regional economy. At a local level, however, the impacts could be more substantive, particularly in cases where a service would be required on an ongoing basis. Such circumstances may accommodate the expansion of existing businesses (e.g., a local maintenance contractor adds staff to accommodate the additional work) or the startup of new businesses.

4.12.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

Socioeconomic impacts associated with construction and operation of Alternative 2-Site 3B would be the same as those described for Alternative 1-Site 3A in Section 4.12.2.

4.12.4 Potential Impacts of the No Action Alternative

The No Action alternative would maintain the status quo with respect to demographic and socioeconomic conditions in the Region. Without the LRDR project, the potential for adverse impacts on local infrastructure and services would not be present. However, the Region would lose the potential for a project-induced stimulus to support economic growth and stability.

4.12.5 Mitigation Measures – Alternative 1-Site 3A and Alternative 2-Site 3B

There would be no significant socioeconomic impacts from construction or operation of the LRDR under Alternative 1-Site 3A or Alternative 2-Site 3B. Therefore, no mitigations are proposed.

4.12.5.1 Construction

The service and healthcare industries may need to hire additional staff in all areas in order to meet the increased demand for services at restaurants, stores, medical offices, and other local businesses created by the additional workforce. The hiring should coincide with the arrival of the new construction workforce, meet the demand created by the new work force, and may slightly reduce the unemployment rate in the Region over the construction period.

Many of the socioeconomic impacts on the Region during construction of the LRDR facility would be positive, particularly from increased revenue for local boroughs and numbers of jobs supported by construction. Any impacts to services or infrastructure would be minor. Consequently, mitigation measures for socioeconomic impacts would not be required or proposed due to construction of the LRDR.

4.12.5.2 Operation

The service industry may need to hire additional staff in various areas in order to meet the increased demand for services at restaurants, stores, medical offices, and other local businesses created by the additional workforce. The hiring should coincide with the arrival of the new operational workforce due to operation of the LRDR.

Due to the small number of new employees that would arrive in the Region compared to the total population of the Region, any adverse impacts to the Region would likely not be significant. Mitigation measures would not be required or proposed due to operation of the LRDR.

4.13 TRANSPORTATION

The capacity of Parks Highway, the Main Gate, and roads on CAFS were evaluated for this EA. (See Figure 3.13-1 for the existing road network within and in the vicinity of CAFS). Existing traffic counts were obtained from the Alaska Department of Transportation and Public Facilities (ADOT&PF) along Parks Highway north of and south of CAFS and from CAFS personnel for traffic counts at the Main Gate. There are no traffic volume data available for internal CAFS roads.

4.13.1 Analysis Methods

Traffic volumes are typically reported as Annual Average Daily Traffic (AADT) amounts, which represent the total volume of vehicles per day (vpd) as averaged by the entire year. For the

analysis of two-lane highways, the Peak Hour Volume or Design Hour Volume (DHV) and directional distribution of traffic are a few of the main inputs for the Highway Capacity Software (HCS) (University of Florida, 2010). The peak hours are typically the morning and evening periods where motorists are traveling to and from work, respectively. The Level of Service (LOS) is a quantitative measurement that represents the quality of service motorists experience as they travel the roadways. The HCS has six LOS, ranging from LOS A to LOS F, with LOS A representing the best operating conditions from the traveler's perspective and LOS F the worst. A LOS of E represents operating conditions at capacity of the facility, with reduced speeds, limited maneuverability, and extremely poor level of driver comfort and convenience.

The existing LOS for Parks Highway just north of and south of Clear Road would be calculated and then the existing traffic volumes would be adjusted to the year of peak construction and year of operation for the LRDR facilities. Then the anticipated offsite peak construction traffic and operation traffic would be added to their respective baseline volumes for the particular year they would take effect. The LOS for the peak construction and operations would then be calculated and compared to the exiting condition LOS. If the LOS is lowered by two or more LOS levels, then mitigations would be required. Highways are typically designed to a LOS C and in some cases LOS D. The results of the HCS models for all three conditions (existing, peak construction, and operations) are provided in Appendix C.

The analysis for the Main Gate would be based on not exceeding the capacity of the ECF using an ECF processing rate of 300 to 450 vehicles per hour (SDDCTEA, 2011) for a single lane with manual checks. This criteria is for Force Protection Condition (FPCON) Bravo +, where the guard checks both vehicle and occupant identifications.

4.13.2 Potential Site-Specific Impacts – Alternative 1-Site 3A

The ADOT&PF has traffic volumes (ADOT&PF, 2013) along Parks Highway in the vicinity of CAFS. In addition, the DHV for the summer months along with a percentage of truck traffic was found in the ADOT&PF 2013. The summer months were used as the time of analysis, due to the higher traffic volumes on the roads during this time period. The AADT for the section of Parks Highway just south of Clear Road is 1,305 vpd and just north of Clear Road is 1,208 vpd. Existing traffic data along Parks Highway at locations south of CAFS were used to approximate the DHV and percentage of trucks to be used in this analysis. Thus the DHV was assumed to be 21.5 percent of the AADT which occurs from 4 to 5 p.m. and the truck traffic was assumed to be 16.7 percent of the DHV. The existing traffic volumes and level of service of the selected locations along Parks Highway in this capacity analysis are noted in Table 4.13-1.

The existing LOS for the selected locations along Parks Highway are both LOS A.

The existing Main Gate has the capacity to process 450 vehicles per hour (SDDCTEA, 2011) through the ECF, based on a single lane with the manual inspection of credentials (for both the

vehicle and occupant) by a security guard. Based on existing gate counts, see Appendix C, the peak hour of inbound traffic was 36 vehicles from 6:00 to 7:00am. Therefore the guards can easily process this volume of traffic, as it represents only 8 percent of the processing capacity at the Main Gate. The existing inbound volume of gate traffic is low since there is permanent housing on CAFS that accommodates a large percentage of the existing workforce.

The widths of the existing internal roads provide adequate capacity for the current workforce at CAFS. The current layout of the internal roads also provides for the sufficient movement of people and materials to existing facilities throughout CAFS.

Table 4.13-1 Existing Traffic Volumes and Levels of Service

Roadway	AADT[(1)]	Traffic Peak Hour Volume[(2)]	LOS[(3)]
Parks Highway (North of CAFS)	1,208	260	A
Parks Highway (South of CAFS)	1,305	281	A

[(1)] Two-way volume (ADOT&PF, 2013a)
[(2)] Based on Higher Summer traffic two-way volume (ADOT&PF, 2013)
[(3)] HCS (University of Florida, 2010) with assumed directional distribution of 50/50

4.13.2.1 Construction

Construction activities at CAFS under Alternative 1-Site 3A would take approximately 4 years to obtain initial capability, with the main construction effort occurring during the first 3 years. An additional 2 years would be required to obtain objective capability. The construction workforce would average approximately 200 personnel and escalate up to a maximum of 350 people during the peak construction period. The initial construction of the Man Camp would start in mid-2017, initial construction of LRDR facilities would start in mid-2016, peak construction period would be in FY 2019 and FY 2020, initial capability would be met in late 2020, and objective capability would be met beginning in FY 2022. See Section 4.12.2.1 for a detailed table describing the construction activities with milestones and the number of personnel expected to be working during each activity.

There would be a Man Camp onsite that should support the majority, if not all of, the construction workers throughout the duration of construction activities. However, in conducting a sensitivity analysis of potential impacts to motorists on Parks Highway in the vicinity of CAFS, it was assumed that 25 percent of the peak construction workforce would live offsite and

commute daily to the LRDR site. Therefore, it was assumed 88 cars, sport utility vehicles (SUVs), and pickups would travel Parks Highway to access CAFS.

There is an onsite location for borrow materials to be used for earthwork activities at the LRDR site and it is just south of Sites 3A and 3B. Furthermore, it is anticipated that a concrete batch plant would be set up onsite as well. Truck traffic from offsite sources was conservatively assumed to be 50 trucks a day during peak construction. Using a 10-hour window for the delivery of materials and equipment during the day would result in 5 trucks entering and 5 trucks exiting CAFS each hour.

For the analysis, it was conservatively assumed that all of this site traffic would come from either the north or from the south of CAFS. Therefore, for the analysis on the 5-mile section of Parks Highway north of Clear Road, it was assumed all the workers would be going home to the north and the trucks would be coming from and going back to the north as well. Thus, the site generated traffic would include 88 cars going northbound for the afternoon/evening commute and 5 trucks going southbound to deliver goods to the LRDR site and 5 trucks were northbound after delivering goods to the LRDR site. Conversely, for the analysis of the 5-mile section of Parks Highway south of Clear Road it was assumed all the workers would be going home to the south and that trucks would be coming from and returning to the south as well. Again, this scenario was developed for a sensitivity analysis to see what the potential impact might be to motorists on Parks Highway taking into account very conservative assumptions.

All of the site generated traffic was assumed to be traveling on Parks Highway during the design hour (or peak hour) of traffic on the highway. The existing traffic volumes were escalated up to the year 2018, during peak construction, to establish a base condition from which the site generated traffic was added and then analyzed. A traffic growth rate for travel on Parks Highway was obtained from ADOT&PF 2010 and resulted in an average growth rate of 1.7 percent. The LOS results with the construction traffic added to the baseline are shown in Table 4.13-2.

Table 4.13-2 LRDR Peak Construction Levels of Service

Roadway	Traffic Peak Hour Volume[(1)]	LOS[(2)]
Parks Highway (North of CAFS)	381	B
Parks Highway (South of CAFS)	404	B
[(1)] Two-way volume [(2)] HCS (University of Florida, 2010)		

The peak construction LOS for the selected locations along Parks Highway are both LOS B and well within the limits preferred by highway agencies. These results represent a drop of one level in LOS as compared to the existing condition, going from LOS A to LOS B.

To assist with the processing of LRDR construction related traffic, and to keep it separate from the processing of the current CAFS workforce and deliveries, a new inbound lane would be added to the Main Gate. The Main Gate design plans states that there should be at least two inbound lanes in the identity check area (PDC, 2015). The construction of this second inbound lane would bring the EFC into compliance with the two-lane requirement. As noted previously, the processing technique of manual checking credentials for a single inbound lane at FPCON Bravo + has a capacity of 450 vehicles per hour (SDDCTEA, 2011). Therefore, even if all of the peak construction workforce lived offsite and had to travel through the Main Gate, in addition to the assumed 5 construction trucks as noted previously, that would equate to 355 vehicles. This total would still be less than the capacity for the processing technique that was assumed to be employed at the new inbound lane. This is a very conservative scenario, as it is expected a large portion of the construction workforce would live at the onsite Man Camp.

As part of an effort to minimize, or eliminate to some degree, the mixing of construction related traffic and current CAFS traffic, a designated route would be used for all construction traffic. The new lane at the ECF would be used and then the construction traffic would turn south on Camp Avenue, west on E Street and ultimately southwest on Loop Road to Site 3A. The dedicated truck routes are shown on Figure 4.13-1. The borrow pit, located just south of Site 3, would be accessed routinely during earthwork activities.

Once the LRDR Man Camp is constructed and occupied, then the construction workers would use existing roads in the southwestern part of CAFS similar to what the construction truck traffic would use. See Figure 4.13-2 for construction worker route from Man Camp to the LRDR sites. The existing road system has the capacity to accommodate anticipated construction traffic.

It is assumed construction related traffic would travel on these existing roads and towards the end of construction improvements to select roads would be constructed to accommodate operations traffic.

Figure 4.13-1 Construction Truck Routes

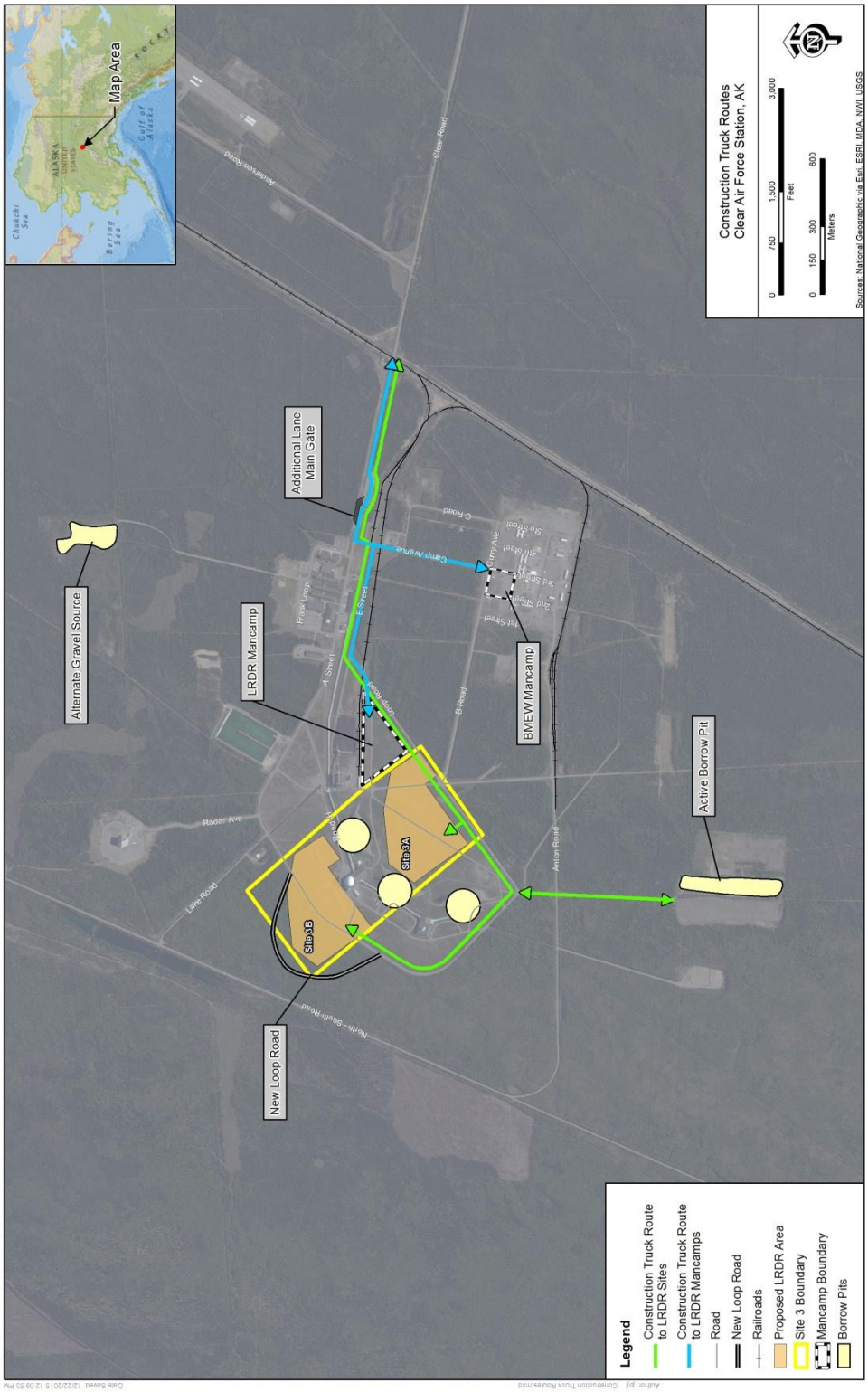


Figure 4.13-2 Construction Worker Routes

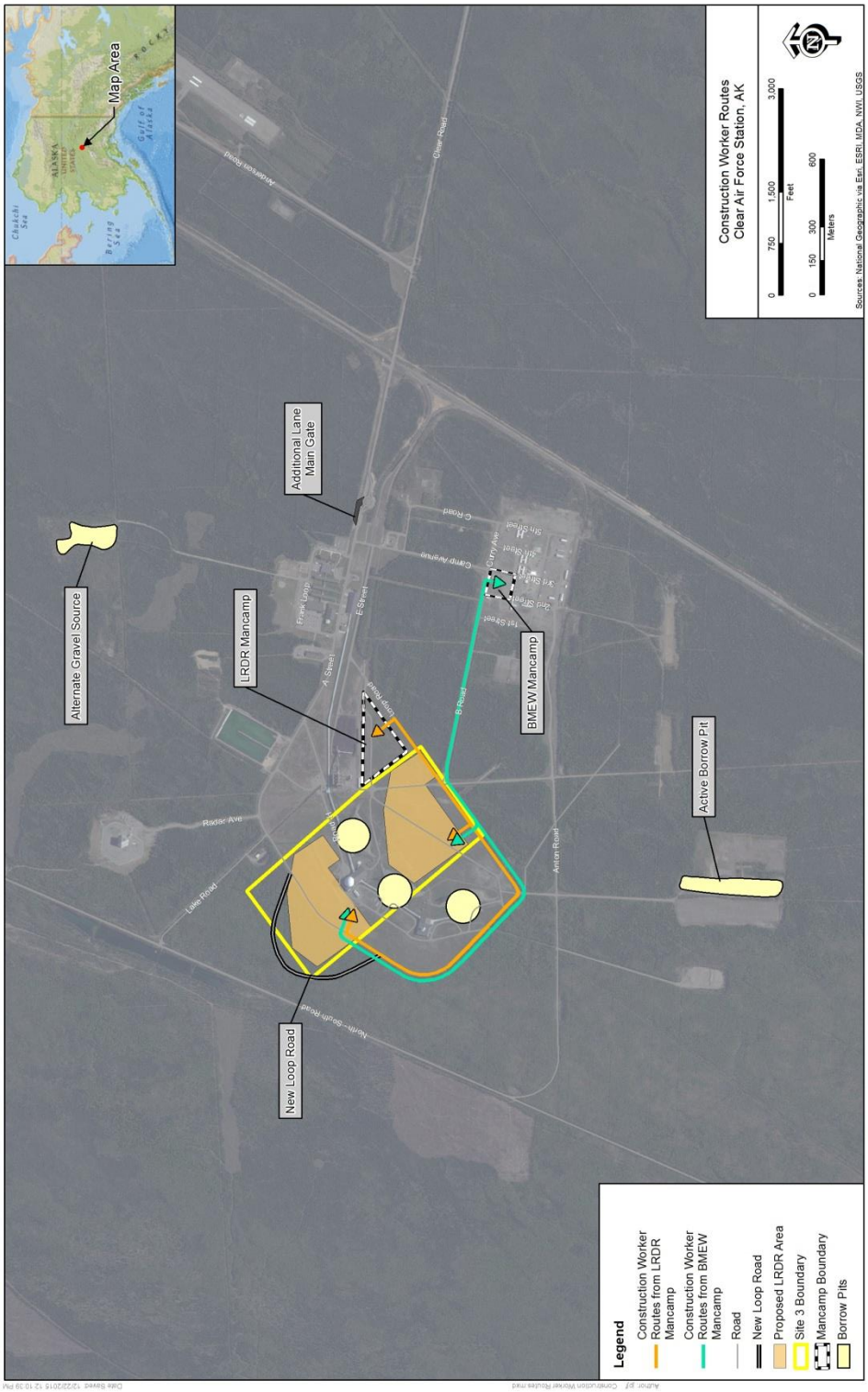


Figure 4.13-3 illustrates the road improvements that would be made to the existing roads which serve the LRDR facilities during operations. The access route from A Street to the LRDR's ECF would be considered primary roadways. A list of improvements for access to Site 3A follows (PDC, 2015):

- Loop Road – 3,300 ft of existing road to be improved from two-lane aggregate road to a two-lane paved road.
- E Street – 1,800 ft of existing road to be improved from a two-lane aggregate road to a two-lane paved road.
- Camp Avenue – 400 ft of existing two-lane paved road to be improved with new base course and pavement.
- Intersection Curve Radius Increase for Fuel Tanker Access.
    - A Street and Camp Avenue Intersection.
    - E Street and Camp Avenue Intersection.
- Street lighting would be installed along the access from A Street to the LRDR driveway entrance.

4.13.2.2 Operation

Based on information provided by MDA, there would be a total of 67 personnel needed to operate the LRDR facility 24 hours per day. Therefore, for this capacity analysis on Parks Highway it was assumed there would be 2 shifts of approximately 34 workers each shift who would travel 150 miles roundtrip to Fairbanks. This is a conservative assumption because most of the workers would be housed onsite as discussed in Section 4.2.1. It was assumed a shift change would occur during the peak hour of traffic on Parks Highway. The year of analysis was assumed to be 2023, which coincides with the completion of testing and when the site has met its objective capability. Similar methodology would be applied for the construction traffic analysis on Parks Highway will be applied for the operations traffic analysis. Thus, while assessing the segment of Parks Highway to the north of Clear Road, it was assumed 34 vehicles would be leaving the site and traveling northbound and the next shift of 34 vehicles would be arriving from the north and headed southbound to the site. Conversely, while assessing the segment of Parks Highway to the south all of the traffic would be coming from or going to the south. The LOS results with the operations traffic added to the baseline are shown in Table 4.13-3.

