Environmental Assessment

Space-Based Laser Integrated Flight Experiment Ground Testing

Prepared for

Ballistic Missile Defense Organization (BMDO)
Office of Secretary of Defense
Pentagon

Prepared by

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COVER SHEET
ENVIRONMENTAL ASSESSMENT FOR
SPACE-BASED LASER INTEGRATED FLIGHT EXPERIMENT
GROUND TESTING

Lead Agency: Ballistic Missile Defense Organization (BMDO), Office of Secretary of Defense (OSD), Pentagon

Executing Agency: Space and Missile Systems Center (SMC), Air Force Materiel Command, Department of the Air Force

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Proposed Action: The Air Force proposes to construct the Space-Based Laser (SBL) Test Facility (STF) complex in the continental United States and perform ground demonstration and validation testing for the Integrated Flight Experiment (IFX) project at one or more of the following sites: Stennis Space Center, Mississippi; Cape Canaveral Air Force Station, Florida; and Redstone Arsenal/Marshall Space Flight Center, Alabama.

Designation: Revised Final Environmental Assessment

Abstract: The SBL program has been a long-term technology development program of the BMDO to demonstrate the potential for a directed energy space weapon to provide defense against ballistic missile attack. Technology development work has been conducted for all essential components of a potential SBL space vehicle. Testing of the high power laser as part of a complete integrated space vehicle system is the next key aspect of the SBL space vehicle development process. The current phase of the SBL space vehicle development process includes the Integrated Test Unit (ITU) and the Integrated Flight Experiment (IFX) test vehicle. The detailed design of the ITU and IFX test vehicle has not been finalized. The SBL program requires a comprehensive test facility complex that simulates the space environment, the STF complex, to conduct high-energy laser performance testing with the ITU and the IFX test vehicle.

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ACRONYMS AND ABBREVIATIONS

45 SW	45^{th} Space Wing
ACM	Asbestos-Containing Material
ADEM	Alabama Department of Environmental Management
ADT	Average Daily Traffic
AF-EMIS	Air Force Environmental Management Information System
AFB	Air Force Base
AFS	Air Force Station
AFI	Air Force Instruction
AFPD	Air Force Policy Directive
AFTOX	Air Force Toxic Chemical Dispersion Model
agl	above ground level
AI&TF	Assembly, Integration, and Test Facility
AICUZ	Air Installation Compatible Use Zone
ALI	Alpha-LAMP Integration
AMCOM	U.S. Army Aviation and Missile Command
AOC	Area of Concern
AQCR	Air Quality Control Region
AST	Aboveground Storage Tank
ATC	Air Traffic Control
AR	Army Regulation
BCE	Beam Control Element
BDE	Beam Director Element
BMD	Ballistic Missile Defense
BMDO	Ballistic Missile Defense Organization
CAA	Clean Air Act
CCAFS	Cape Canaveral Air Force Station
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	Carbon Monoxide
CWA	Clean Water Act
CY	Calendar Year
D_2	Deuterium
DARPA	Defense Advanced Research Projects Agency
dB	Decibel
dBA	A-weighted sound levels
DEPW	Directorate of Environment and Public Works
DF	Deuterium Fluoride
DNL	Day-Night Average Sound Level
DoD	Department of Defense
DoDI	Department of Defense Instruction

DoT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EA	Environmental Assessment
EBS	Environmental Baseline Survey
EELV	Evolved Expendable Launch Vehicle
EFH	Essential Fish Habitats
EIAP	Environmental Impact Analysis Process
EMI/EMC	Electromagnetic Interference/Electromagnetic Compatibility
EO	Executive Order
EIS	Environmental Impact Statement
EPCRA	Emergency Planning and Community Right to Know Act
ERP	Environmental Resource Permit
ESA	Explosive Safe Area
ESC	Environmental Support Contractor
ESQD	Explosive Safety Quantity-Distance
F_2	Fluorine
FAA	Federal Aviation Administration
FAC	Florida Administrative Code
FAR	Federal Aviation Regulation
FCMA	Florida Coastal Management Act
FDCA	Florida Department of Community Affairs
FDEP	Florida Department of Environmental Protection
FICON	Federal Interagency Committee on Noise
FIP	Federal Implementation Plan
FMC	Fishery Management Councils
FMP	Fishery Management Plans
FONSI	Finding of No Significant Impact
FSA	Fuel Storage Areas
FTP	Federal Test Procedure
FWC	Florida Fish and Wildlife Conservation Commission
FY	Fiscal Year
GN_2	Gaseous Nitrogen
GRPC	Gulf Regional Planning Council
H_2	Hydrogen
He	Helium
HABE	High Altitude Balloon Experiment
HEL	High Energy Laser
HF	Hydrogen Fluoride
HUD	Department of Housing and Urban Development
ICUZ	Installation Compatible Use Zone
IDLH	Immediately Dangerous to Life and Health
IFR	Instrument Flight Rule
IFX	Integrated Flight Experiment
IRP	Installation Restoration Program