Figure 4.13-3 Road Improvements for Operations

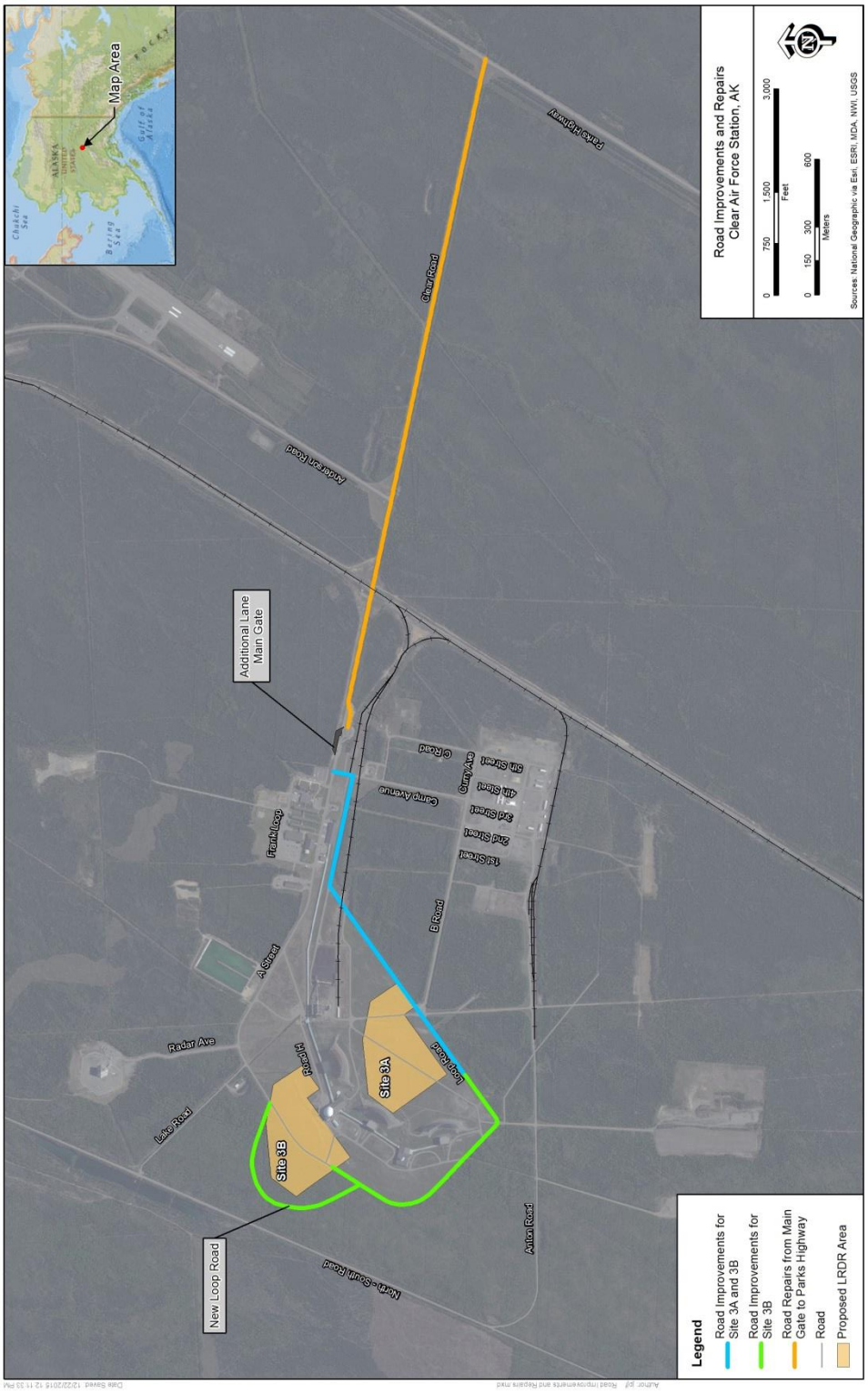


Table 4.13-3 LRDR Operation Levels of Service

Roadway	Traffic Peak Hour Volume[1]	LOS[2]
Parks Highway (North of CAFS)	376	B
Parks Highway (South of CAFS)	401	B
[1] Two-way volume [2] HCS (University of Florida 2010)		

The operation LOS for the selected locations along Parks Highway were just like the construction LOS results with both segments being a LOS B and well within the limits preferred by highway agencies. These results represent a drop of one level in LOS as compared to the existing condition, going from LOS A to LOS B. This is a conservative analysis as there could be some housing onsite to accommodate operations personnel and thus not all of the personnel will live offsite.

The Main Gate has the capacity to accommodate an additional 34 vehicles entering CAFS. The additional inbound lane that was for construction related traffic will now become a dedicated vehicle search area/lane. Therefore, there would be one main inbound lane and a secondary lane used primarily for security screening purposes. If there is stalled car in the main inbound lane, motorists could be directed to the secondary lane and it would function as the main ingress lane for CAFS until the stalled vehicle is removed. Conservatively assuming the LRDR operations personnel all live offsite, there would be a total of approximately70 vehicles (36 existing + 34 LRDR operations staff) entering the Main Gate during the morning peak hour. This total of 70 inbound vehicles only represents 15 percent of the processing capacity of the Main Gate.

The road improvements constructed during the construction phase would be used to access the LRDR facility during its operation, refer to Figure 4.13-3. The route from A Street to the LRDR entrance drive would be designated a primary road and consist of two lanes, 24 ft wide asphalt pavement, and 4 ft wide shoulders (PDC, 2015). If Site 3B is selected, then the improvements on the Loop Road would extend to the west some using existing roadway alignments to tie into the entrance drive. The onsite road network can adequately accommodate the additional LRDR operations staff.

4.13.3 Potential Site-Specific Impacts – Alternative 2-Site 3B

The potential construction and operation transportation impacts for Alternative 2-Site 3B would be the same as for Alternative 1-Site 3A with the following exception. For Alternative 2-Site 3B, during construction, the improvements along Loop Road would continue to the west and terminate at the LRDR driveway entrance, with its location depending on the final layout of the

site. A new section of Loop road would also need to be constructed and is notionally shown to parallel the tree clearing limits on the west side of Site 3B.

4.13.4 Potential Impact of the No Action Alternative

Under the No Action alternative, the LRDR facility would not be constructed or operated, and there would be no impact on transportation.

4.13.5 Mitigation Measures – Alternative 1-Site 3A and Alternative 2-Site 3B

No significant impacts to transportation have been identified for Alternative 1-Site 3A or Alternative 2-Site 3B. Therefore, no mitigation measures are required or recommended for construction or operation of the LRDR at Alternative 1-Site 3A or Alternative 2-Site 3B.

4.14 UTILITIES

Any utilities installed to support both construction and operations of the LRDR would not impact existing utilities onsite.

4.14.1 Analysis Methods

The 2013 Installation Development Plan (USAF, 2013a), which provides descriptions and capacities of the various utilities at CAFS, was reviewed. Information from this plan was compared to the Proposed Actions and No Action alternative to assess impacts to utilities.

4.14.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.14.2.1 Construction

Electrical Power. The commercial power source was connected and switched over in January 2016. Routine power demands for the LRDR were anticipated when the decision to use commercial power was made and were planned to be address by the commercial power. For the LRDR construction activities, electrical power would be supplied to the LRDR Man Camp and distributed to its facilities by the LRDR Construction Contractor on as needed basis. These demands would be temporary and overall would not significantly impact planned needs from this power source.

Water Supply. Groundwater wells would be used to supply the potable, fire protection, and cooling water to address both construction and operation needs. Water needs at the Man Camp would be addressed by newly drilled and installed wells. Separate wells to address potable water needs versus general construction and fire protection needs are anticipated (see Figure 2.2-1 for reference). It is anticipated that the LRDR Construction Contractor would provide any required treatment of potable water. The water supply pipe networks would include independent systems which would not be connected to the existing facilities such as those present in the Composite

Area. Based on the information provided in Section 3.14.2 on existing needs versus planned personnel, it is anticipated that potable water needs from the additional planned personnel would be no higher than the existing demand (e.g., 350 current personnel and peak construction personnel at 350 personnel). All wells required would be installed in accordance with ADEC requirements. Once construction activities are completed, a decision would be made whether to retain or abandon the wells used during construction. Well abandonment, if implemented, would be provided in accordance with ADEC requirements. Overall, based on the demand anticipated versus the water supply present, no significant impacts are anticipated from the water supply demand or needs address during the LRDR construction activities.

Sanitary Sewer System. Sanitary sewage for general construction and Man Camp needs would be address by the LRDR Construction Contractor. It is anticipated that a new temporary septic and leach field would be provided to address this need (see Figure 2.2-1); therefore, no additional demand on CAFS's current sanitary sewer and treatment system from the LRDR construction activities are anticipated. Provisions for the installation, operation, and closure of the temporary septic system would be performed in accordance with ADEC requirements. Overall, based on the construction sanitary sewer needs being independent of the CAFS systems, no significant impacts are anticipated.

Storm Water. Storm water generated during the LRDR construction activities would be addressed through provisions of a General Construction Permit and Storm Water Pollution Prevention Permit prepared and implemented by the LRDR Construction Contractor in accordance with ADEC requirements. Through the General Construction and Storm Water Pollution Prevention Plan, BMPs would be implemented to control and manage storm water run-off, drainage, and erosion concerns. Overall, based on the implementation of the BMPs, no significant impacts from storm water during construction activities are anticipated.

Solid Waste. Solid waste generated during construction activities including refuse generated in the Man Camp would be address by the LRDR Construction Contractor in accordance with ADEC requirements. As discussed in Section 3.14.6, Denali Borough Landfill has sufficient capacity to handle solid waste anticipated to be generated during construction and operation activities. A recycling program for applicable construction-generated waste would also be encouraged. Overall, based on the temporary solid waste needs during construction and disposal capacity available, no significant impacts are anticipated.

Heating Systems. Construction activities, especially at its peak, would primarily be provided during limited spring/summer/limited fall periods, therefore, minimizing the need for temporary heating systems. The heating systems for construction-related activities would be provided by the LRDR Construction Contractor and operated only on an as needed and temporary basis. No demands on heating systems present at CAFS are anticipated for the LRDR construction-related activities. Overall, based on the anticipated temporary heating system demands from

construction activities and the systems being separate from the current systems at CAFS, no significant impacts are anticipated.

4.14.2.2 Operations

Electrical Power. The routine electrical power demands for the LRDR project were included in the planning when the decision was made at CAFS to use a commercial power source. This power source has been installed. In addition, generators for LRDR-related facilities would be installed to provide approximately 30 MW of emergency power. No significant impacts are anticipated from the installation or operation of these electrical systems.

Water Supply. The water demands for potable, fire protection, and cooling uses for the LRDR operations would be met by the addition of groundwater wells.

Potable and fire protection water for the LRDR facilities would be provided by newly drilled and installed dedicated groundwater wells. Individual treatment systems would also be provided Due to the limited number of planned additional operating staff (67 total personnel anticipated); the overall water supply demand versus groundwater availability would be very low. Wells and treatment systems for the LRDR would be provided in accordance with ADEC requirements. Overall, based on the low potable water supply demand that would be needed for the LRDR, no significant impacts are anticipated.

As described in Section 2.1.3.1, repairs and enhancements to the potable water supply systems (including new wells and enhanced treatment) would be implemented as a non-mission LRDR-specific support facility action in conjunction with the dormitory and heating plant. Based on information provided in Section 3.14.2, the current demand is much lower than the well capacity; therefore; if new wells are provided and even enhanced, it is anticipated that this action would not result in significant impacts for the groundwater water supply. In addition to water resources and general utilities, because the repairs/replacements to the potable water facility will be provided at the existing and previously developed location, no additional significant impacts to other resources (e.g., biological resources, cultural resources) are anticipated.

Cooling water for the LRDR facilities would be provided by newly drilled and installed dedicated groundwater wells. No treatment would be required for the cooling water prior to or following use. As presented in Section 2.2.1.4, the demand for cooling water associated with the LRDR would range between 4,000 and 8,000 GPM (Golder Associates, 2015). As described in Section 3.14.2, current and historic water demands for cooling water have been as high as 4,781 GPM. After commercial power is provided (planned to be completed by Spring 2016), the coal-fired plant would be shut down and the total demand will decrease to approximately 933 GPM (USAF, 2013a). Based on summing these quantities (the anticipated cooling water demand and the total demand after commercial power is provided) the total remaining demand could range from 5,000 to 8,000 GPM. Although this anticipated range is slightly higher than the current and

historic high demand of 4,781 GPM, no significant adverse impacts would be anticipated from the cooling water demand. However, additional well installation and aquifer testing would be conducted to assess the aquifer capacities and need to multiple wells (Golder Associates, 2015).

Sanitary Sewer System. Sanitary sewage for the LRDR operations facilities would be provided by two separate, independent septic tank leach field systems. These systems would be designed, constructed, and operated in accordance with ADEC requirements.

The sanitary sewer of the new dormitory used to house the LRDR operations person will be connected to CAFS's existing sanitary sewer system. As discussed in Section 3.14.3, the existing sanitary sewer is directed to the Imhoff tank that was sized for a population of 2,000 (USAF, 2013a).

Overall, based on the anticipated demand versus the planned and existing sanitary sewer facilities no significant impacts are anticipated.

Storm Water. Storm water generated during LRDR operations would be addressed during the design in accordance with all applicable UFC, local, and State requirements to mitigate storm water impacts from the proposed construction. The design would incorporate BMPs to control and manage storm water run-off, drainage, and erosion concerns. Overall, based on the implementation of the BMPs, no significant impacts from storm water during operation activities are anticipated.

Wastewater. The wastewater to be generated during LRDR operations would primarily consist of cooling water. As presented in Section 2.2.1.4, the demand (and assumed wastewater discharge) for cooling water associated with the LRDR would range between 4,000 and 8,000 GPM (Golder Associates, 2015), or 5.8 to 11.5 MGD. As discussed in Section 3.14.5, cooling water sources would ultimately discharge to Lake Sansing, which CAFS currently to monitors for pH and temperature in accordance the industrial wastewater discharge permit (0231DB0050). The permit would need to be revised based on the change in the source of the discharge. If the discharge rate is above the rate in the current permit, a new permit might be required based on the changed discharge quantities, or the current permit might be revised. The maximum discharge rate that could be accommodated by the wastewater system is up to 13.5 MGD. Also as indicated in Section 3.14.5, the previous rate of discharge from the existing coal-fired plant was 3 MGD and previous discharge from the Old Tech Site produced an average of 6.3 MGD (USAF, 2013a). When these two sources were discontinued, Lake Sansing could receive up to an additional 9.3 MGD. Lake Sansing also currently receives up 2 MGD from the SSPARS, which when combined with the anticipated cooling water flow from the LRDR would only result in a potential discharge of 7.8 to 13.5 MGD to Lake Sansing once the LRDR is operating. Therefore, comparing the anticipated LRDR discharge rates to the overall additional flow and potential future discharge, no significant impacts on a flow basis are anticipated from the cooling water discharge from Lake Sansing.

Solid Waste. Solid waste generated during operations would include administrative and personnel refuse from the increase of operating staff (67 people) which would be insignificant. Based on the insignificant increase of solid waste anticipated, no significant impacts from solid waste generated during operating are anticipated.

Heating Systems. Potential impacts to heating systems additions for the LRDR were primarily evaluated in Section 4.2 Air Quality. This assessment included both the emissions generated from heating systems from both the new LRDR facilities plus the new dormitory planned to house the LRDR operations personnel. As indicated by the results presented in Section 4.2.2.2, air quality impacts for the operation of the overall proposed action were expected to be minor.

Therefore, overall based on the air quality conclusion, no significant impacts are anticipated from the addition of the heating systems for the LRDR.

4.14.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

Impacts related to utilities during construction and operation for Alternative 2-Site 3B would be the same as those described for Alternative 1-Site 3A in Section 4.14.2.

4.14.4 Potential Impact of the No Action Alternative

Under the No Action alternative, the LRDR facility would not be constructed or operated and there would be no impact on utilities.

4.14.5 Mitigation Measures

No significant utility impacts have been identified for Alternative 1-Site 3A or Alternative 2-Site 3B. Therefore, no mitigations are recommended or proposed. BMPs implemented during construction and operations were discussed in Sections 4.14.2 and 4.14.3, respectively.

4.15 WATER RESOURCES

Alternative 1-Site 3A, Alternative 2-Site 3-B, and the No Action Alternative would not impact water resources from ground disturbing activities during construction. Short-term disturbances from grading and excavating land could cause wind or water soil erosion. No significant impacts are projected to occur to surface water from airborne sediment or surface water runoff. No impact to the unconfined aquifer and groundwater would occur because of its extensive area and depth. There would be no impacts to floodplains.

A separate assessment of wetlands (often considered a water resource) is provided in Section 4.16.

4.15.1 Analysis Methods

To establish the potential impacts to water resources, documents on the hydrology and hydrogeology of the area were reviewed. The planned activities were compared to existing activities to evaluate potential changes. Maps showing topography, watersheds and installation drainage were examined. The review focused on the proximity of the areas planned for proposed construction activities to surface waters and hydrogeology in the project area, and water quality in the local area.

4.15.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.15.2.1 Construction

Details of LRDR construction impacts and mitigation measures for water resources from water supply and storm water are discussed in detail in Section 4.14.2.1. These results indicate that there would be no significant impacts on water resources from groundwater (water supply) pumping/use (groundwater) or from storm water discharges (surface water) are anticipated.

4.15.2.2 Operations

Details of LRDR operations impacts and mitigation measures for water resources from water supply and storm water are discussed in detail in Section 4.14.2.2 and show that there would be, no significant impacts from groundwater (water supply) pumping/use (groundwater) or from storm water or wastewater discharges (surface water).

4.15.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

Impacts on water resources from Alternative 2-Site 3B would be the same as those described for Alternative 1-Site 3A in Section 4.15.2.

4.15.4 Potential Impact of the No Action Alternative

Under the No Action alternative, the LRDR facility would not be constructed or operated and there would be no impact on water resources.

4.15.5 Mitigation Measures – Alternative 1-Site 3A and Alternative 2-Site 3B

No significant impacts have been identified for water resources from Alternative 1-Site 3A or Alternative 2-Site 3B. No mitigations are recommended or proposed. BMPs that would be implemented during construction and operations to minimize impacts to water resources (groundwater and surface water) were discussed in Sections 4.14.2 and 4.14.3, respectively.

4.16 WETLANDS

No impacts to wetlands are likely to occur as no wetlands were identified by the NWI within the proposed construction locations for this project. Furthermore, delineations conducted by the USACE for more recent projects proposed at CAFS (MDA, 2012; USAF, 2005) did not encounter wetlands in the area proposed for this project.

4.16.1 Analysis Methods

To assess impacts for this project, the LRDR facility's configuration and the activities associated with its construction and operation were conceptually superimposed on the environmental setting of the project site and the vicinity to determine the type and extent (in terms of magnitude and duration) of impacts on the resource of interest. For wetlands, the assessment included considering the location and function of LRDR components and activities relative to the location and function of on-installation wetlands and waterbodies, and then determining the types of direct and indirect impacts that would occur (i.e., filling, draining, changes in storm water runoff flows, etc.), their duration (temporary, permanent or intermittent), their geographic influence (LRDR site vs CAFS vs offsite vs Regional), the project phase in which they would be affected (construction or operation) and their significance. The presence of wetlands was analyzed using the NWI (USFWS, 2015) and wetland information obtained from two previous EAs:

- The New Mission Beddown and Construction, CAFS, AK, EA (MDA, 2012).
- EA for Basewide Facilities Upgrade at CAFS, AK (USAF, 2005a).

None of the known wetlands at CAFS are located in the immediate project area; therefore, wetlands would not be impacted by the project.

4.16.2 Potential Site-Specific Impacts of Alternative 1-Site 3A

4.16.2.1 Construction

Under Alternative 1-Site 3A, approximately 40 acres of land would be impacted by construction in areas that were previously disturbed. No impacts to wetlands would occur as no wetlands were identified within the area proposed for the LRDR system, the Mission Support Facilities, Lake Sansing, associated drainage Man Camp Areas A and B, and dormitory.

4.16.2.2 Operation

For Alternative 1-Site 3A, no wetlands were identified within the area proposed for the LRDR system or the Mission Support Facilities, so no effects on wetlands due to events such as storm water runoff or routine site maintenance work (which would largely consist of mowing grass during the growing season) are anticipated during normal operations.

4.16.3 Potential Site-Specific Impacts of Alternative 2-Site 3B

Under Alternative 2-Site 3B, approximately 50 acres of land would be impacted by construction, with all but 26 in areas that were previously disturbed. No wetlands were identified within the area proposed for the LRDR system or the Mission Support Facilities, so no effects on wetlands due to events such as storm water runoff or routine site maintenance work (which would largely consist of mowing grass during the growing season) are anticipated during normal operations.

4.16.4 Potential Impacts of the No Action Alternative

Under the No Action alternative, the LRDR would not be constructed or operated, and there would be no impacts to wetlands.

4.16.5 Mitigation Measures – Alternative 1-Site 3A and Alternative 2-Site 3B

4.16.5.1 Construction

No construction-related impacts to wetlands would be expected under Alternative 1-Site 3A or Alternative 2-Site 3B. Therefore, no wetland-specific mitigation measures are necessary or proposed.

The following summarizes BMPs measures that may be proposed by MDA or USAF as a matter of course to ensure environmental impacts are minimized:

- Conventional construction site BMPs for soil stabilization and erosion control measures would be implemented to reduce impacts to aquatic, biological and wetland resources.
- Vegetation disturbance and tree removal would be minimized as feasible during construction activities. Vegetation clearing or removal would be conducted only to the extent necessary.
- Revegetation of disturbed areas would be implemented in the same growing season as the disturbance or as soon as practicable.

4.16.5.2 Operation

No operation-related impacts to wetlands are expected under Alternative 1-Site 3A or Alternative 2-Site 3B. Therefore, no wetland-specific mitigation measures are necessary or proposed. However, conventional storm water management and erosion control BMPs would be implemented during project operation to ensure that environmental impacts are minimized. Also, appropriate measures for controlling oil and chemical spills during operation would be implemented. Such measures would reduce the potential for storm water-related flow, erosion, and sedimentation impacts and for chemical or oil releases to water or biological resources.

4.17 CUMULATIVE IMPACTS

Cumulative impacts are considered to be the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time. Unless otherwise noted, the cumulative impacts described would be same for Alternative 1-Site 3A and Alternative 2-Site 3B.

Several other projects/activities that have been or are planned to be implemented in the project vicinity have been identified and are listed and briefly described below. A schedule of all projects/activities discussed is provided on Figure 2.2-3.

- Fire Station in Composite Area. Erection of concrete and steel structure with an area of 20,667 sf; used for housing and maintaining firefighting equipment. Additional descriptive details of this action are provided in the 2005 Basewide EA (USAF, 2005a).
- Consolidation of Structures in Composite Area. Modifications to existing structures to enhance working efficiency, conserve energy, and optimize space utilization; involved improvements affecting 65,000 sf of office/maintenance/living space. Additional descriptive details of this action are provided in the 2005 Basewide EA (USAF, 2005a).
- Main Gate Improvements. Main gate improvements to enhance installation safety and security. Includes a load vehicle inspection point, installation of final denial barriers, and entry lane pavement repairs/improvements. Affects 40,000 sf of area at the gate entry. Additional descriptive details of this action are provided in the 2005 Basewide EA (USAF, 2005a). Lane widening at the main gate (additional construction lane) will be addressed as part of the main gate improvement activities.
- Old Tech Site Demo/Cleanup. Demolition activities were discussed in detail in Section 2.2.1.1 and in the 2001 Demolition EA (USAF, 2001a).
- Commercial Electricity Tie-In and Heat Plant. CAFS is currently in the process of tying the installation into a commercial electrical power source and installation of a heating plant for the Composite area (could be as soon as October 2015). Specific details for this action were provided in a 2013 EA (USAF, 2013b). This action once implemented would provide electric and heating that is currently provided by the existing coal-fired power plant and this system would eventually be shut down, demolished, and removed from the installation. This EA includes additional details regarding the pending shut down, demolition, or removal of the coal-fired coal plant.

The potential environmental impacts of these projects/activities have been individually assessed under separate actions (EAs, also shown). The potential effects of the above projects combined with those of the LRDR project on each environmental resource is briefly discussed below.

Air Quality. No significant impacts to air quality were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). Of the projects listed above, the most likely project to potentially result in cumulative impacts to air quality are the Old Tech Site Demo/Cleanup Project and the commercial electricity tie-in and heat plant action. The demolition may cause some temporary and localized air emissions from fugitive dust and the equipment used to demolish the Old Tech Site. Commercial power has been connected to the facility in January 2016 and the existing coal-fired power plant has been shut down. The emission sources that had been provided from previous inventories described in Section 3.2 had included three coal-fired boilers, two diesel generators, the coal ash collection and storage systems, and the coal crusher facility. The shut-down of these emission sources will significantly decrease the baseline air emissions of criteria pollutants and GHGs. Considering this factor, it would be expected that, even with the construction and operation of the LRDR facility, the Old Tech Site Demo/Cleanup and the other projects mentioned above, there would be a net reduction in the air quality emissions and impacts in the project area. Consequently, no significant cumulative air quality impacts would result.

Airspace. No significant impacts to airspace were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). Due to their low vertical profile and ground-based nature, none of the above projects would, by themselves or in combination with other activities on CAFS, significantly affect airspace. Consequently, no significant project-specific or cumulative impacts on airspace would be expected.

Biological Resources. No significant impacts to biological resources were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). CAFS is an active military installation that occasionally requires new construction, facility improvements, or infrastructure upgrades to continue its mission. Such projects can disturb or remove vegetation, disrupt wildlife and (for those involving impacts to aquatic systems [such as wetlands, streams, or rivers]) disrupt fish communities as well as the aquatic insects or plankton that supports fisheries. However, these projects have occurred (or would occur) in the already-developed portion of the installation, a factor which has the general effect of avoiding or reducing to less-than-significant any adverse impacts to local and Regional wildlife, botanical and aquatic communities. The abundance of better quality habitat in the surrounding Region further reduces the significance of any such impacts, including those of the Proposed Action. As such, no significant cumulative impacts on biological resources would be expected.

Cultural Resources. No significant impacts to cultural resources were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), or the commercial electricity tie-in and heat plant (USAF, 2013b). The Old Tech Site buildings were identified as potentially eligible for the NRHP (USAF, 2001a) and mitigation would be required. The implementation of the LRDR project is not expected to have any significant impacts on cultural resources, and therefore, no significant cumulative effects on cultural resources.

Environmental Justice. No significant disproportionate impacts to minority populations, low income populations, or children were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). For the above projects as well as the LRDR project, the greatest potential for environmental justice impacts would occur from construction and operation-related air and noise emissions on off-installation low income or minority populations. However, all of these projects would be largely restricted to the confines of CAFS. Also, as discussed in the environmental justice analysis, there are no substantive concentrations of low income or minority populations in close proximity to CAFS and project site. As such, no significant, disproportionate cumulative environmental justice impacts would result.

Geology and Soils. No significant impacts to geology and soils were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). The LRDR project as well as each of the above projects would result in a certain amount of ground-disturbing activity, which could expose soil to erosion during windy conditions and periods of precipitation. However, no significant cumulative impacts to geology and soils would result.

Hazardous Materials & Hazardous Waste Management. No significant impacts to hazardous materials and hazardous waste management were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). The LRDR project and those listed above would use certain hazardous materials during construction and operation such as cleaning agents, paints, solvents, and other materials, and produce hazardous waste such as oily rags, chemical waste, used welding rods, etc. Such materials would be stored, used, and disposed of according to industry and regulatory standards and guidelines. The amount of waste material generated by any single project or by the group as a whole would be relatively small and would not represent an undue burden on disposal facilities. Therefore, no significant cumulative impacts are expected.

Health & Safety. No significant impacts to health and safety were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). CAFS uses an internal security system aimed at protecting CAFS facilities and personnel from unauthorized access by enemies of the state and the general public. Such systems would be continued and enhanced as needed with the implementation of the LRDR project by itself or in combination with the projects identified above. Likewise, safety and pollution prevention measures would be implemented to protect the general public from health and safety risks (e.g., oil spills, noise emissions, air emissions, project vehicular traffic, etc.) posed by any or all of said projects. Considering this factor and the fact that air quality and noise impacts are expected to be individually and cumulatively negligible, no significant cumulative impacts to health and safety are anticipated.

Land Use. No significant impacts to land use were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). All land use impacts associated with the construction and operation of the LRDR facility would be confined to the general area of current operations and would meet land use management plans for the facility. There would be no noticeable impacts observed by nearby communities, as the land use impacts would be largely contained within the fence line of CAFS. Consequently, no significant cumulative land use impacts would be expected.

Noise. No significant impacts to noise were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). Regardless of the configuration of the proposed LRDR facility and the other future proposed activities, there would be no significant cumulative impacts to ambient noise levels within the boundaries of CAFS or in the surrounding area. This is because substantive noise emissions from the LRDR project or any of the other would largely consist of temporary, construction/demolition-related, noise-producing activities and/or intermittent noise emissions from testing at the power plant and therefore, would not result in continuous, intrusive individual or cumulative noise emissions. In addition, noise control measures would be put into practice to maintain noise emissions at appropriate levels.

Socioeconomics. No significant impacts to socioeconomics were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). For each of the above projects, as well as the LRDR project, local traffic patterns would likely be disrupted during project construction. Otherwise, individually and in combination, these projects would result in largely positive, although insignificant, socioeconomic impacts on the local communities.

Transportation. No significant impacts to transportation were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). The most noticeable transportation impacts associated with the construction and operation the projects would include: (1) equipment and materials deliveries made during the construction stages; and (2) worker commuter traffic during both construction and operation. While such impacts may be noticeable, they would not cause substantial traffic delays or pattern changes – whether considered alone as a single project or cumulatively – because of the sparse population and low traffic volumes that characterize the area.

Utilities. No significant impacts to utilities were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). It is likely that project development would place additional demand on local utilities including electrical, water treatment, wastewater/storm water management, etc. However, CAFS facilities have been designed and constructed to provide capacity for a certain degree of future development. In addition, CAFS has adopted plans for responding to future utility needs. Finally, the MDA has included measures in the LRDR project for addressing project-specific utility needs to minimize impacts on existing utilities. These measures would be expected to reduce or eliminate cumulative impacts on local utilities.

Water Resources. No significant impacts to airspace were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). It is likely that project development would place additional demand on water supply, water treatment, and wastewater/storm water management facilities and resources. The LRDR project itself would require little water during the construction phase, but approximately 5.8 to 11.5 MGD of groundwater for once-through cooling purposes during operation. The project would discharge this same amount of resulting heated effluent into Lake Sansing.

As stated previously, the withdrawal of this amount of groundwater would have no substantive effect on the quantity or quality of water in the source aquifer. Considering that the projects listed above would have little or no water demands that would add to that of the LRDR project, no significant cumulative impacts on groundwater resources during either construction or operation would be expected.

With regards to storm water, the LRDR project as well as each of the above projects would result in a certain amount of ground-disturbing activity and establishment of additional impervious surfaces, which could increase storm water runoff and expose soil to erosion during periods of precipitation. However, all of the projects would implement storm water management measures

during construction and operation which would reduce individual storm water runoff impacts to less-than-significant levels. Further, the increase in the amount of additional impervious surfaces at CAFS that would result from the combined development of the LRDR project and others would be negligible. Consequently no significant cumulative impacts to storm water runoff quantities, rates or patterns at CAFS would result.

The amount of wastewater that would be generated by the other projects considered in these cumulative impacts – whether individually or as a whole – would be but a small fraction of that produced by the LRDR facility. Therefore, the cumulative effect of the combined wastewater impacts of the LRDR project and the others would be insignificant.

Wetlands. No significant impacts to wetlands were identified for the fire station, consolidation of the structures in the composite area, main gate improvements projects (USAF, 2005a), the Old Tech Site demo/cleanup (USAF, 2001a), or the commercial electricity tie-in and heat plant (USAF, 2013b). CAFS property (including that proposed for development for the LRDR facility) has been surveyed for wetlands. As indicated in the wetlands section, no jurisdictional wetlands occur in the area that would be disturbed by any configuration of the LRDR project. Therefore, no adverse cumulative effects on wetlands would occur.

4.18 SUMMARY OF PROPOSED BEST MANAGEMENT PRACTICES

A summary of the BMPs proposed by MDA or the USAF to ensure environmental impacts are minimized as part of the MDA or USAF Proposed Actions and Action Alternatives is presented in Table 4.18-1. These BMPs are management measures routinely implemented by MDA and the USAF and are not considered mitigations.

Table 4.18-1 Summary of Proposed Best Management Practices (BMPs)

Resource	BMPs[1]
Air Quality - Construction	Proper maintenance of construction vehicles and equipment. Apply dust inhibitors such as water or surfactants. Revegetate disturbed areas.
Air Quality – Operation	Maintain adherence to air permits. Keep equipment in good operating condition.
Airspace - Construction	No specific BMPs identified.
Airspace - Operation	Maintain restricted area information on aeronautical charts and in FAA Airport Guides. Utilize specific design features of the LRDR to ensure that HIRF impinging on aircraft will not exceed HIRF limits.
Biological - Construction	Standard dust suppression techniques and vehicle maintenance programs to minimize emissions from fugitive dust and vehicle exhaust. Soil stabilization and erosion control measures reduce indirect biological resource impacts.

Table 4.18-1 Summary of Proposed Best Management Practices (BMPs)

Resource	BMPs[1]
	Minimize vegetation disturbance. Initiate and conduct clearing and ground disturbance activities prior to nesting/breeding seasons.
Biological - Operation	Include storm water management Continue erosion control measures, as needed. Follow spill prevention and control measures. Follow existing installation plans such as the Invasive Species Control Plan and INRMP.
Cultural Resources - Construction	Follow ICRMP and AFI procedures for cultural resource management.
Cultural Resources – Operation	Follow ICRMP and AFI procedures for cultural resource management.
Environmental Justice - Construction	Follow BMPs for other resources.
Environmental Justice – Operation	Follow BMPs for other resources.
Geology and Soils - Construction	Stabilize disturbed areas as soon as possible. Stockpile and reuse topsoil when possible.
Geology and Soils – Operation	Maintain vegetation to prevent erosion.
Hazardous Materials and Hazardous Waste Management - Construction	Follow CAFS and Contractor-developed hazardous materials and hazardous waste plans and procedures including training.
Hazardous Materials and Hazardous Waste Management – Operation	Follow CAFS hazardous materials and hazardous waste plans and procedures including training.
Health & Safety - Construction	Follow CAFS safety plans and procedures. Prepare and follow JHAs. Employ engineering controls, including sound insulating equipment. Provide hearing protection when noise levels are expected to be above 85 dBA.
Health & Safety – Operation	Follow CAFS safety plans and procedures. Prepare and follow JHAs.
Land Use - Construction	Follow waste disposal procedures. Implement erosion control measures. Follow spill prevention procedures.
Land Use - Operation	Follow waste disposal procedures. Follow spill prevention procedures.
Noise - Construction	Use equipment with appropriate mufflers and keep properly maintained. Perform noisier activities (such as pile driving) during day-light hours.

Table 4.18-1 Summary of Proposed Best Management Practices (BMPs)

Resource	BMPs[1]
Noise - Operation	Employ engineering controls such as installing standard noise control measures (i.e., silencers).
Socioeconomics - Construction	No specific BMPs identified.
Socioeconomics – Operation	No specific BMPs identified.
Transportation - Construction	Follow established policy and guidelines. Use existing roads, as possible. Obtain and comply with permits for oversize loads, as needed. Evaluate road use and conditions on an ongoing basis and repair, as needed. Control potential soil erosion, maintain culverts, ditches, and catch basins.
Transportation – Operation	Follow established policy and guidelines. Evaluate road use and conditions on an ongoing basis and repair, as needed. Control potential soil erosion, maintain culverts, ditches, and catch basins.
Utilities - Construction	Provide for storm water management during construction (see Water Resources).
Utilities - Operation	Provide for storm water management (see Water Resources).
Water Resources - Construction	Standard dust suppression techniques including applying water or surfactants. Implement soil stabilization and erosion control measures. Minimize vegetation disturbance. Use existing roads as much as possible.
Water Resources – Operation	Include storm water management Continue erosion control measures, as needed. Follow spill prevention and control measures. Follow existing plans such as the INRMP.
Wetlands - Construction	Implement soil stabilization and erosion control measures. Minimize vegetation disturbance and tree removal. Revegetate disturbed areas in the same growing season as the disturbance or as soon as practicable.
Wetlands - Operation	BMPs implemented for biological resources, storm water control, hazardous wastes and hazardous materials would also serve to protect wetlands.

Notes:
1. General BMPs listed. This is not intended to be an exhaustive, all-inclusive, list of BMPs to be employed during implementation of the alternatives.

5.0 REFERENCES

GENERAL CAFS REFERENCE DOCUMENTS

MDA, 2015b. Missile Defense Agency (MDA), Email correspondence, Subject: *Asbestos Disposal for BMEWS*, Dan Spiegelberg, MDA, to Marshall Claxton, Black & Veatch Special Project Corp., 14 December 2015.

USACE, 2015b. U.S. Army Corps of Engineers (USACE), *Joint Master Site Plan – CAFS, Alaska, Sheet 1, Location and Vicinity Maps,* U.S. Army Engineer District Corps of Engineers, Anchorage, Alaska, 24-09-2015, provided to Black & Veatch Special Projects Corp. via email by Missile Defense Agency, 11 November 2015.

USACE, 2015c. U.S. Army Corps of Engineers (USACE), Memo for Record – Volumetric Calculation for Disposal of Materials at Clear Air Station, AK; 2 December 2015.

USAF, 1993. U.S. Air Force (USAF), *Installation Restoration Program, Restoration Management Action Plan, Clear Air Force Station,* December 1993.

USAF, 2013a. U.S. Air Force (USAF), *Installation Development Plan*, Clear AFS, AK, January 2013.

USAF, 2015a. U.S. Air Force (USAF), *Integrated Cultural Resources Management Plan*, Clear AFS, AK, updated annually by BAE/ENV, January 2015.

USAF, 2015b. U.S. Air Force (USAF), *Integrated Natural Resources Management Plan*, Clear AFS, AK, updated annually by BAE, January 2015.

CLEAR AIR FORCE STATION EAs & FONSIs

Jacobs Engineering, 2002. *Supplemental EA Coal-Fuel Heat and Power Plant Upgrade Backup Generators*, Clear AFS, AK, September 2002.

USAF, 2001a. U.S. Air Force (USAF), *Final Environmental Assessment for Demolition of Technical Site,* Clear AFS, AK, June 2001.

USAF, 2001b. U.S. Air Force (USAF), *Draft Finding of No Significant Impact Final EA for Demolition of Technical Site,* Clear AFS, AK, June 2001.

USAF, 2005a. U.S. Air Force (USAF), *Final Environmental Assessment, Basewide Facilities Upgrade,* Clear AFS, AK, December 2005.

USAF, 2007a. U.S. Air Force (USAF), *Final Environmental Assessment for Construction/Renovation Projects,* Clear AFS, AK, February 2007.

USAF, 2013b. U.S. Air Force (USAF), *Final Environmental Assessment for Clear AFS Grid Tie-In and Heat Plant*, Clear AFS, Alaska, July 2013.

USAF, 2014a. U.S. Air Force (USAF), *Final Environmental Assessment for Installation-Wide Development at Clear Air Force Station, Alaska*, February 2014.

MISSILE DEFENSE AGENCY EAs and EISs

MDA, 2007. Missile Defense Agency (MDA), *Ballistic Missile Defense Agency (BMDS) Programmatic Environmental Impact Statement*; January 2007

MDA, 2012. Missile Defense Agency (MDA), *Environmental Assessment, New Beddown and Construction*, Clear AFS, AK, August 2012.

CAFS SPECIFIC RESOURCE ASSESSMENT DOCUMENTS

AIR QUALITY

ADEC, 2012. Alaska Department of Environmental Conservation (ADEC) *Title V Air Quality Operating Permit; Permit AQ0318TVP03*, Issue Date October 2, 2012, Expiration Date: 2 October 2017.

ADEC, 2014. Alaska Department of Environmental Conservation (ADEC) *Title V Air Quality Control Minor Permit-Central Heat/Power Plant Decommissioning*; *Permit AQ0318MSS05*, Final 30 July 2014.

ADEC, 2015. Alaska Department of Environmental Conservation (ADEC) "*Annual Air Quality Monitoring Network Plan*", May 2015, <http://dec.alaska.gov/AIR/am/am_airmonplan.htm>.

CEQ, 2014. Council on Environmental Quality (CEQ), "*Guidance on Considering Climate Change in NEPA Reviews and Conduction Programmatic NEPA Reviews*", White House Council, December 2014.

Chapin et al., 2014. F.S. Chapin III, S.F. Trainor, P. Cochran, H. Huntington, C. Markon, M. McCammon, A.D. McGuire, and M. Serreze, *Chapter 22: Alaska, Climate Change Impacts in the United States: The Third National Climate Assessment*, J.M. Melillo, Terese (T.C.) Richmond, and G. W. Yohe, Eds., U.S. Global Change Research Program, http://nca2014.globalchange.gov/report/regions/alaskaClimate, 2014.