ITU	Integrated Test Unit
JPC	Joint Propellants Contractor
KSC	Kennedy Space Center
kV	kilovolt
kVA	kilovolt-ampere
kWh	kilowatt-hours
L_{eq}	Equivalent Sound Level
L_{max}	Maximum Sound Level
L_p	Sound Pressure Level
LAMP	Large Aperture Mirror Program
LATN	Low Altitude Tactical Navigation
lb	pound
LBS	Launch Base Support
LEPC	Local Emergency Planning Committee
LN_2	Liquid Nitrogen
LOC	Level of Concern
LODE	Large Optics Demonstration Experiment
LOS	Large Optical Segment
LOS	Level of Service
LPE	Laser Payload Element
LTF	Laser Test Facility
$\mu g/m^3$	micrograms per cubic meter
MDEQ	Mississippi Department of Environmental Quality
mgd	million gallons per day
MMBtu	million British thermal units
MOA	Military Operations Area
MPC	Mississippi Power Company
MPO	Metropolitan Planning Organization
MSAAP	Mississippi Army Ammunition Plant
MSFC	Marshall Space Flight Center
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
msl	mean sea level
MTR	Military Training Route
N_2	Nitrogen
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NaOH	Sodium Hydroxide
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NF_3	Nitrogen Trifluoride
NFA	No Further Action
NMD	National Missile Defense
NMFS	National Marine Fisheries Service
NO_2	Nitrogen Dioxide

NO_X	Nitrogen Oxides
NOI	Notice of Intent
NOTAM	Notice to Airmen
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
O_2	Oxygen
O_3	Ozone
OBDG	Ocean Breeze Dry Gulch
OCA	Offsite Consequence Analysis
ODS	Ozone Depleting Substance
OEL	Occupational Exposure Level
OEL-C	Occupational Exposure Level Ceiling
OPC	Office of Pollution Control
OPlan	Operations Plan
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
P2	Pollution Prevention
Pb	Lead
PCB	Polychlorinated Biphenyls
PEL	Permissible Exposure Level
$PM_{2.5}$	Particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers
PM_{10}	Particulate matter with an aerodynamic diameter less than or equal to 10 micrometers
ppm	parts per million
PRS	Pressure Recovery System
PSD	Prevention of Significant Deterioration
psia	pounds per square inch absolute
PTC	Performance Test Chamber
PTF	Performance Test Facility
RSA	Redstone Arsenal
RCF	Remote Control Facility
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROI	Region of Influence
RSF	Reactant Storage Facility
SBL	Space-Based Laser
SCE	Spacecraft Element
SCTL	Soil Cleanup Target Levels
SDIO	Strategic Defense Initiative Organization
SEL	Sound Exposure Level
SH	State Highway
SHPO	State Historic Preservation Officer

SIP	State Implementation Plan
SJRWMD	St. Johns River Water Management District
SMAB	Solid Motor Assembly Building
SO_2	Sulfur Dioxide
SO_X	Sulfur Oxides
SPCC	Spill Prevention, Control, and Countermeasure
SR	State Road
SSC	Stennis Space Center
STF	Space-Based Laser Test Facility
SWMU	Solid Waste Management Units
SWPPP	Storm Water Pollution Prevention Plan
TCE	Trichloroethene
Tenn-Tom	Tennessee-Tombigbee Waterway
TLV	Threshold Limit Value
TMD	Theater Missile Defense
tpy	tons per year
TSP	Total Suspended Particulates
TV/TB	Thermal Vacuum and Thermal Balance
TVA	Tennessee Valley Authority
U.S.	United States
USACE	U.S. Army Corps of Engineers
USAF	United States Air Force
USBMA	U.S. Ballistic Missile Agency
USC	United States Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tanks
VC	Vinyl Chloride
VFR	Visual Flight Rule
VOC	Volatile Organic Compound
VPD	Vehicles per Day
WNWR	Wheeler National Wildlife Refuge
WTP	Water Treatment Plant
WW II	World War II
WWTP	Wastewater Treatment Plant

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CHAPTER 1

PURPOSE OF AND NEED FOR ACTION

1.1 BACKGROUND

The Space-Based Laser (SBL) program is a research program aimed at developing and demonstrating the technology for a space-based directed energy weapon for ballistic missile defense that has global capability for negating ballistic missiles in the boost phase. The program has its roots in the Defense Advanced Research Projects Agency (DARPA), beginning over 20 years ago (ca. 1977). The program transitioned to the Strategic Defense Initiative Organization (SDIO), which later became the Ballistic Missile Defense Organization (BMDO). In 1997, the Air Force was designated the SBL program Executing Agent for BMDO. The current SBL program is the culmination of previous space-based directed energy programs.

In the last few years, important technical achievements in advancing the SBL concept have been made through various programs (these were separate and standalone research and development programs), including:

- development of the Alpha High Energy Laser (HEL), a megawatt-class hydrogen-fluoride laser;
- development of the Large Aperture Mirror Program (LAMP), a four-meter diameter segmented mirror built to the requisite optical quality;
- development of resonator optics materials supporting the use of uncooled mirrors in the HEL beam path;
- development of the Large Optics Demonstration Experiment (LODE), a low energy beam control system;
- development of the Alpha-LAMP Integration (ALI) program, an integrated system including the Alpha HEL, the LAMP, and the current beam control system; and
- development of the High Altitude Balloon Experiment (HABE) program, a demonstration of a low energy laser performing acquisition, tracking, pointing, and fire control functions in a realistic timeframe against actual thrusting ballistic missiles.

The next step in the SBL program would be development of an Integrated Test Unit (ITU) and Integrated Flight Experiment (IFX) test vehicle for ground testing in a new SBL Test Facility (STF) complex. This component of the SBL program is the subject of this Environmental Assessment (EA). Future components of the program could include the launch of the IFX test vehicle for on-orbit testing.

1.2 PURPOSE OF AND NEED FOR THE PROPOSED ACTION

For over fifty years, ballistic missiles have been a threat to the United States and its military operations. During the Cold War, the strategic balance between Soviet and U.S. forces held this threat in check through the ability of each side to destroy the other after an initial attack. Since the 1991 Gulf War, there has been a proliferation of ballistic missile capabilities throughout the world. Currently, over twenty countries now have ballistic missiles of theater (intermediate) range. These missiles can carry and deploy nuclear, chemical, and/or biological weapons. Furthermore, an estimated two-dozen countries have, or are capable of developing, these weapons of mass destruction. The U.S. government considers the proliferation of ballistic missiles in combination with development of weapons of mass destruction a great danger to both national and global security.

Within the Department of Defense, BMDO is the lead agency for managing, directing, and executing the Ballistic Missile Defense (BMD) program. The BMDO objectives are threefold. First, BMDO is responsible to develop and deploy Theater Missile Defenses (TMD) to meet the existing missile threat to deployed U.S. and allied forces. Second, BMDO is developing options to deploy a limited National Missile Defense (NMD) for the United States as a hedge against the emergence of limited long-range ballistic missile threats. Third BMDO is responsible for supporting research on advanced ballistic missile defense technologies to keep pace with the ballistic missile threats and improve the performance of TMD and NMD systems.

In keeping with the second and third objectives, BMDO is conducting various research programs to demonstrate the technology for boost phase interception of ballistic missiles. One of these programs is the SBL program. The SBL system would be a space-based directed energy weapon for global ballistic missile defense that has the capability of negating ballistic missiles in the boost phase. A ballistic missile can be tracked and targeted most easily when it is in the boost phase, i.e., when its engines are firing. Additionally, interception in the boost phase would occur over or near the territory from which the missile was launched.

The SBL IFX is a part of the overarching SBL program. The primary IFX objective is to conduct research and technology demonstration to advance and assess the feasibility of the SBL concept and its technologies, culminating in execution of an on-orbit demonstration. The IFX effort includes two decisional phases: 1) design, development, and ground testing (including test facilities design and construction); and 2) launch, on-orbit testing, lethal demonstration, vehicle disposition, and delivery of data. The current decision relates only to the first phase of ground testing. If the ground testing phase is successfully concluded, a future decision could be made to implement the second phase of space testing.

The ground testing phase of the IFX program requires a new test facility complex, the STF complex, for high power performance testing of the laser in a simulated space environment while fully integrated with the ITU and the IFX test vehicle. At this point in the IFX program, a decision must be made regarding the locations for the components of the STF complex and associated ground testing. Therefore, the ground testing component of the IFX program requires specific Environmental Impact Analysis Process (EIAP) documentation and action. A decision regarding the possible launch of the IFX test vehicle in 2012 would not be made until the ground testing research supported through the STF complex confirms that the test vehicle can be successfully launched and operated. The launch decision would be supported by appropriate NEPA analysis.

1.3 ALTERNATIVE SITES FOR THE PROPOSED ACTION

The alternative sites for the Proposed Action include Stennis Space Center (SSC), Mississippi; Redstone Arsenal (RSA)/Marshall Space Flight Center (MSFC), Alabama; and Cape Canaveral AFS (CCAFS), Florida. Site maps showing the installations are included as Figures 1-1, 1-2, and 1-3.

1.4 DECISION TO BE MADE

The decision to be made by the Director, BMDO, is to select one or more of the sites and their respective facility locations for the construction and operation of the STF complex for ground testing of the SBL IFX, or to take no action. The decision could be made to situate the various components of the STF complex at different sites, i.e., to split the complex between sites.

1.5 SCOPE OF THE ENVIRONMENTAL REVIEW

Federal agencies that fund, support, permit, or implement major programs and activities are required to take into consideration the environmental consequences of proposed actions in the decision-making process under the National Environmental Policy Act (NEPA) of 1969, Title 42, United States Code (USC), Section 4321, et seq. (42 USC 4321 et seq.). The intent of NEPA is to require Federal decision-makers to consider the environmental impacts of proposed projects prior to an implementing decision. The Council on Environmental Quality (CEQ) was established under NEPA to implement and oversee federal policy in this process. The CEQ issued regulations implementing the process in Title 40, Code of Federal Regulations (CFR), Parts 1500-1508 (40 CFR 1500-1508). The CEQ regulations require that an EA:

- Briefly provide evidence and analysis to determine whether the Proposed Action might have significant effects that would require preparation of an Environmental Impact Statement (EIS). If the analysis determines that the environmental effects will not be significant, a Finding of No Significant Impact (FONSI) will be prepared for the approval of the decision maker.
- Facilitate the preparation of an EIS, if required.