NCDC, 2015a. National Climatic Data Center (NCDC) Quick Links, "*U.S. Climate Normals Products*," 1981-2010, Nenana Municipal Airport and Kobe Hill, AK <http://www.ncdc.noaa.gov/data-access/land-based-station-data/land-based-datasets/climate-normals/1981-2010-normals-data> (accessed 28 August 2015).

NCDC, 2015b, National Climatic Data Center (NCDC), "*International Station Data Hourly*," Nenana Municipal Airport, AK, 1980-2014.

USACE, 2013. U.S. Corps of Engineers (USACE), *Meteorological Monitoring Report, Annual Report #2*, Clear Air Force Station, Clear, Alaska, prepared by North Wind Services, 30 July 2013.

USACE, 2014. U.S. Corps of Engineers (USACE), *Meteorological Monitoring Report, Annual Report #2*, Clear Air Force Station, Clear, Alaska, prepared by North Wind Services, 30 July 2014.

USAF, 2015c. U.S. Air Force (USAF), "*Clear Air Force Station Permit No. 000318TVP03, Rev. 1 Fee Assessment*", 11 March 2015.

USAF, 2015d. U.S. Air Force (USAF), "*Air Conformity Applicability Model (ACAM)*," Version 5.0.2, June 2015.

USEPA, 2011. "*National Ambient Air Quality Standards (NAAQS)*," 2011, <http://www.epa.gov/air/criteria.html/>, (accessed 28 August 2014).

USEPA, 2013c. U.S. Environmental Protection Agency (USEPA), "*National Emissions Inventory*," Version 1, September 2013.

USEPA, 2014b. U.S. Environmental Protection Agency (USEPA), "*Motor Vehicle Emission Simulator (MOVES) computer model*", Office of Transportation and Air Quality (OTAQ), October 2014.

USEPA, 2015. U.S. Environmental Protection Agency (USEPA), "*USEPA Green Book*", 2015, <http://www.epa.gov/airquality/greenbook/>, (25 February 2015).

WRCC, 2015. Western Regional Climate Center (WRCC), "*U.S. COOP Station Map, Summary of the Day*," Nenana Municipal Airport, AK 1916-2001, <http://www.wrcc.dri.edu/coopmap/> (accessed August 28, 2015).

AIRSPACE

Airnav, 2015. Clear Alaska Area Airspace Map, < http://www.airnav.com/airport/PACL >, (assessed 24 September 2015).

DoD, 2010. Department of Defense (DoD) MIL-STD-464C *Interface Standard-Electromagnetic Environmental Effects Requirements for Systems*; 1 December, 2010.

FAA, 2008. U.S. Department of Transportation, Federal Aviation Administration, *Pilot's Handbook of Aeronautical Knowledge FAA-H-8083-25A*, 2008.

FAA, 2016. Federal Aviation Administration (FAA); *Digital - Airport/Facility Directory (d-A/FD)*; https://www.faa.gov/air_traffic/flight_info/aeronav/digital_products/dafd/ (assessed 18, 2016).

FAR/AIM, 1998. *Federal Aviation Regulation (FAR) Part 73 Aeronautical Information Manual (AIM),* 1998.

Illman, 1999. Illman, Paul E., *The Pilot's Air Traffic Control Handbook*, 2nd Edition, New York: TAB Books, 1999.

MDA, 2016. Missile Defense Agency (MDA), *MDA Sensors Directorate, LRDR Program Office Calculations*, March 2016.

USAF, 2016. United States Air Force (USAF), *F-35A Operational Beddown - Pacific Final Environmental Impact Statement,* February 2016.

BIOLOGICAL RESOURCES

ADF&G, 2006. Alaska Department of Fish and Game (ADF&G), *Our Wealth Maintained: A strategy for Conserving Alaska's Diverse Wildlife and Fish Resource*, Juneau, Alaska, xviii+824 pp., 2006.

Carlson, M. L. and T. Gotthardt, 2009. *Reconnaissance Survey for Threatened, Endangered and Sensitive Species at Clear Air Force Station, Alaska,* Alaska Natural Heritage Program, University of Alaska Anchorage, prepared for USAF and U.S. Army Medical Research, 2009.

Johnson, J. and V. Litchfield, 2015. *Catalog of waters important for spawning, rearing, or migration of anadromous fishes – Interior Region*, Effective 1 June 2015, Alaska Department of Fish and Game (ADF&G), Special Publication No. 15-06, Anchorage, 2015.

North Wind, 2005. North Wind Inc., *Invasive Plant Species Control Plan*, , Clear Air Force Station, Clear, Alaska, prepared for Air Force Space Command, May 2005.

USAF, 2015f. U.S. Air Force (USAF), *Clear ASF Invasive Species Control, 2015 Report,* Clear Air Force Station, Clear, Alaska, 2015.

USASMDC, 1993. U.S. Army Space and Strategic Defense Command (USASMDC), *Ground Based Radar (GBR) Family of Radars Environmental Assessment*, prepared for U.S. Army program Executive Office, Global Protection Against Limited Strikes, May 1993.

USDA, 2005. U.S. Department of Agriculture (USDA), U.S. Forest Service, *Forest Inventory and Assess at Clear Air Force Station, Alaska,* prepared in cooperation with the U.S. Air Force, Clear Air Force Station, October 2005.

USFWS, 2015. U.S. Fish and Wildlife Service (USFWS), IPaC Trust Report, *Information, Planning, and Conservation System* [online application] www.fws.gov/ipac, Project Code C4FDS-C2PEJ-HJRBT-EYJSU-JAHJQU, generated 16 August 2015.

CULTURAL RESOURCES

CAFS, 2009. *Comprehensive Agreement between the Nenana Native Council and the Clear Air Force Station*, signed by CAFS on 12 December 2008 and the Nenana Native Council on 2 January 2009.

Goebel and Bigelow, 1991. *Final Report of Archeological Reconnaissance Survey of the Clear Air Force Station, Clear, Alaska*, August 1991.

Northern Land Use Research, Inc., 1995. *Cultural Resource Management Plan for Clear Air Force Station, Alaska*, prepared for EA Engineering, Science and Technology, Inc., 1995

Powers, W. R., and J. F. Hoffecker, 1989. *Late Pleistocene Settlement in the Nenana Valley, Central Alaska*, American Antiquity, 54(2):263-287.

ENVIRONMENTAL JUSTICE

ADH ,2013. Alaska Department of Health and Social Services, Data and Statistics, http://dhss.alaska.gov/dph/VitalStats/Pages/data/default, (accessed 16-20 July 2015).

CDC, 2013. Center for Disease Control (CDC), "*Nutrition, Physical Activity and Obesity: Data, Trends and Maps"*, nccd.cdc.gov/NPAO_DTM/LocationSummary.aspx?state=Alaska, (accessed July 2015)

Federal Register, 2015. Federal Register, Volume 80, Number 14, Notices, Department of Health and Human Services, Office of the Secretary, Annual Update of the HHS Poverty Guidelines, issued Thursday, January 22, 2015, http://familiesusa.org/sites/default/files/product_documents/FPL-federal-register.pdf , accessed 20 July 2015.

U.S. Census, 2014. U.S. Census Bureau, Demographic and Housing Estimates, 2009-2013 American Community Survey, 5-Year Estimates, http://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml, accessed 16-20 July 2015.

USEPA, 2012. U.S. Environmental Protection Agency (USEPA), Environmental Justice, "Basic Information," <http://www.epa.gov/oecaerth/environmentaljustice/basics/index.html>, last updated 24 May 2012 (accessed 20 July 2015).

USEPA, 2013a. U.S. Environmental Protection Agency (USEPA), "EJView,"

http://epamap14.epa.gov/ejmap/entry.html, last updated 11 January 2013 (accessed 16-20 July 2015).

USEPA, 2013b. U.S. Environmental Protection Agency (USEPA), "EJSCREEN" http://ejscreen.epa.gov/mapper/ , last updated 10 June 2015 (accessed July 2015).

USEPA, 2014a. U.S. Environmental Protection Agency (USEPA), *Guidelines for Preparing Economic Analyses*, Chapter 10 - Environmental Justice, Children's Environmental Health and Other Distributional Considerations, National Center for Environmental Economics, Office of Policy, http://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0568-50.pdf/$file/EE-0568-50.pdf, 17 December 2010, updated May 2014.

GEOLOGY & SOILS

PDC, 2015. PDC Inc. Engineers and RIM Architects (PDC), *Site/Infrastructure Design, Entry Control Facility and Maintenance Facility Parametric Design Submittal (15%) Document*, Clear Air Force Station, KY, 26 June 2015.

USAF, 1992. United States Air Force (USAF), *Air Force Manual 88-3, Seismic Design for Buildings*, October 1992.

USGS, 1976. U.S. Geological Survey (USGS), *Alaska Topographic Series. Fairbanks quadrangle: Topographic Map 1: 250,000*, 1976.

USGS 1999a. U.S. Geologic Survey (USGS), *Ground Water Atlas of the United States: Alaska, Hawaii, Puerto Rico and the U. S. Virgin Islands*, HA 730-N; Alaska, 1999, http://capp.water.usgs.gov/gwa/ch_n/index.html (accessed August 2015).

USGS 1999b. U.S. Geologic Survey (USGS), *Probabilistic Seismic Hazard Maps of Alaska*, Open File Report 99-36, 1999.

USGS, 2004. U.S. Geological Survey (USGS), Earthquake Database, National Earthquake Information Center, http://gldss7.cr.usgs.gov/neis/epic/epic.htmll

HAZARDOUS MATERIALS/HAZARDOUS WASTE

BAE, 2015a. BAE Systems Integrated Technical Solutions (BAE), *Hazardous Waste Management Plan*, Clear Air Force Station, Clear, Alaska, January 2015.

BAE, 2015b. BAE Systems Integrated Technical Solutions (BAE), *Spill Management Plan*, Clear Air Force Station, Clear, Alaska, January 2015.

BAE, 2015c. BAE Systems Integrated Technical Solutions (BAE), *Asbestos Operations and Management Plan*, Clear Air Force Station, Clear, Alaska, January 2015.

BAE, 2015d. BAE Systems Integrated Technical Solutions (BAE), *Lead Management Plan*, Clear Air Force Station, Clear, Alaska, January 2015.

Jacobs, 2003. Jacobs Engineering Group Inc., *PCB Debris and PCB Item Removal Report*, Clear Air Force Station, Clear, Alaska, Final, December 2003.

USAF, 2002. U.S. Air Force (USAF), *Abate Asbestos and Lead, and Salvageable Materials Study*, DXEB 01-1014E, CAFS, prepared by GMD Inc., March 2002.

HEALTH & SAFETY

IEEE, 2005. Institute of Electrical and Electronics Engineers (IEEE), *Std C95.1, 2005. Standard for Safety Levels with Respect to Human Exposure of Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz*, 2005.

MDA, 2015. Missile Defense Agency (MDA), Email correspondence, Subject*: LRDR RF Safety* from Kenneth Cole CIV MDA/DPFF to Lt Col Jason Burch, USAF AFSPC 13 SWS/CC, 23 September 2015.

USAF, 2007b. U.S. Air Force (USAF), *Clear Air Force Station Radiation Safety Program Instruction*, CAFS, Clear AK, December 2007.

USAF, 2014b. U.S. Air Force (USAF), *Air Force Instruction, Electromagnetic Field Radiation (EMFR) Occupational and Environmental Health Program*, 1 August 2014.

LAND USE

AAK, 2015. Anderson, Alaska (AAK), Community Webpage, http://www.anderson.govoffice.com/index.asp?SEC=52F2BF6C-7A8E-4325-9BC8-5CA56A904477&Type=B_BASIC (accessed August 12, 2015).

Google Earth, 2015. Google Earth View of Clear Air Force Station, accessed 19 August 2015.

NMBC, 2012. DoD, Missile Defense Agency. "*New Mission Beddown and Construction, Clear Air Force Station, Alaska*." 12-MDA-6761, August 2012.

PL, 2015. Public Lands (PL) Interpretive Association, Alaska Public Lands Interactive Map, http://publiclands.org/Get-Books-and-Maps.php?plicstate=AK, accessed 12 August 2015.

NOISE

Anderson 2015. City of Anderson, AK, City Codes, Chapter 6.04.010, Nuisances declared unlawful, http://www.anderson.govoffice.com/index.asp?SEC=92B5E379-4A07-4C2F-83B9-002F33418204&DE=8FF3B9B3-382C-4BB2-ACA2-B6F164DB0132&Type=B_BASIC , (accessed 25 September 2015).

ANSI, 2013. American National Standards Institute (ANSI), Acoustical Terminology, ANSI S1.1-2013.

DoD, 1978. U.S. Department of Defense (DoD), Publication TM 5-803-2, "Planning in the Noise Environment," 15 June 1978.

FHWA, 2006. Federal Highway Administration (FHWA), Roadway Construction Noise Model, January 2006.

OSHA, 2005. Occupational Safety and Health Administration (OSHA), eTools: Noise and Hearing Conservation, https://www.osha.gov/dts/osta/otm/noise/index.html, accessed December 2015.

USEPA, 1971. U.S. Environmental Protection Agency (USEPA), Publication NTID 300.3, "Community Noise," 31 December 1971.

USEPA, 1974. U.S. Environmental Protection Agency (USEPA), Publication 550/9-74-004, "Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety," March 1974.

SOCIOECONOMICS

AKDLWD, 2012. Alaska Department of Labor and Workforce Development (AKDLWD), Population Projections. <http://laborstats.alaska.gov/pop/popproj.htm> (accessed 14 August 2015).

AKDLWD, 2014. Alaska Department of Labor and Workforce Development (AKDLWD). <http://live.laborstats.alaska.gov/ces/ces.cfm?at=60&a=000006&adj=0> (accessed 17 August 2015).

AKDLWD, 2015. Alaska Department of Labor and Workforce Development (AKDLWD), Unemployment Rates. <http://almis.labor.state.ak.us/labforce/graph.pdf> (accessed 17 August 2015).

BLS, 2014. Bureau of Labor Statistics (BLS), Occupational Employment and Wages, http://www.bls.gov/oes/current/oes470000.htm#st (accessed 17 August 2015).

DoD, 2012. U.S. Department of Defense (DoD), Under Secretary of Defense, "Military Construction Army Reprogramming Request," 10 May 2012.

ISER, 2015. Institute of Social and Economic Research ISER), Goldsmith, Scott. "2014 *Alaska's Construction Spending Forecast*.", University of Alaska Anchorage, February 2015.

Martz, Paul, 2014. "*Alaska Industry Forecast, 2012-2022*," Alaska Department of Labor and Workforce Development (AKDLWD), October 2014.

U.S. Census, 2010a. U.S. Census Data for the State of Alaska, www.census.gov, accessed 14 August 2015.

U.S. Census, 2010b. U.S. Census Data for Denali Borough, Alaska, http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=bkmk, accessed 14 August 2015.

TRANSPORTATION

ADOT&PF, 2010. Alaska Department of Transportation and Public Facilities (ADOT&PF), *Interior Alaska Transportation Plan*, November 2010.

ADOT&PF, 2013. Alaska Department of Transportation and Public Facilities (ADOT&PF), Central Region Traffic Volume Report 2011-2012-2013, 2013.

PDC, 2015. PDC Inc. Engineers and RIM Architects (PDC), *Site/Infrastructure Design, Entry Control Facility and Maintenance Facility Parametric Design Submittal (15%) Document*, Clear Air Force Station, KY, 26 June 2015.

SDDCTEA, 2011. Military Surface Deployment and Distribution Command Transportation Engineering Agency (SDDCTEA), Better Military Traffic Engineering, SDDCTEA 55-17, Scott Air Force Base, IL, 2011.

University of Florida, 2010. University of Florida, Highway Capacity Software, Gainesville, FL, 2010, version 6.1 and the software is based on the methodologies in the Transportation Research Council, Highway Capacity Manual, Transportation Research Board, Washington, DC, 2010.

UTILITIES

ADEC, 2005. Alaska Department of Environmental Conservation (ADEC), *Wastewater Disposal Permit No. 0231DB005 for the Clear Air Force Station Power Plant*, issued 30 December 2005, expires 29 December 2010.

BAE, 2015e. BAE Systems Integrated Technical Solutions (BAE), *Solid Waste Management Plan*, Clear Air Force Station, Clear, Alaska, January 2015.

Golder Associates, 2015. *Aquifer Evaluation Report, Clear Air Force Station, Alaska*, prepared for U.S. Corps of Engineers (USACE) Alaska District by Golder Associates, 23 June 2015.

WATER RESOURCES

Golder Associates, 2015. *Aquifer Evaluation Report, Clear Air Force Station, Alaska*, prepared for U.S. Corps of Engineers (USACE) Alaska District by Golder Associates, 23 June 2015.

USAF, 1999. U.S. Air Force (USAF), Clear Air Station Wetlands - National Wetlands Inventory Map, 1999

USAF, 2011c. U.S. Air Force (USAF), *Final Report Technical Memorandum, Storm Water Drainage Survey*, Clear AFS, AK, April 2011.

USAF, 2011d. U.S. Air Force (USAF), *Final Report Analysis of Storm Water Permit Requirements and Recommendations,* Clear AFS, AK, April 2011.

USAF, 2015e. U.S. Air Force (USAF), *Stormwater Runoff Management Plan,* Clear Air Force Station, Clear, Alaska, January 2015.

USGS, 2005. U.S. Geological Survey (USGS), Groundwater Levels for the Nation, http://waterdata.usgs.gov/usa/nwis/, 2005.

WETLANDS

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe, 1979. *Classification of Wetlands and Deepwater Habitats of the U.S.,* U.S. Fish and Wildlife Service (USFWS), USFWS/OBS-79/31, 103 pp.

Environmental Laboratory, 1987. *Corps of Engineers Wetlands Delineation Manual*, Technical Report Y-87-1, U.S. Army Corps of Engineers, Washington, D.C., January 1987.

USACE, 2011a. *Clear UEWR Upgrade-Wetlands Delineation Report, Clear Missile Warning Station,* Clear, Alaska, August 2011

USACE, 2015a. U.S. Army Corps of Engineers (USACE), *Approved Jurisdictional Determination Letter*, Clear AFS, Alaska, USACE File POA-2014—369, dated 10 January 2015.

USFWS, 2015.U.S. Fish and Wildlife Service (USFWS), IPaC Trust Report, *Information, Planning, and Conservation System* [online application] www.fws.gov/ipac, Project Coe C4FDS-C2PEJ-HJRBT-EYJSU-JAHJQU, generated 16 August 2015.

BUILDING AND CODE REQUIREMENTS

Unified Facilities Criteria:

UFC 1-200-02 *High Performance and Sustainable Building Requirements*

UFC 3-201-01 Chapter 3, *Storm Drainage Systems*

UFC 3-210-10 *Low Impact Development*

UFC 3-301- 01 *Structural Engineering*

UFC 3-310-04 *Seismic Design for Buildings*

6.0 LIST OF PREPARERS

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B.S. 1985, Chemical Engineering, Kansas State University
Years of Experience: 30

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M.S. 1985, Aquatic Ecology, Western Kentucky University
B.S. 1981, Zoology, North Dakota State University;
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B.S. 1987, Civil Engineering, University of Missouri
Years of Experience: 28

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M.S. 2004, Environmental Science, Drexel University
B.A. 1995, Geo/Environmental Studies, Shippensburg University
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M.S. 2000, Atmospheric Science, University of Illinois
B.S. 1998, Atmospheric Science, University of Missouri
Years of experience: 8

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M.S. 1989, Biological Sciences, Northern Illinois University
B.S. 1985, Biological Sciences, Northern Illinois University
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Jacob Taylor Registered Geologist
B.S. 2006, Comprehensive Geology, Northwest Missouri State
Year of experience: 9

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B.S. 2010, Environmental Engineering, Missouri University of Science & Technology
Years of Experience: 5

Cole Hambleton, Environmental Scientist
B.S., Biology, Kansas State University
Juris Doctorate – Natural Resources Law, Washburn University School of Law
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M.S. 1989, Civil Engineering, University of Kansas
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M.S. 2006, Civil Engineering, Brigham Young University
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B.A. 2005, Geography, DePaul University
Years of Experience: 10

Dusty Miller, Environmental Scientist
B.S. 1997, Environmental Studies, The University of Kansas
Years of experience: 11

APPENDICES

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APPENDIX A

AGENCY AND NATIVE COUNCIL CORRESPONDENCE

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APPENDIX A-1

PRE-DRAFT EA
AGENCY AND NATIVE COUNCIL CORRESPONDENCE

Dr. Fathima Siddeek (Zeena),
Alaska Department of Environmental Conservation
Air Permits Program Supervisor
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Juneau, AK 99801
907-465-5303
Fathima.siddeek@alaska.gov
Coordinating meeting held on 07/23/15. Meeting minutes provided in Administrative Record.

Patrick Dunn, Air Permits Program
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Coordinating meeting held on 07/23/15 Meeting minutes provided in Administrative Record.

Dr. Judith E. Bittner, Chief
State Historic Preservation Office
Office of History and Archaeology
Division of Parks and Outdoor Recreation
Alaska Department of Natural Resources
550 W. 7th Avenue, Suite 1260
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Coordinating meeting held on 07/23/15 Meeting minutes provided in Administrative Record.

Shina duVall State Archaeologist
State Historic Preservation Office
550 W. 7th Avenue, Suite 1310
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Shina.duvall@alaska.gov
Coordinating meeting held on 07/23/15 Meeting minutes provided in Administrative Record. Additional follow-up correspondence provided to SHPO, see Appendix A-3.

Jim Rypkema, Water Discharge Authorization
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Alaska Department of Environmental Conservation
Wells & Permitting
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Alaska Department of Environmental Conservation
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610 University Ave
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Shawna Laderach, Drinking Water
Alaska Department of Environmental Conservation
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Coordinating meeting held on 07/23/15 Meeting minutes provided in Administrative Record.

Jennifer Curtis, NEPA Reviewer
U.S. Environmental Protection Agency
Alaska Operations Office
222 W. 7th Ave. #19
Anchorage, AK 99513-7588
907-271-6324
curtis.jennifer@epamail.epa.gov
Contacted by phone - No meeting/no review required, would like courtesy copy.

Brooke Merrell
National Park Service
907-644-3510
Brooke_Merrell@nps.gov
Contacted by phone – No meeting required but would plan to review EA.

Jeanne Proulx
Alaska Department of Natural Resources
Division of Mining, Land & Water
Northern Region Office
3700 Airport Way
Fairbanks, AK 99709
Jeanne.proulx@alaska.gov
Contacted by phone – No meeting required but would plan to review EA

Joanne Kuykendall
USDA Natural Resource Conservation Service
590 University Ave., Suite B
Fairbanks, AK 99709
907-479-3159
Contacted by phone - No need to review or be involved.

Kathy Morgan
Nenana Native Council
PO Box 369
Nenana, AK 99760
907-832-5461
See correspondence in Appendix A-2.

Jewel Bennett – Branch Chief
Conservation Planning
U.S. Fish and Wildlife Service
Fairbanks Federal Building
101 12th Avenue
Fairbanks, AK 99701-6236
907-456-0324
Jewel_bennett@fws.gov
Contacted by email and phone, no response received.

Donald Young
Alaska Department of Fish and Game
1300 College Road
Fairbanks, AK 99701
907-459-7233
Don.young@alaska.gov
Contacted by email, no response received in regards to meeting.

Mark Wallace
U.S. Army Corps of Engineers
USACE Alaska District
PO Box 6898
JBER, AK 99506-0898
Mark.N.Wallace@usace.army.mil
Contact has been provided in regards to field verification of project specific wetland impacts.

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APPENDIX A-2

PRE-LRDR EA CORRESPONDENCE WITH NENANA NATIVE COUNCIL

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DEPARTMENT OF THE AIR FORCE
13th SPACE WARNING SQUADRON (AFSPC)
CLEAR AFS ALASKA

20 January 2016

MEMORANDUM FOR NENANA NATIVE COUNCIL
ATTN: KATHY MORGAN
PO BOX 369
Nenana AK 99760

FROM: 13 SWS/CC
200 A Street, Stop 1
Clear AFS AK 99704-5360

SUBJECT: Notification of Long-Range Discrimination Radar Construction and Technical Site Demolition at Clear AFS

1. Clear AFS would like to notify you that an Environmental Assessment (EA) is being prepared for the construction of a Long-Range Discrimination Radar (LRDR) and demolition of the Technical Site. A draft EA will be sent to you for review in February or March 2016. The draft EA will further describe the projects. The general schedule for the construction and demolition project is as follows:

- Spring 2016: Additional characterization of hazardous material and asbestos will begin as preparation for demolition.
- Spring 2016: Demilitarization (removal) of the three radar screens and two radomes above buildings 101 and 102 will begin.
- Summer 2016: The removal of the remaining hazardous materials and asbestos will begin at the Technical Site.
- Summer 2016: The demolition of the remaining Technical Site structures will begin.
- Summer 2016: Construction camp preparation at the Technical Site will begin.
- Summer 2017: Construction of the LRDR at the Technical Site will begin.

2. If you have any questions or concerns, please contact Bob Tomlinson at (719) 556-8059 or robert.tomlinson@us.af.mil. Please address all official correspondence to 13 SWS/CC, 200 A Street, Stop 1, Clear AFS, AK 99704-5360.

BURCH.JASON.B.1187343980
Digitally signed by BURCH.JASON.B.1187343980
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USAF, cn=BURCH.JASON.B.1187343980
Date: 2016.01.25 07:04:04 -09'00'

JASON B. BURCH, Lt Col, USAF
Commander

cc:
BAE/ENV
21 CES/CEIE

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APPENDIX A-3

CORRESPONDENCE WITH STATE HISTORIC PRESERVATION OFFICE

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DEPARTMENT OF THE AIR FORCE
13th SPACE WARNING SQUADRON (AFSPC)
CLEAR AFS ALASKA

20 January 2016

MEMORANDUM FOR ALASKA STATE HISTORIC PRESERVATION OFFICE
ATTN: SHINA DUVALL
OFFICE OF HISTORY AND ARCHAEOLOGY
DIVISION OF PARKS AND OUTDOOR RECREATION
550 W. 7th Avenue, Suite 1310
Anchorage AK 99501-3565

FROM: 13 SWS/CC
200 A Street, Stop 1
Clear AFS AK 99704-5360

SUBJECT: Notification of Long-Range Discrimination Radar Construction and Technical Site Demolition at Clear AFS

1. In accordance with Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR Part 800, we are providing information for your review and concurrence regarding the project at Clear AFS to construct a Long-Range Discrimination Radar (LRDR) and demolish the Technical Site. The general project schedule is as follows:

- Spring 2016: Additional characterization of hazardous material and asbestos will begin.
- Spring 2016: Demilitarization (removal) of the three radar screens and two radomes above buildings 101 and 102 will begin.
- Summer 2016: The removal of the remaining hazardous materials and asbestos at the Technical Site will begin.
- Summer 2016: The demolition of the remaining Technical Site structures will begin.
- Summer 2016: Construction camp preparation at the Technical Site will begin.
- Summer 2017: Construction of the LRDR at the Technical Site will begin.

Clear AFS has entered into the environmental review phase of this project and will prepare documentation to support the determination of this project as a Finding of No Significant Impact (FONSI) under the National Environmental Policy Act (NEPA). We are inviting your comments on the Area of Potential Effects (APE) for this project pursuant to 36 CFR 800.4.

2. Clear AFS has determined that the project will have "No Adverse Effect" pursuant to 36 CFR 800.5. As described in the Memorandum of Agreement (MOA) between the Air Force and the Alaska State Historic Preservation Office, the Technical Site buildings and structures were eligible for listing in the National Register of Historic Places. The history of the complex and its significance during the Cold War have been detailed through the mitigation measures discussed in the MOA. After all the mitigation measures were complete, the MOA was terminated by both parties. The LRDR construction is planned for previously developed area adjacent to the Technical Site. The construction project is further described in the

Environmental Assessment (EA), the draft of which will be sent to your office for review in February or March 2016 under a separate cover letter.

3. If you have any questions or concerns, please contact Bob Tomlinson at (719) 556-8059 or robert.tomlinson@us.af.mil. If you have no objection to the determination of "No Adverse Effect" from these projects after reviewing the EA, please provide written confirmation to 13 SWS/CC, 200 A Street, Stop 1, Clear, AK 99704-5360.

BURCH.JASON.B.1187343980

Digitally signed by BURCH.JASON.B.1187343980
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USAF, cn=BURCH.JASON.B.1187343980
Date: 2016.01.25 07:05:44 -09'00'

JASON B. BURCH, Lt Col, USAF
Commander

cc:
BAE/ENV
21 CES/CEIE

APPENDIX A-4

PROPOSED FINAL EA REVIEW DISTRIBUTION LIST

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Division of Parks and Outdoor Recreation
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Gary Mendivil
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Brooke Merrell
National Park Service
Denali National Park & Preserve
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Andrea Stacy
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Air Resources Division
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Denver, CO 80228

APPENDIX B

AIR QUALITY CALCULATIONS AND CORRESPONDENCE WITH ALASKA DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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APPENDIX B-1

CONSTRUCTION EMISSION CALCULATIONS

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CAFS LRDR EA

Clear Air Force Station (CAFS), Alaska

CAFS Estimated Annual Air Emissions During Construction

2017

Pollutant	Construction Equipment Emissions [1] (ton/yr) Alternative 1 Site 3A	Construction Equipment Emissions [1] (ton/yr) Alternative 2 Site 3B	Worker Vehicle Emissions [2] (ton/yr)	On-Road Haul/Delivery Truck Emissions [3] (ton/yr)	TOTAL Annual Emissions (ton/yr) Alternative 1 Site 3A	TOTAL Annual Emissions (ton/yr) Alternative 2 Site 3B
VOC	7.24	7.24	0.92	0.07	8.2	8.2
NO_X	50.24	50.24	0.88	0.73	51.8	51.8
SO_X	41.84	41.84	0.004	0.001	41.8	41.8
$PM_{2.5}$	2.49	2.49	0.03	0.02	2.5	2.5
PM_{10}	143.94	190.54	0.03	0.03	144.0	190.6
CO	33.51	33.51	9.49	0.23	43.2	43.2
CO_2e [4]	7,729	7,729	632	134	8,495	8,495

2018

Pollutant	Construction Equipment Emissions [1] (ton/yr) Alternative 1 Site 3A	Construction Equipment Emissions [1] (ton/yr) Alternative 2 Site 3B	Worker Vehicle Emissions [2] (ton/yr)	On-Road Haul/Delivery Truck Emissions [3] (ton/yr)	TOTAL Annual Emissions (ton/yr) Alternative 1 Site 3A	TOTAL Annual Emissions (ton/yr) Alternative 2 Site 3B
VOC	9.34	9.34	1.51	0.02	10.9	10.9
NO_X	63.23	63.23	1.39	0.22	64.8	64.8
SO_X	17.72	17.72	0.01	0.0004	17.7	17.7
$PM_{2.5}$	3.26	3.26	0.05	0.01	3.3	3.3
PM_{10}	3.26	3.26	0.06	0.01	3.3	3.3
CO	45.98	45.98	16.09	0.07	62.1	62.1
CO_2e [4]	9,872	9,872	1,124	44	11,040	11,040

2019

Pollutant	Construction Equipment Emissions [1] (ton/yr) Alternative 1 Site 3A	Construction Equipment Emissions [1] (ton/yr) Alternative 2 Site 3B	Worker Vehicle Emissions [2] (ton/yr)	On-Road Haul/Delivery Truck Emissions [3] (ton/yr)	TOTAL Annual Emissions (ton/yr) Alternative 1 Site 3A	TOTAL Annual Emissions (ton/yr) Alternative 2 Site 3B
VOC	8.61	8.61	2.79	0.02	11.4	11.4
NO_X	57.45	57.45	2.45	0.20	60.1	60.1
SO_X	17.72	17.72	0.02	0.0004	17.7	17.7
$PM_{2.5}$	2.88	2.88	0.09	0.01	3.0	3.0
PM_{10}	2.88	2.88	0.10	0.01	3.0	3.0
CO	45.02	45.02	30.53	0.07	75.6	75.6
CO_2e [4]	9,821	9,821	2,230	4	12,055	12,055

2020

Pollutant	Construction Equipment Emissions [1] (ton/yr) Alternative 1 Site 3A	Construction Equipment Emissions [1] (ton/yr) Alternative 2 Site 3B	Worker Vehicle Emissions [2] (ton/yr)	On-Road Haul/Delivery Truck Emissions [3] (ton/yr)	TOTAL Annual Emissions (ton/yr) Alternative 1 Site 3A	TOTAL Annual Emissions (ton/yr) Alternative 2 Site 3B
VOC	8.04	8.042	2.06	0.02	10.1	10.1
NO_X	52.56	52.56	1.73	0.18	54.5	54.5
SO_X	17.72	17.72	0.01	0.0004	17.73	17.73
$PM_{2.5}$	2.57	2.57	0.07	0.005	2.6	2.6
PM_{10}	2.57	2.57	0.08	0.006	2.6	2.6
CO	44.56	44.56	23.13	0.06	67.7	67.7
CO_2e [4]	9,848	9,848	1,753	43	11,644	11,644

2021

Pollutant	Construction Equipment Emissions [1] (ton/yr) Alternative 1 Site 3A	Construction Equipment Emissions [1] (ton/yr) Alternative 2 Site 3B	Worker Vehicle Emissions [2] (ton/yr)	On-Road Haul/Delivery Truck Emissions [3] (ton/yr)	TOTAL Annual Emissions (ton/yr) Alternative 1 Site 3A	TOTAL Annual Emissions (ton/yr) Alternative 2 Site 3B
VOC	1.35	1.35	0.61	0.01	2.0	2.0
NO_X	8.52	8.52	0.51	0.14	9.2	9.2
SO_X	0.02	0.02	0.004	0.0003	0.03	0.03
$PM_{2.5}$	0.37	0.37	0.02	0.004	0.4	0.4
PM_{10}	0.37	0.37	0.02	0.004	0.4	0.4
CO	9.26	9.26	6.83	0.05	16.1	16.1
CO_2e [4]	1,967	1,967	518	32	2,518	2,518

Notes:

1. The construction equipment emissions for each criteria pollutant is based on output from the United States Air Force Air Conformity Applicability Model (ACAM), Version 5.02.
2. Criteria pollutant emissions were calculated in the "Construction Worker Vehicle" spreadsheet using emission factors from ACAM, Version 5.02.
3. Criteria pollutant emissions were calculated in the "OnRoad Haul-Delivery Truck" spreadsheet using emission factors from ACAM, Version 5.02.
4. CO_2e was calculated using emission factors from ACAM, Version 5.02 and is provided in units of metric tons.

CAFS LRDR EA

Clear Air Force Station (CAFS), AK

CO_2 Emissions Calculations

Annual Emission Factors		2017	2018	2019	2020	2021
		Emission Factors[1] (lb/hr)				
Activity	**Construction Equipment Name**	**CO2**	**CO2**	**CO2**	**CO2**	**CO2**
Site Prep	Air Compressors Composite	63.607	--	--	--	--
	Bore/Drill Rigs Composite	164.9	--	--	--	--
	Crawler Tractors Composite	114.01	--	--	--	--
	Crushing/Proc Equipment Composite	132.3	--	--	--	--
	Dumpers/Tenders	7.6243	--	--	--	--
	Excavators Composite	119.58	--	--	--	--
	Generator Sets	60.992	--	--	--	--
	Graders Composite	132.74	--	--	--	--
	Off-Highway Trucks	260.05	--	--	--	--
	Other Construction Equipment Composite	122.54	--	--	--	--
	Other Material Handling Equipement Composite	141.19	--	--	--	--
	Plate Compactors Composite	4.3138	--	--	--	--
	Pressure Washers	9.4135	--	--	--	--
	Pumps Composite	49.606	--	--	--	--
	Rollers Composite	67.046	--	--	--	--
	Rubber Tire Dozers Composite	239.08	--	--	--	--
	Rubber Tire Loaders Composite	108.61	--	--	--	--
	Scrapers Composite	262.48	--	--	--	--
	Tractors/Loaders/Backhoes	66.797	--	--	--	--
	Trenchers Cpmposite	58.714	--	--	--	--
Construction	Aerial Lifts Composite	34.721	34.721	34.721	34.721	34.721
	Air Compressors Composite	63.607	63.607	63.607	63.607	63.607
	Bore/Drill Rigs Composite	164.89	164.88	164.87	164.86	164.88
	Concrete and Mortar Mixers	7.2481	7.2481	7.2481	7.2481	7.2481
	Concrete/Industrial Saws Composite	58.463	58.463	58.463	58.463	58.463
	Cranes	128.62	128.62	128.62	128.63	128.63
	Crawler Tractors Composite	114.01	114.01	114.01	114.01	114.01
	Crushing/Proc Equipment Composite	132.3	132.3	132.3	132.3	132.3
	Dumpers/Tenders	7.6243	7.6243	7.6243	7.6243	7.6243
	Excavators Composite	119.57	119.57	119.57	119.57	119.57
	Forklifts	54.395	54.395	54.395	54.395	54.395
	Generator Sets Composite	60.992	60.992	60.992	60.992	60.992
	Graders Composite	132.74	132.74	132.74	132.74	132.74
	Off-Highway Trucks	260.05	260.07	260.08	260.08	260.08
	Other Construction Equipment Composite	122.54	122.52	122.5	122.49	122.49
	Other Material Handling Equipement Composite	141.19	141.19	141.19	141.19	141.19
	Pavers	77.933	77.933	77.933	77.933	77.933
	Paving Equipment Composite	68.94	68.94	68.94	68.939	68.938
	Plate Compactors Composite	4.3138	4.3138	4.3138	4.3138	4.3138
	Pressure Washers	9.4135	9.4135	9.4135	9.4135	9.4135
	Pumps Composite	49.606	49.606	49.606	49.606	49.606
	Rollers Composite	67.046	67.044	67.042	67.04	67.038
	Rubber Tired Dozers	239.08	239.08	239.08	239.08	239.08
	Rubber Tire Loaders Composite	108.61	108.61	108.61	108.61	108.61
	Scrapers Composite	262.48	262.48	262.48	262.48	262.48
	Surfacing Equipment Composite	165.96	165.96	165.96	165.96	165.96
	Tractors/Loaders/Backhoes Composite	66.797	66.797	66.797	66.798	66.798
	Trenchers Cpmposite	58.714	58.713	58.713	58.713	58.713
	Welders Composite	25.602	25.602	25.602	25.602	25.602