This EA provides the basis for a determination of the degree of the environmental impacts of the proposed and alternative actions. The EA is part of the Environmental Impact Analysis Process (EIAP) for the proposed project as set forth in Air Force

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EXPLANATION

Major Roadways

NORTH

Scale 1:4,000,000

0 50.5 101 Kilometers

0 31.5 63 Miles

Figure 1-1

Site Map
Stennis Space Center, MS

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EXPLANATION

Major Roadways

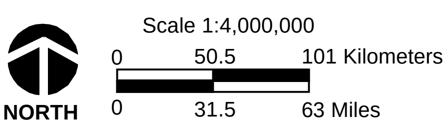

Figure 1-2

Site Map
Redstone Arsenal/Marshall
Space Flight Center, AL

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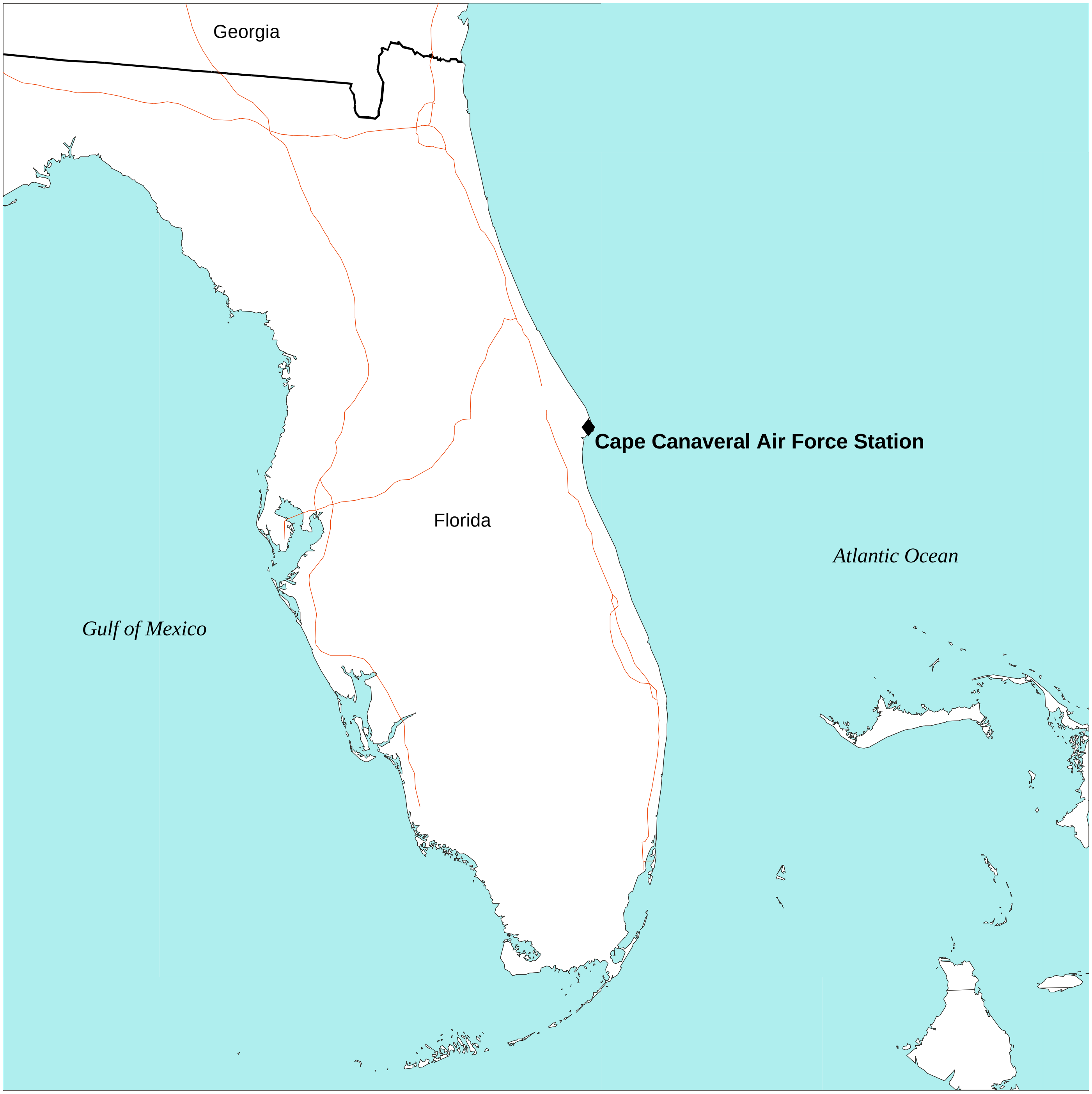

EXPLANATION

Major Roadways

Figure 1-3

Site Map
Cape Canaveral AFS, FL

NORTH

Scale 1:4,000,000

0 50.5 101 Kilometers

0 31.5 63 Miles

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Instruction (AFI) 32-7061, *The Environmental Impact Analysis Process*, effective July 6, 1999, which implements NEPA, CEQ regulations, Department of Defense (DoD) Instruction 4715.9, *Environmental Planning and Analysis*, and Air Force Policy Directive (AFPD) 32-70, *Environmental Quality*.