Annual Estimated Emissions												Year 2017	Year 2018	Year 2019	Year 2020	Year 2021
		Number of Equipment Pieces[2]					2017	2018	2019	2020	2021	Metric Tons	Metric Tons	Metric Tons	Metric Tons	Metric Tons
Activity	Construction Equipment List [2]	2017	2018	2019	2020	2021	Hrs/yr[3]	Hrs/yr[3]	Hrs/yr[3]	Hrs/yr[3]	Hrs/yr[3]	CO2	CO2	CO2	CO2	CO2
Site Prep	Air Compressors Composite	2	0	0	0	0	1830	--	--	-	-	105.6	0	0	0	0
	Bore/Drill Rigs Composite	2	0	0	0	0	1830	--	--	--	--	273.8	0	0	0	0
	Crawler Tractors Composite	2	0	0	0	0	1830	--	--	--	--	189.3	0	0	0	0
	Crushing/Proc Equipment Composite	1	0	0	0	0	1830	--	--	--	--	109.8	0	0	0	0
	Dumpers/Tenders	2	0	0	0	0	1830	--	--	--	--	12.7	0	0	0	0
	Excavators Composite	5	0	0	0	0	1830	--	--	--	--	496.3	0	0	0	0
	Generator Sets Composite	1	0	0	0	0	1830	--	--	--	--	50.6	0	0	0	0
	Graders Composite	2	0	0	0	0	1830	--	--	--	--	220.4	0	0	0	0
	Off-Highway Trucks	5	0	0	0	0	1830	--	--	--	--	1079.3	0	0	0	0
	Other Construction Equipment Composite	1	0	0	0	0	1830	--	--	--	--	101.7	0	0	0	0
	Other Material Handling Equipement Composite	1	0	0	0	0	1830	--	--	--	--	117.2	0	0	0	0
	Plate Compactors Composite	2	0	0	0	0	1830	--	--	--	--	7.2	0	0	0	0
	Pressure Washers	1	0	0	0	0	1830	--	--	--	--	7.8	0	0	0	0
	Pumps Composite	4	0	0	0	0	1830	--	--	--	--	164.7	0	0	0	0
	Rollers Composite	7	0	0	0	0	1830	--	--	--	--	389.6	0	0	0	0
	Rubber Tire Dozers Composite	1	0	0	0	0	1830	--	--	--	--	198.5	0	0	0	0
	Rubber Tire Loaders Composite	1	0	0	0	0	1830	--	--	--	--	90.2	0	0	0	0
	Scrapers Composite	3	0	0	0	0	1830	--	--	--	--	653.6	0	0	0	0
	Tractors/Loaders/Backhoes	3	0	0	0	0	1830	--	--	--	--	166.3	0	0	0	0
	Trenchers Cpmposite	2	0	0	0	0	1830	--	--	--	--	97.5	0	0	0	0
Construction	Aerial Lifts Composite	1	3	3	3	0	1472	3650	3650	3660	2184	23.2	172.5	172.5	172.9	0.0
	Air Compressors Composite	5	5	5	5	0	1472	3650	3650	3660	2184	212.3	526.5	526.5	528.0	0.0
	Bore/Drill Rigs Composite	1	1	1	1	4	1472	3650	3650	3660	2184	110.1	273.0	273.0	273.7	653.4
	Concrete and Mortar Mixers	3	1	1	1	0	1472	3650	3650	3660	2184	14.5	12.0	12.0	12.0	0.0
	Concrete/Industrial Saws Composite	3	2	2	2	0	1472	3650	3650	3660	2184	117.1	193.6	193.6	194.1	0.0
	Cranes	2	4	4	4	0	1472	3650	3650	3660	2184	171.8	851.8	851.8	854.2	0.0
	Crawler Tractors Composite	2	4	4	4	1	1472	3650	3650	3660	2184	152.2	755.0	755.0	757.1	112.9
	Crushing/Proc Equipment Composite	1	1	1	1	1	1472	3650	3650	3660	2184	88.3	219.0	219.0	219.6	131.1
	Dumpers/Tenders	1	1	1	1	0	1472	3650	3650	3660	2184	5.1	12.6	12.6	12.7	0.0
	Excavators Composite	2	1	1	1	0	1472	3650	3650	3660	2184	159.7	198.0	198.0	198.5	0.0
	Forklifts	0	3	3	3	0	1472	3650	3650	3660	2184	0.0	270.2	270.2	270.9	0.0
	Generator Sets Composite	2	2	2	2	2	1472	3650	3650	3660	2184	81.4	202.0	202.0	202.5	120.8
	Graders Composite	1	1	1	1	1	1472	3650	3650	3660	2184	88.6	219.8	219.8	220.4	131.5
	Off-Highway Trucks	3	2	2	2	0	1472	3650	3650	3660	2184	520.9	861.2	861.2	863.5	0.0
	Other Construction Equipment Composite	2	2	2	2	1	1472	3650	3650	3660	2184	163.6	405.7	405.6	406.7	121.3
	Other Material Handling Equipment Composite	1	1	1	1	0	1472	3650	3650	3660	2184	94.3	233.8	233.8	234.4	0.0
	Pavers	1	3	3	3	1	1472	3650	3650	3660	2184	52.0	387.1	387.1	388.1	77.2
	Paving Equipment Composite	1	3	3	3	1	1472	3650	3650	3660	2184	46.0	342.4	342.4	343.3	68.3
	Plate Compactors Composite	1	0	0	0	0	1472	3650	3650	3660	2184	2.9	0.0	0.0	0.0	0.0
	Pressure Washers	1	1	1	1	0	1472	3650	3650	3660	2184	6.3	15.6	15.6	15.6	0.0
	Pumps Composite	4	6	6	6	0	1472	3650	3650	3660	2184	132.5	492.8	492.8	494.1	0.0
	Rollers Composite	2	1	1	1	1	1472	3650	3650	3660	2184	89.5	111.0	111.0	111.3	66.4
	Rubber Tired Dozers Composite	1	1	1	1	0	1472	3650	3650	3660	2184	159.6	395.8	395.8	396.9	0.0
	Rubber Tire Loaders Composite	3	8	8	8	1	1472	3650	3650	3660	2184	217.6	1438.5	1438.5	1442.5	107.6
	Scrapers Composite	1	1	1	1	1	1472	3650	3650	3660	2184	175.3	434.6	434.6	435.8	260.0
	Surfacing Equipment Composite	1	1	1	1	0	1472	3650	3650	3660	2184	110.8	274.8	274.8	275.5	0.0
	Tractors/Loaders/Backhoes Composite	2	2	2	2	1	1472	3650	3650	3660	2184	89.2	221.2	221.2	221.8	66.2
	Trenchers Cpmposite	2	1	1	1	0	1472	3650	3650	3660	2184	78.4	97.2	97.2	97.5	0.0
	Welders Composite	2	6	6	6	2	1472	3650	2920	2928	2184	34.2	254.3	203.5	204.0	50.7
												2017	2018	2019	2020	2021
											Total Metric Tons of CO_2 Emissions from Construction Equipment	7,729.46	9,871.73	9,820.81	9,847.73	1,967.47

Notes:

1. Carbon dioxide emission factors for each construction equipment and annual period are from USAF's ACAM model, Version 5.02. The ACAM model utilizes emission factors for construction vehicles that is based on the USEPA's MOVES program.
2. The preliminary construction equipment list and number of equipment per year for site preparation and construction was developed using information from previous projects conducted at the Clear AFS and projects completed by the MDA that are similar to the proposed action.
3. The number of hours per year for the construction equipment is based on the preliminary assumptions for the construction schedule. Site preparation will begin April 2017 through September 2017 for 10 hours/day. Construction starts July 2017 through September 2021 and will take place throughout the year. Construction will last 8 hours per day in 2017, 10 hours per day in 2018 to 2020, and 8 hours/day in 2021. The emission analysis assumes that he construction equipment will be operating during the entire work day, which is not likely and makes this analysis a bounding estimate of air emissions.

CAFS LRDR EA

Clear Air Force Station (CAFS), AK

Air Emissions Estimate for Worker Vehicles duirng Construciton

Annual Emission Factors[1, 2] (g/mi)

Vehicle Type	2017							2018							2019							2020							2021						
	VOC	$PM_{2.5}$	PM_{10}	NOx	CO	CO_2	SO_2	VOC	$PM_{2.5}$	PM_{10}	NOx	CO	CO_2	SO_2	VOC	$PM_{2.5}$	PM_{10}	NOx	CO	CO_2	SO_2	VOC	$PM_{2.5}$	PM_{10}	NOx	CO	CO_2	SO_2	VOC	$PM_{2.5}$	PM_{10}	NOx	CO	CO_2	SO_2
Passenger Cars	0.486	0.016	0.018	0.381	4.664	349.310	0.002	0.441	0.014	0.016	0.328	4.376	341.006	0.002	0.401	0.013	0.014	0.283	4.115	332.171	0.002	0.367	0.011	0.013	0.247	3.890	322.866	0.002	0.367	0.011	0.013	0.247	3.890	322.866	0.002
Light-Duty Trucks	0.572	0.019	0.021	0.636	6.260	452.701	0.003	0.513	0.017	0.019	0.549	5.758	439.542	0.003	0.462	0.016	0.018	0.475	5.313	427.045	0.003	0.420	0.014	0.016	0.415	4.941	415.017	0.003	0.420	0.014	0.016	0.415	4.941	415.017	0.003

Estimated Annual Air Emissions (tons/year)

Vehicle Type	Miles/ Trip[3]	Months/Year[4]					Trips/Month [5] [6]					2017							2018							2019							2020							2021						
		2017	2018	2019	2020	2021	2017	2018	2019	2020	2021	VOC	$PM_{2.5}$	PM_{10}	NO_x	CO	CO_2 [7]	SO_2	VOC	$PM_{2.5}$	PM_{10}	NO_x	CO	CO_2 [7]	SO_2	VOC	$PM_{2.5}$	PM_{10}	NO_x	CO	CO_2 [7]	SO_2	VOC	$PM_{2.5}$	PM_{10}	NO_x	CO	CO_2 [7]	SO_2	VOC	$PM_{2.5}$	PM_{10}	NO_x	CO	CO_2 [7]	SO_2
Passenger Cars	150	9	12	12	12	9	584	800	1632	1320	520	0.4224	0.0139	0.0156	0.3311	4.0533	275.396	0.0017	0.7000	0.0222	0.0254	0.5206	6.9461	491.05	0.0032	1.2985	0.0421	0.0453	0.9164	13.3250	975.786	0.0065	0.9612	0.0288	0.0340	0.6469	10.1883	767.130	0.0052	0.2840	0.0085	0.0101	0.1911	3.0102	226.652	0.0015
Light-Duty Trucks	150	9	12	12	12	9	584	800	1632	1320	520	0.4971	0.0165	0.0183	0.5527	5.4403	356.91	0.0026	0.8143	0.0270	0.0302	0.8714	9.1398	632.94	0.0048	1.4960	0.0518	0.0583	1.5381	17.2043	1254.49	0.0097	1.1000	0.0367	0.0419	1.0869	12.9409	986.08	0.0079	0.3250	0.0108	0.0124	0.3211	3.8235	291.34	0.0023
		Total Annual Emissions from Worker Vehicles										0.9195	0.0304	0.0339	0.8838	9.4936	632.31	0.0043	1.5143	0.0492	0.0556	1.3921	16.0860	1123.99	0.0079	2.7945	0.0939	0.1036	2.4545	30.5293	2230.27	0.0162	2.0612	0.0655	0.0760	1.7338	23.1292	1753.21	0.0131	0.6090	0.0193	0.0224	0.5123	6.8336	517.99	0.0039

Notes [ ]:

1. Emission factors for Passenger Car (LDGV) and Light-Duty Gasoline Truck (LDGT All) are from USAF 's ACAM model, Version 5.02.
   The ACAM model utilizes mobile vehicle emission factors representative of the Denali Borough that is based on the US EPA's MOVES program.
2. This table provides annual emission factors for each year of construction of the proposed action.
3. Total miles/trip is based on a roundtrip commuting distance for those who drive to Fairbanks, AK on their off days, 75 miles from the construction site for a round trip of 150 miles.
4. The months per year assumes that site preparation and construction will will start in April 2017 and continues through September 2021.
5. Trips/Month are based on monthly project estimates for the expected distribution of workers averaged over each year of the expected construction schedule, assuming 8 trips taken to Fairbanks, AK each month.
   The analysis uses 145 workers during 2017, 199 workers in 2018, 407 workers in 2019, 330 workers in 2020 and 129 workers in 2021, who are assumed to reside at the Clear AFS Man Camp during working days.
6. It is assumed that the fleet of worker vehicles during construction will be a mix of 50 percent passenger cars and 50 percent light-duty gasoline trucks.
7. Maximum estimated emissions for CO_2 is provided in units of metric tons. All other criteria pollutants is provided in units of tons.

CAFS LRDR EA

Clear Air Force Station (CAFS), AK

Air Emissions Estimate for On-Road Haul/Delivery Trucks duirng Construciton

Annual Emission Factors[1, 2] (g/mi)

Vehicle Type	2017							2018							2019							2020							2021						
	VOC	$PM_{2.5}$	PM_{10}	NOx	CO	CO_2	SO_2	VOC	$PM_{2.5}$	PM_{10}	NOx	CO	CO_2	SO_2	VOC	$PM_{2.5}$	PM_{10}	NOx	CO	CO_2	SO_2	VOC	$PM_{2.5}$	PM_{10}	NOx	CO	CO_2	SO_2	VOC	$PM_{2.5}$	PM_{10}	NOx	CO	CO_2	SO_2
Heavy Duty Diesel Vehicle (HDDV)	0.752	0.240	0.260	7.534	2.378	1526.27	0.013	0.692	0.208	0.226	6.862	2.206	1511.27	0.013	0.639	0.181	0.197	6.271	2.056	1497.41	0.013	0.593	0.158	0.172	5.739	1.925	1484.51	0.013	0.593	0.158	0.172	5.739	1.925	1484.51	0.013

Estimated Annual Air Emissions (tons/year)

Vehicle Type	Miles/ Trip[3]	Trips/Year[4, 5]					2017							2018							2019							2020							2020						
		2017	2018	2019	2020	2021	VOC	$PM_{2.5}$	PM_{10}	NO_x	CO	CO_2 [6]	SO_2	VOC	$PM_{2.5}$	PM_{10}	NO_x	CO	CO_2 [6]	SO_2	VOC	$PM_{2.5}$	PM_{10}	NO_x	CO	CO_2 [6]	SO_2	VOC	$PM_{2.5}$	PM_{10}	NO_x	CO	CO_2 [6]	SO_2	VOC	$PM_{2.5}$	PM_{10}	NO_x	CO	CO_2 [6]	SO_2
HDDV	20	4375	1460	1460	1460	1092	0.0725	0.0231	0.0251	0.7267	0.2294	133.55	0.0013	0.0223	0.0067	0.0073	0.2209	0.0710	44.13	0.0004	0.0206	0.0058	0.0063	0.2018	0.0662	4.37	0.0004	0.0191	0.0051	0.0055	0.1847	0.0620	43.35	0.0004	0.0143	0.0038	0.0041	0.1382	0.0463	32.42	0.0003
	Total Annual Emissions						0.0725	0.0231	0.0251	0.7267	0.2294	133.55	0.0013	0.0223	0.0067	0.0073	0.2209	0.0710	44.13	0.0004	0.0206	0.0058	0.0063	0.2018	0.0662	4.37	0.0004	0.0191	0.0051	0.0055	0.1847	0.0620	43.35	0.0004	0.0143	0.0038	0.0041	0.1382	0.0463	32.42	0.0003

Notes [ ]:

1. Emission factors for the Heavy Duty Diesel Vehicles (HDDV) are from USAF 's ACAM model, Version 5.02. The ACAM model utilizes mobile vehicle emission factors representative of the Denali Borough that is based on the USEPA's MOVES program.
2. This table provides annual emission factors for each year of construction of the proposed action.
3. Total miles/trip is based on a roundtrip distance of 20 miles from the Clear AFS site to account for dirt deliveries, dirt removal, construction waste removal, and deliveries of construction materials during site preparation and construction.
4. The air emissions analysis assumes that construction will take place starting in July of 2017, all year 2018 to 2020, and through September of 2021.
5. It is assumed that on-road haul/delivery trucks will be used during site preparation and construction phases of the proposed action. The number of trips per year during 2017 is based on that 175,000 yd^3 of dirt will be needed for cut and fill during site preparation, 50 percent of dirt for cut and fill will be transported offsite, and that a dump truck with a haul capacity of 20 yd3 will be used. The number of trips during 2018 through 2021 is based on the assumption that there will be at least four trips per day for deliveries of construction materials or removal of construction wastes each day of construction. Year 2021 will have trips through September.
6. Maximum estimated emissions for CO_2 is provided in units of metric tons. All other criteria pollutants is provided in units of tons.

CAFS LRDR EA

Clear Air Force Station (CAFS), AK

Building and Structure Information

Building and Structure Information for the Proposed Action [1]					
Building Name	Estimated Height [2] (ft)	Number of Buildings [2]	Building Size Length [2] (ft)	Building Size Width [2] (ft)	Building Area (ft^2)
Mission Control Facility (MCF)	30	1	240	240	55,953
LRDR Equipment Shelter (LES)	80	1	150	100	15,000
Entry Control Facility (ECF)	18	1	40	30	1,085
LRDR Power Plant (LPP)	47	1	230	130	28,852
Fuel storage	9	1	73	72	4,956
Maintenance Facility	26	1	155	80	12,232
				Total Building Area (ft^2)	118,078
				Ave Building Height (ft)	35.00

Notes:

1. This table provides the dimensions of Buildings that is used as input into the USAF's ACAM model to estimate air emissions during construction of the proposed action.
2. The estimated heights, building dimensions and building area are from the proposed action's DOPAA.

APPENDIX B-2

OPERATIONS AIR EMISSIONS CALCULATIONS

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CAFS LRDR EA

Clear Air Force Station (CAFS), Alaska

Summary of Emissions During Operation of CAFS

Pollutant	ANNUAL EMISSIONS (TPY) [1]		
	2020	2021	2022
NO_X	85.09	114.57	117.93
VOC	76.85	102.47	102.52
SO_2	0.17	0.24	0.28
$PM_{2.5}$	2.56	3.44	3.50
PM_{10}	3.10	4.23	4.51
CO	47.35	63.41	64.25
GHG - CO_2e Basis	16,501	23,139	26,552

Notes [ ]:

1. Emissions for 2020 are based on operations beginning in April (9 months of the year) for the diesel generator, 3 mmBtu/hr boilers and 6 mmBtu boilers. Emissions for 2021 are based on operations for a full annual period for the previously mentioned emission sources and operations beginning in October of 2021 for the 7 mmBtu/hr boiler. Emissions for 2022 are based on operations for a full annual period for all emission sources.

CAFS LRDR EA

Clear Air Force Station (CAFS), Alaska

Air Emissions Estimate for Power Plant Emergency Generators

Basis:

Number of Units	8	
Fuel	Diesel Fuel Oil	
Power Rating	3,600	kW
Heat Input	33.50	mmBtu/hr
Heating Value of Fuel	137,000	Btu/gal [2]
Fuel Burn Rate	245	gal/hr [1]
Hours of Operation	500	hours per year
Density of Fuel	7.05	lb/gal [2]
Sulfur Content of Fuel	0.0015	% [3]

Global Warming Potentials [4]	
CO_2	1
CH_4	25
N_2O	298

Pollutant	Mass Emission Rate				Annual Emissions (tpy)		
	g/kw-hr	lb/mmBtu	Notes	(lb/hr)	2020 [11]	2021 [12]	2022 [12]
CO	3.50		[8]	27.78	41.6674	55.56	55.56
NO_X	6.40		[8]	50.79	76.19	101.59	101.59
PM	0.20		[8]	1.59	2.38	3.17	3.17
PM_{10}	0.20		[5]	1.59	2.38	3.17	3.17
$PM_{2.5}$	0.20		[5]	1.59	2.38	3.17	3.17
SO_2	0.0065		[6]	0.052	0.08	0.10	0.10
VOC	6.40		[8,9]	50.79	76.19	101.59	101.59
GHG-Mass	--	--	[7]	5,462	8,193	10,924	10,924
CO_2	--	1.63E+02	[10]	5,461.73	8,193	10,923	10,923
CH_4	--	6.61E-03	[10]	0.22	0.33	0.44	0.44
N_2O	--	1.32E-03	[10]	4.43E-02	0.07	0.09	0.09
GHG-CO2e	--	--	[7]	5,480	7,458	9,944	9,944
CO_2	--	--	[4]	5,462	7,432	9,910	9,910
CH_4	--	--	[4]	5.54	7.54	10.05	10.05
N_2O	--	--	[4]	13.2	17.97	23.96	23.96

Notes [ ]:

1. Based on manufacturer's specifications for Caterpillar C175-20 Engine Generator Set - 3600 ekW maximum power rating.
2. Based on diesel fuel characteristics listed in Reference 2.
3. Based on the requirements of 40 CFR Part 63, Subpart ZZZZ and 40 CFR Part 80.510(b).
4. CO_2 equivalents (CO_2e) are given in metric tonnes and are based on the global warming potential for applicable pollutant as listed in Table A-1 to Subpart A of 40 CFR Part 98 - Global Warming Potentials.
5. Conservatively assumed all particulate matter emissions are less than 2.5 micrometers in diameter.
6. Assumed all sulfur in the fuel is converted to SO_2.
7. The GHG emissions is the sum of all applicable GHG pollutants.
8. Emission limits for Tier II engine manufactured after 2006 and >560 kW - 40 CFR §89.112(a), Table 1.
9. Emission limit provided by Tier II standards is for NO_X+NMHC. Engine VOC emissions were conservatively assumed to be equal to the entire emission limit of 6.4 g/kW-hr.
10. Emission factors obtained from 40 CFR Part 98, Tables C-1 & C-2.
11. Operation is expected to start in April 2020 (9 months of the year).
12. 2021 and 2022 represent a full year of operation and annual period going forward.

References:

1. USEPA, AP-42, Fifth Edition, Vol. I. Chapter 3 "Stationary Internal Combustion Sources", Section 3.4 "Large Stationary Diesel and All Stationary Duel-Fuel Engines". October 1996.
    a. Table 3.4-1 "Gaseous Emission Factors for Large Stationary Diesel and All Stationary Duel-Fuel Engines".
2. USEPA, AP-42, Fifth Edition, Vol. I. Appendix A "Miscellaneous Data & Conversion Factors". September 1985.