A previous EA, *Laser Test Facility Environmental Assessment*, dated December 1999 (Ballistic Missile Defense Organization, 1999), assessed the environmental impacts of locating the STF at the alternative sites, but at different locations on the sites than those evaluated in the current EA. This EA will utilize pertinent information from the previous EA, e.g., Affected Environment and baseline, but revise the analysis for the current locations and proposed facilities. The previous EA assumed all new construction, but the current EA considers alternatives that would maximize the use of existing facilities at each of the alternative sites, minimizing expense and environmental impact to the extent practicable.

In deciding where the STF complex should be located, there are actually six alternatives since a decision could be made to locate the two primary components of the STF complex, the laser testing component of the STF complex and the space vehicle integration component, at any of the alternative sites, either separately or together. In this EA, three site alternatives are analyzed with the assumption that the entire STF complex would be at a single site. If there were a "split" STF, the environmental consequences at each alternative site would be less than those analyzed in the EA, but all of the site-specific impacts would be captured within the "envelope" of the analysis. Because of the distance between the three sites, there would be no additive impacts. Therefore, the "split" STF alternatives are not analyzed in detail since the environmental consequences would be the same or less, but a "split" STF decision would be supported by the analysis in this EA. In the case of a "split" decision, the IFX test vehicle would be transported by barge between the chosen sites. The impacts associated with such transport are addressed in this EA.

This EA identifies, describes, and evaluates the potential environmental impacts that could result from the implementation of the Proposed Action at any of the alternative sites, and includes possible cumulative impacts from all reasonably foreseeable activities at each of the alternative sites. It also identifies required environmental permits relevant to the Proposed Action. As appropriate, the affected environment and environmental consequences of the Proposed Action may be described in terms of regional overview or site-specific descriptions. Finally, the EA identifies measures to prevent or minimize environmental impacts.

The environmental analysis will focus on the most important issues among the following environmental resources identified for study: air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste management, health and safety, land use and aesthetics, noise, socioeconomics, transportation, utilities, water resources, and environmental justice.

1.6 INTRODUCTION TO THE ORGANIZATION OF THE DOCUMENT

This EA is organized into seven chapters.

Chapter 1 contains the purpose of and need for the Proposed Action; defines the sites and locations for the Proposed Action; identifies the decision to be made and the decision-maker; presents the scope of the environmental review and the EIAP; and outlines the organization of this EA.

Chapter 2 provides introductory information relative to the Proposed Action and alternatives; gives a history on the formulation of the alternatives; briefly describes alternatives eliminated from further consideration; details the Proposed Action; presents the no-action alternative; describes the alternative actions; identifies other actions announced for the alternative sites; and summarizes the environmental impacts.

Chapter 3 contains a general description of the environmental resources that potentially could be affected by the Proposed Action or alternatives at each of the alternative sites.

Chapter 4 analyzes the environmental consequences of the alternatives, including the No-Action Alternative; states any unavoidable environmental impacts; and describes any irreversible or irretrievable commitment of resources.

Chapter 5 lists preparers of this document.

Chapter 6 lists persons and agencies consulted in the preparation of this EA.

Chapter 7 is a list of source documents relevant to the preparation of this EA.

CHAPTER 2

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the formulation of alternatives, identifies alternatives eliminated from further consideration, describes in detail the Proposed Action and the No Action Alternative, and indicates other reasonably foreseeable actions proposed at the installations that could contribute to cumulative impacts. The Proposed Action is the construction and operation of the STF complex at one or more of three alternative sites and locations to support the SBL IFX mission.

2.2 HISTORY OF THE FORMULATION OF ALTERNATIVES

Executing authority for the SBL program was transferred from the Ballistic Missile Defense Organization (BMDO) to the Air Force in 1997. As discussed in the previous EA for the Laser Test Facility (Ballistic Missile Defense Organization, 1999), exclusionary criteria, developed in accordance with BMDO Directive 6051, March 1995, *Comprehensive Siting Analysis Procedures*, and BMDO Directed Energy Directorate guidelines, were applied to numerous installations, including both DoD and NASA facilities. It was not feasible, within schedule and funding constraints, to visit all sites that had passed the exclusionary criteria. Site Screening Criteria were then developed to evaluate the locations based on information from available databases. The four highest scoring sites were identified as Proposed Action alternative sites. These four sites were evaluated in the previous EA for the Laser Test Facility (LTF) (Ballistic Missile Defense Organization, 1999).

All of the currently considered sites were previously evaluated in the 1999 EA, along with an alternative site at Kennedy Space Center (KSC), Florida. For this EA, the STF complex would be situated at different locations at each of the alternative sites. KSC and CCAFS cooperated in the development of an alternative location at CCAFS which includes no construction or facility usage at KSC. Therefore, KSC is not considered in this current EA. KSC did cooperate with CCAFS under the agreement between KSC and CCAFS that established the Cape Canaveral Spaceport.