CAFS LRDR EA

Clear Air Force Station (CAFS), Alaska

Air Emissions Estimate for 3 MMBtu/hr Boilers

Basis:

Number of Boilers	2	
Fuel	Diesel Fuel Oil	

Boiler Information

Heat Input	3.0	MMBtu/hr [1]
Heating Value of Fuel	137,000	Btu/gal[2]
Fuel Burn Rate	22	gal/hr
Hours of Operation (Per Boiler)	8,760	hours per year
Annual Fuel Usage (Cumulative)	383,650	gal/year
Sulfur Content of Fuel	0.0015	%

Miscellaneous Data

Density of Fuel Oil	7.05	lb/gal[2]
SO_2 to SO_3 Conversion Rate	100	% by volume (assumed)
Molecular Weight of Sulfur	32	lb/lb-mol
Molecular Weight of Oxygen	16	lb/lb-mol
Molecular Weight of Hydrogen	1	lb/lb-mol

Global Warming Potentials [10]	
CO_2	1
CH_4	25
N_2O	298

Boiler Emissions Summary

Pollutant	Mass Emission Rate (per unit)				Annual Emissions (tpy)		
	(lb/gal)	(lb/MMBtu)	Notes	(lb/hr)	2020 [11]	2021 [12]	2022 [12]
CO	0.005	0.036	[5]	0.11	0.72	0.96	0.96
NO_X	0.02	0.146	[5]	0.44	2.88	3.84	3.84
PM (total)	0.0033	0.0241	[2,3,5]	0.072	0.47	0.63	0.63
PM (filterable)	0.0020	0.0146	[2,3,5]	0.044	0.29	0.38	0.38
PM (condensable)	0.0013	0.0095	[2,3]	0.028	0.19	0.25	0.25
PM_{10}	--	0.012	[7]	0.04	0.24	0.32	0.32
$PM_{2.5}$	--	0.003	[7]	0.009	0.06	0.08	0.08
SO_2	2.12E-04	1.54E-03	[4]	4.63E-03	0.03	0.04	0.04
VOC	2.52E-04	1.84E-03	[8]	5.52E-03	0.04	0.05	0.05
GHG-Mass	--	--	[9]	489.19	3,213.95	4,285.26	4,285.26
CO_2	--	1.63E+02	[6]	489	3,213.79	4,285.06	4,285.06
CH_4	--	6.61E-03	[6]	1.98E-02	0.13	0.17	0.17
N_2O	--	1.32E-03	[6]	3.97E-03	0.03	0.03	0.03
GHG-CO2e	--	--	[9]	491	2,925.51	3,900.68	3,900.68
CO_2	--	--	[10]	489	2,915.50	3,887.34	3,887.34
CH_4	--	--	[10]	0.50	2.96	3.94	3.94
N_2O	--	--	[10]	1.18	7.05	9.40	9.40

Notes [ ]:

1. Based on preliminary vendor data.
2. Based on fuel characteristics listed in Reference 2.
3. Total particulate matter is the sum of filterable and condensable PM, given in AP-42 (Reference 1b).
4. Assumed all sulfur in the fuel is converted to SO_2.
5. Criteria pollutant emission factors obtained from AP-42 (Reference 1a) for boilers < 100 Million Btu/hr.
6. Emission factors obtained from 40 CFR Part 98, Tables C-1 & C-2.
7. Particle size distribution obtained from AP-42 (Reference 1c).
8. AP-42 includes VOCs within Total Organic Compounds (TOCs), which also includes semi-volatile organic compounds and condensable organic compounds (Reference 1d).
9. The GHG emissions is the sum of all applicable GHG pollutants.
10. CO_2 equivalents (CO_2e) based on the global warming potential for applicable pollutant as listed in Table A-1 to Subpart A of 40 CFR Part 98 - Global Warming Potentials.
11. Emissions for 2020 are based on operations beginning in April (9 months of the year).
12. Emissions for tons in 2021 and 2022 are based on operations for a full annual period.

References:

1. USEPA, AP-42, Fifth Edition, Vol. I. Chapter 1 "External Combustion Sources", Section 1.3 "Fuel Oil Combustion". September 1999.
   a. Table 1.3-1 "Criteria Pollutant Emission Factors for Fuel Oil Combustion".
   b. Table 1.3-2 "Condensable Particulate Matter Emission Factors for Oil Combustion"
   c. Table 1.3-6 "Cumulative Particle Size Distribution and Size-Specific Emission Factors for Uncontrolled Industrial Boilers Firing Distillate Oil."
   d. Table 1.3-3 "Emission Factors for Total Organic Compounds (TOC), Methane, and Nonmethane TOC (NMTOC) From Uncontrolled Fuel Oil Combustion."
2. USEPA, AP-42, Fifth Edition, Vol. I. Appendix A "Miscellaneous Data & Conversion Factors". September 1985.

CAFS LRDR EA

Clear Air Force Station (CAFS), Alaska

Air Emissions Estimate for 6 MMBtu/hr Boilers

Basis:

Number of Boilers	2	
Fuel	Diesel Fuel Oil	

Boiler Information

Heat Input	6.0	MMBtu/hr [1]
Heating Value of Fuel	137,000	Btu/gal[2]
Fuel Burn Rate	44	gal/hr
Hours of Operation (Per Boiler)	8,760	hours per year
Annual Fuel Usage (Cumulative)	767,299	gal/year
Sulfur Content of Fuel	0.0015	%

Miscellaneous Data

Density of Fuel Oil	7.05	lb/gal[2]
SO_2 to SO_3 Conversion Rate	100	% by volume (assumed)
Molecular Weight of Sulfur	32	lb/lb-mol
Molecular Weight of Oxygen	16	lb/lb-mol
Molecular Weight of Hydrogen	1	lb/lb-mol

Global Warming Potentials [13]	
CO_2	1
CH_4	25
N_2O	298

Boiler Emissions Summary

Pollutant	Mass Emission Rate (per unit)				Annual Emissions (tpy)		
	(lb/gal)	(lb/MMBtu)	Notes	(lb/hr)	2020 [11]	2021 [12]	2022 [12]
CO	0.005	0.036	[5]	0.22	1.44	1.92	1.92
NO_X	0.02	0.146	[5]	0.88	5.75	7.67	7.67
PM (total)	0.0033	0.0241	[2,3,5]	0.145	0.95	1.27	1.27
PM (filterable)	0.0020	0.0146	[2,3,5]	0.088	0.58	0.77	0.77
PM (condensable)	0.0013	0.0095	[2,3]	0.057	0.37	0.50	0.50
PM_{10}	--	0.012	[7]	0.07	0.47	0.63	0.63
$PM_{2.5}$	--	0.003	[7]	0.017	0.11	0.15	0.15
SO_2	2.12E-04	1.54E-03	[4]	9.26E-03	0.06	0.08	0.08
VOC	2.52E-04	1.84E-03	[8]	1.10E-02	0.07	0.10	0.10
GHG-Mass	--	--	[9]	978.37	6,427.90	8,570.53	8,570.53
CO_2	--	1.63E+02	[6]	978	6,427.58	8,570.11	8,570.11
CH_4	--	6.61E-03	[6]	3.97E-02	0.26	0.35	0.35
N_2O	--	1.32E-03	[6]	7.94E-03	0.05	0.07	0.07
GHG-CO2e	--	--	[9]	982	5,851.01	7,801.35	7,801.35
CO_2	--	--	[10]	978	5,831.01	7,774.67	7,774.67
CH_4	--	--	[10]	0.99	5.91	7.88	7.88
N_2O	--	--	[10]	2.37	14.10	18.80	18.80

Notes [ ]:

1. Based on preliminary vendor data.
2. Based on fuel characteristics listed in Reference 2.
3. Total particulate matter is the sum of filterable and condensable PM, given in AP-42 (Reference 1b).
4. Assumed all sulfur in the fuel is converted to SO_2.
5. Criteria pollutant emission factors obtained from AP-42 (Reference 1a) for boilers < 100 Million Btu/hr.
6. Emission factors obtained from 40 CFR Part 98, Tables C-1 & C-2.
7. Particle size distribution obtained from AP-42 (Reference 1c).
8. AP-42 includes VOCs within Total Organic Compounds (TOCs), which also includes semi-volatile organic compounds and condensable organic compounds (Reference 1d).
9. The GHG emissions is the sum of all applicable GHG pollutants.
10. CO_2 equivalents (CO_2e) based on the global warming potential for applicable pollutant as listed in Table A-1 to Subpart A of 40 CFR Part 98 - Global Warming Potentials.
11. Emissions for 2020 are based on operations beginning in April (9 months of the year).
12. Emissions for tons in 2021 and 2022 are based on operations for a full annual period.

References:

1. USEPA, AP-42, Fifth Edition, Vol. I. Chapter 1 "External Combustion Sources", Section 1.3 "Fuel Oil Combustion". September 1999.
   a. Table 1.3-1 "Criteria Pollutant Emission Factors for Fuel Oil Combustion".
   b. Table 1.3-2 "Condensable Particulate Matter Emission Factors for Oil Combustion"
   c. Table 1.3-6 "Cumulative Particle Size Distribution and Size-Specific Emission Factors for Uncontrolled Industrial Boilers Firing Distillate Oil."
   d. Table 1.3-3 "Emission Factors for Total Organic Compounds (TOC), Methane, and Nonmethane TOC (NMTOC) From Uncontrolled Fuel Oil Combustion."
2. USEPA, AP-42, Fifth Edition, Vol. I. Appendix A "Miscellaneous Data & Conversion Factors". September 1985.

CAFS LRDR EA

Clear Air Force Station (CAFS), Alaska

Air Emissions Estimate for 7 MMBtu/hr Boilers

Basis:

Number of Boilers	1	
Fuel	Diesel Fuel Oil	

Boiler Information

Heat Input	7.0	MMBtu/hr [1]
Heating Value of Fuel	137,000	Btu/gal[2]
Fuel Burn Rate	51	gal/hr
Hours of Operation (Per Boiler)	8,760	hours per year
Annual Fuel Usage (Cumulative)	447,591	gal/year
Sulfur Content of Fuel	0.0015	%

Miscellaneous Data

Density of Fuel Oil	7.05	lb/gal[2]
SO_2 to SO_3 Conversion Rate	100	% by volume (assumed)
Molecular Weight of Sulfur	32	lb/lb-mol
Molecular Weight of Oxygen	16	lb/lb-mol
Molecular Weight of Hydrogen	1	lb/lb-mol

Global Warming Potentials [13]	
CO_2	1
CH_4	25
N_2O	298

Boiler Emissions Summary

Pollutant	Mass Emission Rate (per unit)				Annual Emissions (tpy)		
	(lb/gal)	(lb/MMBtu)	Notes	(lb/hr)	2020 [11]	2021 [12]	2022 [12]
CO	0.005	0.036	[5]	0.26	0.00	0.28	1.12
NO_X	0.02	0.146	[5]	1.02	0.00	1.12	4.48
PM (total)	0.0033	0.0241	[2,3,5]	0.169	0.00	0.18	0.74
PM (filterable)	0.0020	0.0146	[2,3,5]	0.102	0.00	0.11	0.45
PM (condensable)	0.0013	0.0095	[2,3]	0.066	0.00	0.07	0.29
PM_{10}		0.012	[7]	0.08	0.00	0.09	0.37
$PM_{2.5}$		0.003	[7]	0.020	0.00	0.02	0.09
SO_2	2.12E-04	1.54E-03	[4]	1.08E-02	0.00	0.01	0.05
VOC	2.52E-04	1.84E-03	[8]	1.29E-02	0.00	0.01	0.06
GHG-Mass	--	--	[9]	1,141.43	0.00	1,249.87	4,999.48
CO_2	--	1.63E+02	[6]	1,141	0.00	1,249.81	4999.23
CH_4	--	6.61E-03	[6]	4.63E-02	0.00	0.05	0.20
N_2O	--	1.32E-03	[6]	9.26E-03	0.00	0.01	0.04
GHG-CO2e	--	--	[9]	1,145	0.00	1,137.70	4,550.79
CO_2	--	--	[10]	1,141	0.00	1,133.81	4535.23
CH_4	--	--	[10]	1.16	0.00	1.15	4.60
N_2O	--	--	[10]	2.76	0.00	2.74	10.96

Notes [ ]:

1. Based on preliminary vendor data.
2. Based on fuel characteristics listed in Reference 2.
3. Total particulate matter is the sum of filterable and condensable PM, given in AP-42 (Reference 1b).
4. Assumed all sulfur in the fuel is converted to SO_2.
5. Criteria pollutant emission factors obtained from AP-42 (Reference 1a) for boilers < 100 Million Btu/hr.
6. Emission factors obtained from 40 CFR Part 98, Tables C-1 & C-2.
7. Particle size distribution obtained from AP-42 (Reference 1c).
8. AP-42 includes VOCs within Total Organic Compounds (TOCs), which also includes semi-volatile organic compounds and condensable organic compounds (Reference 1d).
9. The GHG emissions is the sum of all applicable GHG pollutants.
10. CO_2 equivalents (CO_2e) based on the global warming potential for applicable pollutant as listed in Table A-1 to Subpart A of 40 CFR Part 98 - Global Warming Potentials.
11. Emissions for 2020 are based on operations beginning in April (9 months of the year).
12. Emissions for tons in 2021 and 2022 are based on operations for a full annual period.

References:

1. USEPA, AP-42, Fifth Edition, Vol. I. Chapter 1 "External Combustion Sources", Section 1.3 "Fuel Oil Combustion". September 1999.
   a. Table 1.3-1 "Criteria Pollutant Emission Factors for Fuel Oil Combustion".
   b. Table 1.3-2 "Condensable Particulate Matter Emission Factors for Oil Combustion"
   c. Table 1.3-6 "Cumulative Particle Size Distribution and Size-Specific Emission Factors for Uncontrolled Industrial Boilers Firing Distillate Oil."
   d. Table 1.3-3 "Emission Factors for Total Organic Compounds (TOC), Methane, and Nonmethane TOC (NMTOC) From Uncontrolled Fuel Oil Combustion."
2. USEPA, AP-42, Fifth Edition, Vol. I. Appendix A "Miscellaneous Data & Conversion Factors". September 1985.

CAFS LRDR EA

Clear Air Force Station (CAFS), Alaska

Air Emissions Estimate for Worker Vehicles During Operations

Vehicle Type [1]	Trips/ Month [2]	Months/Year [3]		Miles/ Trip [4]	Emission Factor (g/mi) [5]							Estimated Annual Air Emissions (tons/year) [6]																								
												2020							2021							2022										
		2020	2021 and 2022		VOC	CO	PM_{10}	$PM_{2.5}$	NO_x	CO_2	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NO_x	CO_2	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NO_x	CO_2	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NO_x	CO_2	SO_2
Passenger Car	268	9	12	150	0.367	3.890	0.013	0.011	0.247	322.9	0.002	0.15	1.55	0.01	0.00	0.10	117	0.001	0.20	2.07	0.01	0.01	0.13	156	0.001	0.20	2.07	0.01	0.01	0.13	156	0.001
Light Duty Truck	268	9	12	150	0.420	4.941	0.016	0.014	0.415	415.0	0.003	0.17	1.97	0.01	0.01	0.17	150	0.001	0.22	2.63	0.01	0.01	0.22	200	0.002	0.22	2.63	0.01	0.01	0.22	200	0.002
											Total Annual Emissions	0.31	3.52	0.01	0.01	0.26	267	0.002	0.42	4.70	0.02	0.01	0.35	356	0.003	0.42	4.70	0.02	0.01	0.35	356	0.003

Notes [ ]:

1. It is assumed that the fleet of worker vehicles will be 50% passenger cars and 50% light-duty gasoline trucks.
2. Trips per month is based on the maximum number of workers during operation of the proposed action as listed in the DOPAA. A maximum of 67 workers are expected daily which is split between the two vehicle types. The workers include additional security and maintenance personnel. It is assumed that the workers will live and work at CAFS 5 days a week, and travel to Fairbanks, AK the remaining 2 days a week.
3. Months per year assumes that operation starts in April of 2020. 2021 will be the first full year of operation.
4. Total miles/trip is an average roundtrip distance traveled by the worker vehicles in the area surrounding the Clear AFS site to account for indirect emissions during operation of the proposed action. The analysis assumes this distance to include staff traveling from the mancamp to ammenities available in Fairbanks, AK, 75 miles away for a round trip of 150 miles.
5. The emission factors are from the United States Air Force (USAF) Air Conformity Applicability Model (ACAM). The ACAM model emission factors are derived from the United States Environmental Protection Agency (USEPA) Motor Vehicle Emission Simulator (MOVES) computer model output. Emission factors for the vehicle types are the same for 2020 and 2021.
6. The total annual emissions for CO_2 emission is in units of metric tons per year. The total annual emissions for VOC, CO, PM_{10}, $PM_{2.5}$, NO_x, and SO_2 is provided in units of tons per year.

CAFS LRDR EA

Clear Air Force Station (CAFS), Alaska

Description of Fuel Storage Tanks During Operations

Fuel Tank Diameter [1] (ft)	Fuel Tank Length [1] (ft)	Type of Fuel Tank [2]	Fuel Tank Capacity [2] (gal)	Number of Tanks [2]	Number of RICE Engine Boilers [2]	Hours Per Year of RICE Engines and Boilers [3]	Fuel Consumption Rate [4] (gal/hr)	Annual Fuel Consumption (gal/yr) [5]
3.7	4	Vertical	200	1	2	8760	22	385,440
3.7	4	Vertical	200	1	2	8760	44	770,880
7.6	6	Vertical	1,200	8	8	500	244.5	978,000
10	85	Horizontal	50,000	4	--	--	--	2,134,320

Notes [ ]:

1. The fuel tank diameter and length dimensions for the vertical day tanks given in an email from Kirk Heer on 8/27/2015. The horizontal bulk tank dimensions were estimated using the National Board Standards from Engineering Toolbox Website (http://www.engineeringtoolbox.com/fuel-oil-storage-tanks-dimensions-d_1585.html) as a guide and interpolated by the correct capacity to an approximate size. These numbers are used as input into the USAF's ACAM model to estimate VOC emissions from the fuel storage tanks.
2. The fuel storage tank parameters (i.e., type, number, and capacity) are based on information contained in the proposed action's DOPAA.
3. The emission anlayis for the backup RICE engines assumes that the engines will operate 500 hours or less per year. The emission analysis for the boilers assumes that they are both running all day, all year (8760 hours).
4. Fuel consumption rates are based on the manufacturer's specifications for a Caterpillar C175-20 Engine Generator Set - 3600 ekW maximum operating at maximum load and boiler heating value.
5. The annual consumption for the bulk fuel oil tanks (50,000 gallon tanks) is based on the sum of the amount of fuel consumed by the RICE engines and boilers.

CAFS LRDR EA

Clear Air Force Station (CAFS), Alaska

Air Emissions Estimate for Fuel Storage Tanks During Operations

Emission Activitiy	Estimated Annual Air Emissions (tons/year) [1]																					
	2020							2021							2022							
	VOC	CO	PM_{10}	$PM_{2.5}$	NO_x	CO_2	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NO_x	CO_2	SO_2	VOC	CO	PM_{10}	$PM_{2.5}$	NO_x	CO_2	SO_2
Fuel Storage Tanks	0.231	0	0	0	0	0	0	0.308	0	0	0	0	0	0	0.308	0	0	0	0	0	0

Notes [ ]:

1. The fuel storage tanks will emit VOC's during operations. The amount of VOC's emitted was estimated using the USAF's ACAM model using as input the dimensions of the tank and the amount of turnovers per year for each tank.

APPENDIX B-3

Correspondence with Alaska Department of Environmental Conservation

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THE STATE of ALASKA
GOVERNOR BILL WALKER

Department of Environmental Conservation

DIVISION OF AIR QUALITY
Air Non-Point Mobile Sources

619 E. Ship Creek Avenue, Suite 249
Anchorage, Alaska 99501
Main: 907-269-7577
Toll Free: 866-241-2805
Fax: 907-269-7508
www.dec.alaska.gov

January 22, 2016

Bob Tomlinson
21 CES/CEIE
580 Goodfellow Street
Peterson AFB, CO80914-2370

Dear Mr. Tomlinson:

This letter is in regards to the project identified in the DEC Air Quality Conformity Request Form submitted on January 20, 2016 by email. As identified, the project is the construction of a long range discrimination radar as a component of the Ballistic Missile Defense System to be located at Clear Air Force Base. As described in the attachment the project is not currently in a nonattainment area or maintenance area for air quality control under the Clean Air Act. Therefore, projects receiving federal funds or approvals do not require a conformity analysis under General Conformity regulations.

However, particular attention should be given during any construction activities to take reasonable precaution per 18 AAC 50.045(d) to prevent fugitive dust. Also, if the preferred method for disposal of debris in the development of any raw land is by open burning, "reasonable procedures to minimize adverse environmental effects and limit the amount of smoke generated" must be used, as well as get any applicable permits. A complete description of the open burn guidance policy can be found at http://dec.alaska.gov/air/ap/docs/obrguide.pdf.

A general requirement of the Air Quality Control Regulations is that wastes should be burned in a manner that does not cause a public health, safety or welfare threat, an environmental problem or a nuisance.

Thank you for contacting us about your project. If you have further questions or concerns about air quality issues, you may contact me at (907) 269-7579 or by e-mail at cindy.heil@alaska.gov.

Sincerely,

Cindy Heil
Program Manager, ANPMS

Attachment: Copy of Original request

DEC Air Quality Conformity Request Form
Project Located Outside of Nonattainment/Maintenance Area

- Location of the Project:

Name	Clear Air Force Station
Address	Clear, AK
Lat/Long Coordinates[1]	64.2863 N/149.1935W
Size (acres)	11,438

- Type of Project / Project description:

Construction of a Long Range Discrimination Radar as a component of the Ballistic Missile Defense System for protection of the U.S. against enemy ballistic missile attack.

- Is the project located inside of a nonattainment or maintenance area?

☐ Yes
☑ No

If no, explain how you reached that conclusion.[2]

Project is located in Denali Borough, 48.9 miles from the FNSB Non-attainment area.

- Define the period of performance that can be foreseen.