The alternatives in the 1999 EA assumed primarily new construction for all components of the LTF (STF in current EA). Due to cost considerations for the program, the new alternative locations at each of the alternative sites now maximize the use of existing facilities. Therefore, the STF site layout has been changed at all of the alternative installations from those evaluated in the previous EA.

There are two sets of criteria in use for the site selection process. The first set contains exclusionary criteria. These are criteria that must be met and were applied as part of the process leading to the current three alternative sites. The exclusionary site selection criteria required that the STF shall:

- be in the continental U.S. and owned by the government in fee simple;
- be within 8 kilometers of a commercially navigable waterway to allow for barge transport of the test vehicle to the launch facility at Cape Canaveral Air Force Station (AFS), Florida; and
- provide for a safety zone with a radius of 0.75 miles around the portion of the STF used for laser testing.

The other set of criteria contains evaluative criteria. Those alternatives that meet the exclusionary criteria would then be further evaluated and scored to determine the numerical ranking of the sites so that the chosen alternative would:

- minimize the transportation duration and number of trips required to support the ground tests;
- minimize the number of vertical to horizontal rotations for the assembled IFX and ITU during ground testing;
- minimize the potential schedule impacts due to inclement weather, base operations, demolition, permits, site preparation, and construction;
- minimize operational conflicts with other installation missions;
- minimize site preparation, construction and project costs with particular emphasis on potential hidden (underground) risks, undocumented military and/or industrial hazards, site specific mitigation requirements, potential soil integrity problems, and cut/fill requirements for construction; and
- minimize operation, maintenance, and total life cycle costs.

2.3 IDENTIFICATION OF ALTERNATIVES ELIMINATED FROM FURTHER CONSIDERATION

A detailed discussion of the site screening process and various alternatives eliminated from further consideration is contained in the previous EA (Ballistic Missile Defense Organization, 1999). Numerous installations were screened using the exclusionary criteria. Further site screening reduced the number of alternative sites to four, and this EA considers three alternative sites that have existing facilities to support the IFX mission. The KSC site previously considered has been eliminated from further consideration due to the lack of available existing facilities and potential environmental impacts. KSC and CCAFS cooperated in the development of the alternative location at CCAFS which includes no construction or facility usage at KSC.

2.4 DETAILED DESCRIPTION OF THE PROPOSED ACTION

The IFX ground testing program would proceed in two phases in two primary facilities. The first phase would occur in the Performance Test Facility (PTF) where all laser test firing would occur. Due to safety considerations, there would be a 0.75-mile radius safety zone around the PTF performance test chamber. The 0.75-mile radius safety zone provides for dispersion of emissions associated with the laser tests, and possible catastrophic release of reactants. The second phase would occur in the IFX test vehicle Assembly, Integration, and Test Facility (AI&TF). This facility would be located outside the PTF safety zone, and is the location where the laser and optical payload elements would be integrated with a spacecraft element to constitute the IFX test vehicle, a potentially functional space vehicle.

The first phase of the IFX ground testing program would include the integration of the laser payload elements with a spacecraft simulator to form an ITU for testing in the PTF in a simulated space environment. The ITU would be used to test and demonstrate the functional operation of the integrated payload elements, including laser test firing. All testing of the ITU would occur in the PTF. If testing were concluded successfully, the second phase of the ground testing program would proceed.

The second phase would be integration of the various payload elements with a functional spacecraft element to form the IFX test vehicle. This integration would occur in the AI&TF which would provide facilities for functional testing of the IFX test vehicle in simulated launch and space environments. No laser test firing would occur at the AI&TF. At the conclusion of functional testing in the AI&TF, the IFX test vehicle would be transported to the PTF for laser test firing, completing the ground testing for the IFX program.

As discussed in Section 1.5, *Scope of the Environmental Review*, there are actually six alternatives since a decision could be made to locate the two primary components of the STF complex at any of the three sites, either singly or in combination. In this EA, three alternatives are analyzed with the assumption that the entire STF complex would be at a single location. If there were a “split” STF, the environmental consequences at each alternative location would be less than those analyzed in the EA, but all of the site-specific impacts would be captured within the “envelope” of the analysis. There is no preferred alternative.

2.4.1 STF Complex

The STF complex is being configured for the SBL IFX ground-test program. The ITU and IFX test vehicle testing will be performed in a vertical configuration. Those sites that are not co-located with CCAFS where the potential future launch of the IFX test vehicle would occur would require additional facility areas to support vertical to horizontal rotations in preparation for transportation.

Therefore, there are two different sets of facility requirements for the specific candidate sites: non-consolidated facilities and consolidated facilities. Consolidated facilities would be located at CCAFS (consolidated with the potential future launch facilities), and non-consolidated facilities would be located at SSC and/or RSA/MSFC. The types of requirements are similar; the main difference would be the area required.