State Date	Spring 2017
Construction Period	6 years
Operation Start Date	Summer/fall 2020

- Contact information for responsible federal manager requesting.

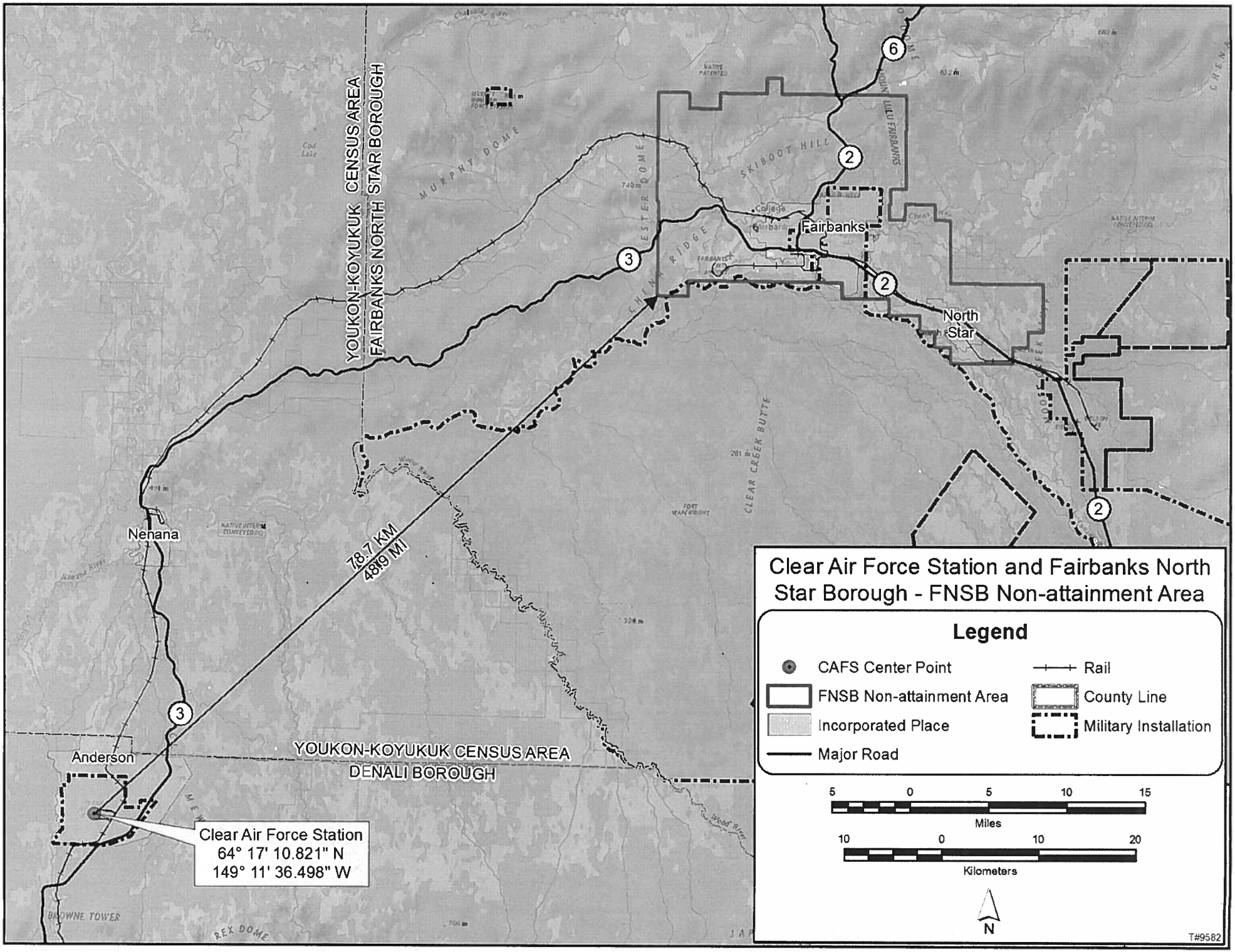
Name	Bob Tomlinson
Agency	21 CES/CEIE
Address	580 Goodfellow Street, Peterson AFB, CO 80914-2370
Phone No.	719-556-8059
Email Address	robert.tomlinson@us.af.mil

If more than one agency is responsible for the project, provide contact information for other managers below.

Name	Dan Spiegelberg
Agency	Missile Defense Agency
Address	5224 Martin Road, Redstone Arsenal, AL 35898
Phone No.	256-450-2672
Email Address	dan.spiegelberg@mda.mil

- Submit this form to: cindy.heil@alaska.gov

[1] For projects located near nonattainment / maintenance areas provide a map/diagram displaying the location of the property relative to the nonattainment / maintenance boundary.
[2] This response is relevant for projects located near nonattainment / maintenance areas.


Clear Air Force Station and Fairbanks North Star Borough - FNSB Non-attainment Area
Legend
CAFS Center Point
FNSB Non-attainment Area
Incorporated Place
Major Road
Rail
County Line
Military Installation
5 0 5 10 15
Miles
10 0 10 20
Kilometers
N
T#9582
YOUKON-KOYUKUK CENSUS AREA
FAIRBANKS NORTH STAR BOROUGH
YOUKON-KOYUKUK CENSUS AREA
DENALI BOROUGH
Fairbanks
North Star
Nenana
Anderson
78.7 KM
48.9 MI
Clear Air Force Station
64° 17' 10.821" N
149° 11' 36.498" W
MURPHY DOME
SKIBOOT HILL
CHENA RIDGE
CLEAR CREEK BUTTE
REX DOME
BROWNE TOWER
2
3
6

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APPENDIX C

TRAFFIC ASSESSMENT DATA

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APPENDIX C-1

HCS RESULTS FOR PARKS HIGHWAY

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HCS 2010: Two-Lane Highways Release 6.1

Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Kevin Harder
Agency/Co.	Black & Veatch
Date Performed	8/31/2015
Analysis Time Period	Design Hour Volume (4-5pm)
Highway	Parks Highway
From/To	NB North of CAFS
Jurisdiction	
Analysis Year	2013
Description	Existing Condition

Input Data

Highway class	Class 1		Peak hour factor, PHF	1.00	
Shoulder width	8.0	ft	% Trucks and buses	15	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	5.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	12	%
Up/down	-	%	Access point density	3	/mi

Analysis direction volume, Vd 130 veh/h
Opposing direction volume, Vo 130 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.8		1.8	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.893		0.893	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	146	pc/h	146	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, (note-3) BFFS	70.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	0.8	mi/h
Free-flow speed, FFSd	69.3	mi/h
Adjustment for no-passing zones, fnp	1.6	mi/h
Average travel speed, ATSd	65.4	mi/h
Percent Free Flow Speed, PFFS	94.4	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.985		0.985	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	132	pc/h	132	pc/h
Base percent time-spent-following, (note-4) BPTSFd	15.0	%		
Adjustment for no-passing zones, fnp	24.3			
Percent time-spent-following, PTSFd	27.1	%		

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.09	
Peak 15-min vehicle-miles of travel, VMT15	163	veh-mi
Peak-hour vehicle-miles of travel, VMT60	650	veh-mi
Peak 15-min total travel time, TT15	2.5	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	3200	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	5.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	65.4	mi/h
Percent time-spent-following, PTSFd (from above)	27.1	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	-	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	65
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	130.0
Effective width of outside lane, We	35.00
Effective speed factor, St	5.07
Bicycle LOS Score, BLOS	3.82
Bicycle LOS	D

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Kevin Harder
Agency/Co.	Black & Veatch
Date Performed	8/31/2015
Analysis Time Period	Design Hour Volume (4-5pm)
Highway	Parks Highway
From/To	SB South of CAFS
Jurisdiction	
Analysis Year	2013
Description	Existing Condition

Input Data

Highway class	Class 1		Peak hour factor, PHF	1.00	
Shoulder width	8.0	ft	% Trucks and buses	15	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	5.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	14	%
Up/down	-	%	Access point density	6	/mi

Analysis direction volume, Vd 141 veh/h
Opposing direction volume, Vo 140 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.7		1.7	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.905		0.905	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	156	pc/h	155	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	70.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.5	mi/h
Free-flow speed, FFSd	68.5	mi/h
Adjustment for no-passing zones, fnp	1.7	mi/h
Average travel speed, ATSd	64.4	mi/h
Percent Free Flow Speed, PFFS	94.0	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.985		0.985	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	143	pc/h	142	pc/h

Base percent time-spent-following, (note-4) BPTSFd	16.1	%
Adjustment for no-passing zones, fnp	27.6	
Percent time-spent-following, PTSFd	29.9	%

Level of Service and Other Performance Measures

Level of service, LOS	A	
Volume to capacity ratio, v/c	0.10	
Peak 15-min vehicle-miles of travel, VMT15	176	veh-mi
Peak-hour vehicle-miles of travel, VMT60	705	veh-mi
Peak 15-min total travel time, TT15	2.7	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	3189	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	5.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	64.4	mi/h
Percent time-spent-following, PTSFd (from above)	29.9	
Level of service, LOSd (from above)	A	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	-	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	141.0
Effective width of outside lane, We	33.90
Effective speed factor, St	5.07
Bicycle LOS Score, BLOS	4.24
Bicycle LOS	D

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Kevin Harder
Agency/Co.	Black & Veatch
Date Performed	8/31/2015
Analysis Time Period	Design Hour Volume (4-5pm)
Highway	Parks Highway
From/To	NB North of CAFS
Jurisdiction	
Analysis Year	2018
Description	Peak Construction

Input Data

Highway class	Class 1		Peak hour factor, PHF	1.00	
Shoulder width	8.0	ft	% Trucks and buses	13	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	5.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	12	%
Up/down	-	%	Access point density	3	/mi

Analysis direction volume, Vd 235 veh/h
Opposing direction volume, Vo 146 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.5		1.7	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.939		0.917	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	250	pc/h	159	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, (note-3) BFFS	70.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	0.8	mi/h
Free-flow speed, FFSd	69.3	mi/h
Adjustment for no-passing zones, fnp	1.7	mi/h
Average travel speed, ATSd	64.3	mi/h
Percent Free Flow Speed, PFFS	92.9	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.987		0.987	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	238	pc/h	148	pc/h
Base percent time-spent-following, (note-4) BPTSFd	25.0	%		
Adjustment for no-passing zones, fnp	26.4			
Percent time-spent-following, PTSFd	41.3	%		

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.15	
Peak 15-min vehicle-miles of travel, VMT15	294	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1175	veh-mi
Peak 15-min total travel time, TT15	4.6	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	2781	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	5.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	64.3	mi/h
Percent time-spent-following, PTSFd (from above)	41.3	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	-	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	65
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	235.0
Effective width of outside lane, We	28.00
Effective speed factor, St	5.07
Bicycle LOS Score, BLOS	5.29
Bicycle LOS	E

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Kevin Harder
Agency/Co.	Black & Veatch
Date Performed	8/31/2015
Analysis Time Period	Design Hour Volume (4-5pm)
Highway	Parks Highway
From/To	SB South of CAFS
Jurisdiction	
Analysis Year	2018
Description	Peak Construction

Input Data

Highway class	Class 1		Peak hour factor, PHF	1.00	
Shoulder width	8.0	ft	% Trucks and buses	13	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	5.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	14	%
Up/down	-	%	Access point density	6	/mi

Analysis direction volume, Vd 246 veh/h
Opposing direction volume, Vo 158 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.5		1.7	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.939		0.917	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	262	pc/h	172	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h

Estimated Free-Flow Speed:

Base free-flow speed, (note-3) BFFS	70.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.5	mi/h
Free-flow speed, FFSd	68.5	mi/h
Adjustment for no-passing zones, fnp	1.9	mi/h
Average travel speed, ATSd	63.2	mi/h
Percent Free Flow Speed, PFFS	92.3	%

Percent Time-Spent-Following

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.987		0.987	
Grade adjustment factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	249	pc/h	160	pc/h

Base percent time-spent-following, (note-4) BPTSFd	25.9	%
Adjustment for no-passing zones, fnp	29.2	
Percent time-spent-following, PTSFd	43.7	%

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.15	
Peak 15-min vehicle-miles of travel, VMT15	308	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1230	veh-mi
Peak 15-min total travel time, TT15	4.9	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	2816	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	5.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	63.2	mi/h
Percent time-spent-following, PTSFd (from above)	43.7	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	-	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	246.0
Effective width of outside lane, We	28.00
Effective speed factor, St	5.07
Bicycle LOS Score, BLOS	5.31
Bicycle LOS	E

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Kevin Harder
Agency/Co.	Black & Veatch
Date Performed	2/23/2016
Analysis Time Period	Design Hour Volume (4-5pm)
Highway	Parks Highway
From/To	NB North of CAFS
Jurisdiction	
Analysis Year	2023
Description Operation	

Input Data

Highway class	Class 1		Peak hour factor, PHF	1.00	
Shoulder width	8.0	ft	% Trucks and buses	12	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	5.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	12	%
Up/down	-	%	Access point density	3	/mi

Analysis direction volume, Vd 188 veh/h
Opposing direction volume, Vo 188 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.5		1.5	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.943		0.943	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	199	pc/h	199	pc/h

Free-Flow Speed from Field Measurement:		
Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, (note-3) BFFS	70.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	0.8	mi/h
Free-flow speed, FFSd	69.3	mi/h
Adjustment for no-passing zones, fnp	2.2	mi/h
Average travel speed, ATSd	64.0	mi/h
Percent Free Flow Speed, PFFS	92.4	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.988		0.988	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	190	pc/h	190	pc/h
Base percent time-spent-following,(note-4) BPTSFd	20.6	%		
Adjustment for no-passing zones, fnp	30.1			
Percent time-spent-following, PTSFd	35.7	%		

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.12	
Peak 15-min vehicle-miles of travel, VMT15	235	veh-mi
Peak-hour vehicle-miles of travel, VMT60	940	veh-mi
Peak 15-min total travel time, TT15	3.7	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	3200	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	5.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	64.0	mi/h
Percent time-spent-following, PTSFd (from above)	35.7	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	-	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	65
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	188.0
Effective width of outside lane, We	28.00
Effective speed factor, St	5.07
Bicycle LOS Score, BLOS	4.69
Bicycle LOS	E

Notes:
1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

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Phone: Fax:
E-Mail:

Directional Two-Lane Highway Segment Analysis

Analyst	Kevin Harder
Agency/Co.	Black & Veatch
Date Performed	2/23/2016
Analysis Time Period	Design Hour Volume (4-5pm)
Highway	Parks Highway
From/To	SB South of CAFS
Jurisdiction	
Analysis Year	2023
Description Operation	

Input Data

Highway class	Class 1		Peak hour factor, PHF	1.00	
Shoulder width	8.0	ft	% Trucks and buses	12	%
Lane width	12.0	ft	% Trucks crawling	0.0	%
Segment length	5.0	mi	Truck crawl speed	0.0	mi/hr
Terrain type	Level		% Recreational vehicles	2	%
Grade: Length	-	mi	% No-passing zones	14	%
Up/down	-	%	Access point density	6	/mi

Analysis direction volume, Vd 201 veh/h
Opposing direction volume, Vo 200 veh/h

Average Travel Speed

Direction	Analysis (d)		Opposing (o)	
PCE for trucks, ET	1.5		1.5	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adj. factor, (note-5) fHV	0.943		0.943	
Grade adj. factor, (note-1) fg	1.00		1.00	
Directional flow rate, (note-2) vi	213	pc/h	212	pc/h

Free-Flow Speed from Field Measurement:

Field measured speed, (note-3) S FM	-	mi/h
Observed total demand, (note-3) V	-	veh/h
Estimated Free-Flow Speed:		
Base free-flow speed, (note-3) BFFS	70.0	mi/h
Adj. for lane and shoulder width, (note-3) fLS	0.0	mi/h
Adj. for access point density, (note-3) fA	1.5	mi/h
Free-flow speed, FFSd	68.5	mi/h
Adjustment for no-passing zones, fnp	2.2	mi/h
Average travel speed, ATSd	63.0	mi/h
Percent Free Flow Speed, PFFS	92.0	%

Percent Time-Spent-Following

Direction	Analysis(d)		Opposing (o)	
PCE for trucks, ET	1.1		1.1	
PCE for RVs, ER	1.0		1.0	
Heavy-vehicle adjustment factor, fHV	0.988		0.988	
Grade adjustment factor,(note-1) fg	1.00		1.00	
Directional flow rate,(note-2) vi	203	pc/h	202	pc/h

Base percent time-spent-following,(note-4) BPTSFd	21.7	%
Adjustment for no-passing zones, fnp	33.5	
Percent time-spent-following, PTSFd	38.5	%

Level of Service and Other Performance Measures

Level of service, LOS	B	
Volume to capacity ratio, v/c	0.13	
Peak 15-min vehicle-miles of travel, VMT15	251	veh-mi
Peak-hour vehicle-miles of travel, VMT60	1005	veh-mi
Peak 15-min total travel time, TT15	4.0	veh-h
Capacity from ATS, CdATS	1700	veh/h
Capacity from PTSF, CdPTSF	1700	veh/h
Directional Capacity	3192	veh/h

Passing Lane Analysis

Total length of analysis segment, Lt	5.0	mi
Length of two-lane highway upstream of the passing lane, Lu	-	mi
Length of passing lane including tapers, Lpl	-	mi
Average travel speed, ATSd (from above)	63.0	mi/h
Percent time-spent-following, PTSFd (from above)	38.5	
Level of service, LOSd (from above)	B	

Average Travel Speed with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for average travel speed, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for average travel speed, Ld	-	mi
Adj. factor for the effect of passing lane on average speed, fpl	-	
Average travel speed including passing lane, ATSpl	-	

Percent Time-Spent-Following with Passing Lane

Downstream length of two-lane highway within effective length of passing lane for percent time-spent-following, Lde	-	mi
Length of two-lane highway downstream of effective length of the passing lane for percent time-spent-following, Ld	-	mi
Adj. factor for the effect of passing lane on percent time-spent-following, fpl	-	
Percent time-spent-following including passing lane, PTSFpl	-	%

Level of Service and Other Performance Measures with Passing Lane

Level of service including passing lane, LOSpl	-	
Peak 15-min total travel time, TT15	-	veh-h

Bicycle Level of Service

Posted speed limit, Sp	65
Percent of segment with occupied on-highway parking	0
Pavement rating, P	3
Flow rate in outside lane, vOL	201.0
Effective width of outside lane, We	28.00
Effective speed factor, St	5.07
Bicycle LOS Score, BLOS	4.73
Bicycle LOS	E

Notes:

1. Note that the adjustment factor for level terrain is 1.00, as level terrain is one of the base conditions. For the purpose of grade adjustment, specific dewngrade segments are treated as level terrain.
2. If vi (vd or vo) >= 1,700 pc/h, terminate analysis-the LOS is F.
3. For the analysis direction only and for v>200 veh/h.
4. For the analysis direction only.
5. Use alternative Exhibit 15-14 if some trucks operate at crawl speeds on a specific downgrade.

APPENDIX C-2

VEHICLE COUNT

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Main Gate at Clear Air Force Station
Hourly Traffic Counts (Inbound & Outbound)
Counts performed by CAFS personnel

INBOUND COUNT

	Day of Wk	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	Daily#
6-Sep-15	Sun							6	6	2	2	2	0	4	5	6	4	7	4	6	8	3	2	1	1	69
7-Sep-15	Mon	1	2	2	0	1	4	6	3	1	4	3	2	1	2	2	1	5	3	9	2	7	8	5	5	79
8-Sep-15	Tue	0	3	3	2	2	9	34	16	9	4	7	6	5	3	7	6	4	8	3	6	1	0	0	0	138
9-Sep-15	Wed	1	0	0	1	2	7	36	22	4	6	9	8	3	0	1	4	3	4	1	5	8	4	6	1	136
10-Sep-15	Thu	0	1	1	0	1	13	16																		32
																										454
Total AVG:		1	2	2	1	2	8	20	12	4	4	5	4	3	3	4	4	5	5	5	6	5	4	3	2	

OUTBOUND COUNT

	Day of Wk	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	
6-Sep-15	Sun							9	10	5	4	1	3	2	1	6	10	6	2	2	5	1	5	0	0	72
7-Sep-15	Mon	0	0	0	0	0	0	2	1	4	2	0	1	0	0	2	2	4	7	7	4	4	4	0	0	44
8-Sep-15	Tue	0	1	0	2	0	0	2	2	2	3	2	6	3	2	3	6	11	25	4	4	4	2	2	1	87
9-Sep-15	Wed	0	0	0	1	1	0	2	5	5	3	4	3	10	7	4	7	10	32	9	5	9	7	2	3	129
10-Sep-15	Thu	0	1	1	0	1	1	1																		5
																										337
Total AVG:		0	1	0	1	1	0	3	5	4	3	2	17	4	4	4	6	8	17	6	5	5	5	1	1	

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