2.4.1.1 Non-Consolidated Facilities Requirements

Non-consolidated facilities would be situated at SSC or RSA/MSFC. These sites would not support consolidated operations with the possible future launch operations, and would require additional facility area to support the added logistics (e.g., vertical to horizontal rotations required for transportation preparation).

The STF complex includes two primary facility requirements, the PTF and the AI&TF. The PTF support facilities include the Remote Control Facility (RCF) and Reactant Storage Facility (RSF). The AI&TF includes the environmental test chambers and support facilities for integration of the elements of the IFX test vehicle. Other facility requirements include engineering, warehouse, and administration areas.

Detailed facility designs and site layouts for each of the candidate sites have not been prepared, although locations at each installation have been identified. Additional NEPA analysis and documentation may be performed in the future on specific aspects, if required based on the detailed designs and site layouts. Table 2-1 indicates the functional occupancy requirements in square feet of floor space for the key facility requirements. Figure 2-1 illustrates the notional non-consolidated PTF requirements, Figure 2-2 illustrates the notional non-consolidated PTF support facility requirements, and Figure 2-3 illustrates the notional non-consolidated AI&TF requirements

Table 2-1 Non-Consolidated Facilities Requirements

Facility	Space Requirements (square feet)
Performance Test Facility	39,300
Remote Control Facility	4,200
Reactant Storage Facility	6,300
Assembly, Integration, and Test Facility	56,900
Engineering, Warehouse, Administration	31,000
Totals	**137,700**

Performance Test Facility

The PTF complex would include a Performance Test Chamber (PTC) and a Pressure Recovery System (PRS), and occupy less than 12 acres in a 0.75-mile radius safety zone.

The PTC would provide the vacuum chamber capable of holding the ITU and IFX test vehicle and associated test instrumentation during laser performance testing. The PTC would be a chamber designed to achieve and maintain conditions similar to an orbital space environment during laser test firing. The chamber would be large enough to house the ITU or IFX test vehicle and instrumentation.

The PRS would be a multistage steam ejector pumping system that would create a vacuum to remove exhaust gas from the PTC during laser performance testing. Each of the two condensers in the PRS would remove up to 99 percent of emissions

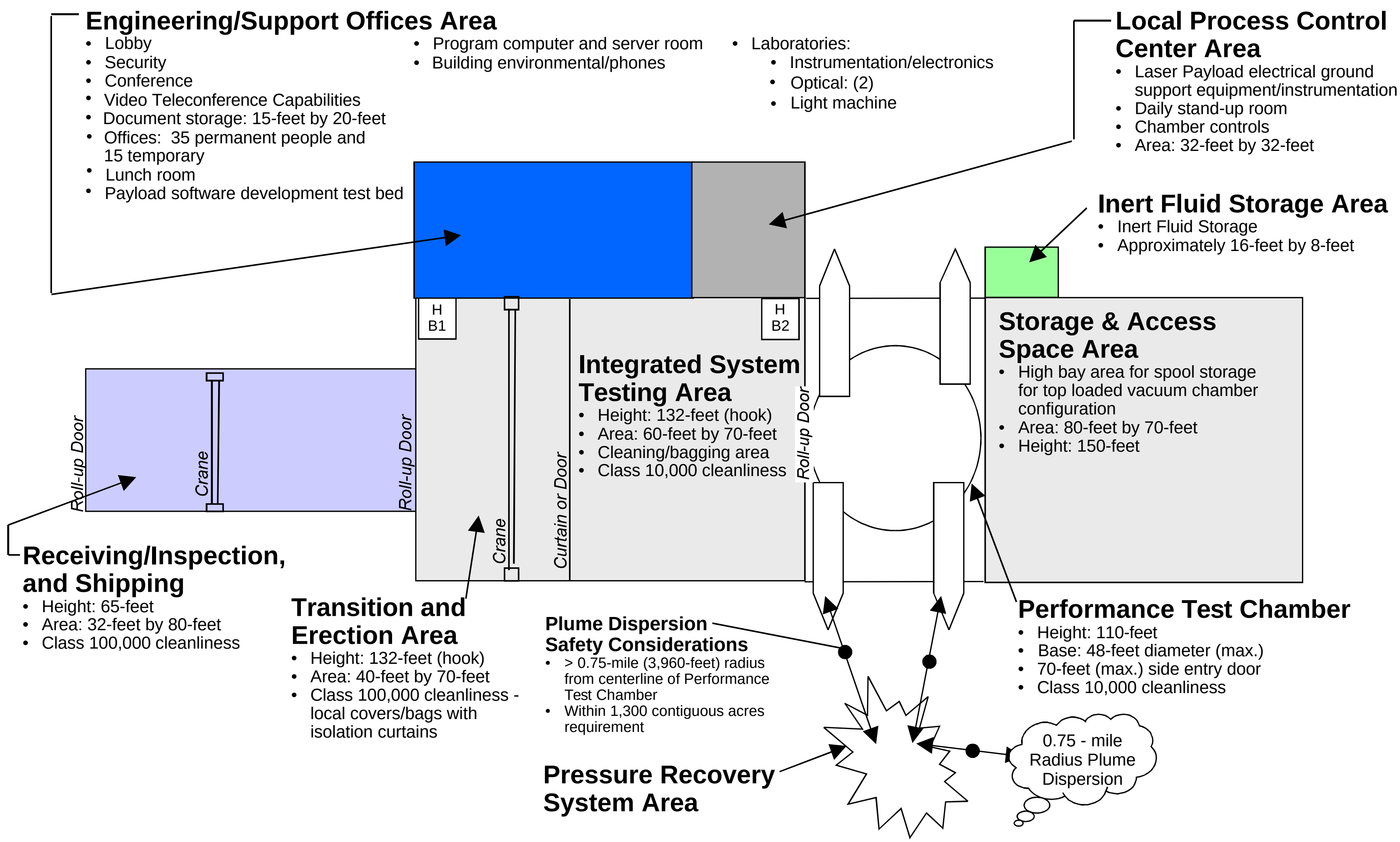

Figure 2-1

Notional Non-Consolidated Performance Test Facility

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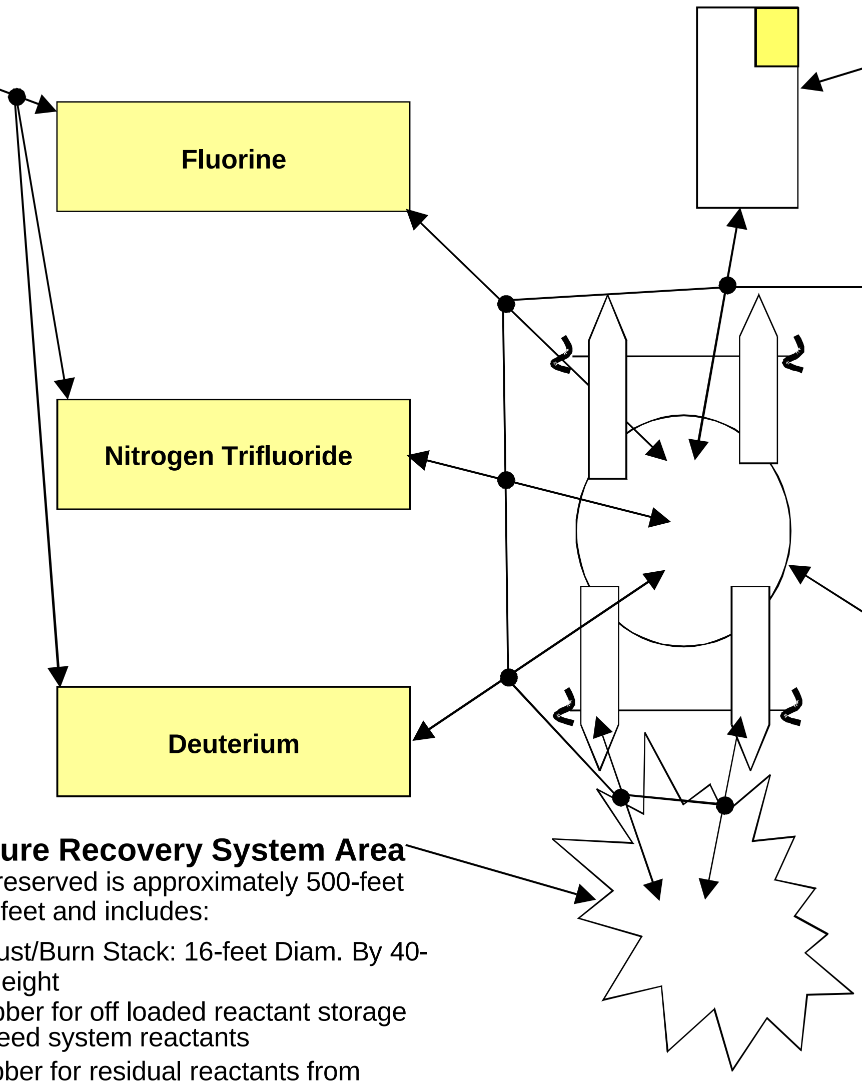
Reactant Storage Facility Area

- Reactant (Inert Fluid) Storage and Feed System - storage, loading, and distribution equipment
  - Fluorine - F_2
  - Nitrogen Trifluoride - NF_3
  - Deuterium - D_2 /Helium
- Area: 70-feet by 30-feet
- Igloo or bunker blast containment construction will be required



Remote Control Facility Area

- Control, computer/instrumentation, storage, conference, viewing, and building environmental rooms
- Offices: 20 temporary

Plume Dispersion Safety Considerations

- > 0.75-mile (3,960-feet) radius from centerline of Performance Test Chamber
- Within 1,300 contiguous acres requirement

Performance Test Chamber

- Integrated with the Performance Test Facility

Pressure Recovery System Area

Space reserved is approximately 500-feet by 600-feet and includes:

- Exhaust/Burn Stack: 16-feet Diam. By 40-feet height
- Scrubber for off loaded reactant storage and feed system reactants
- Scrubber for residual reactants from reactant transfer system

Figure 2-2

Notional Non-Consolidated PTF Support Facilities for Laser Performance Testing

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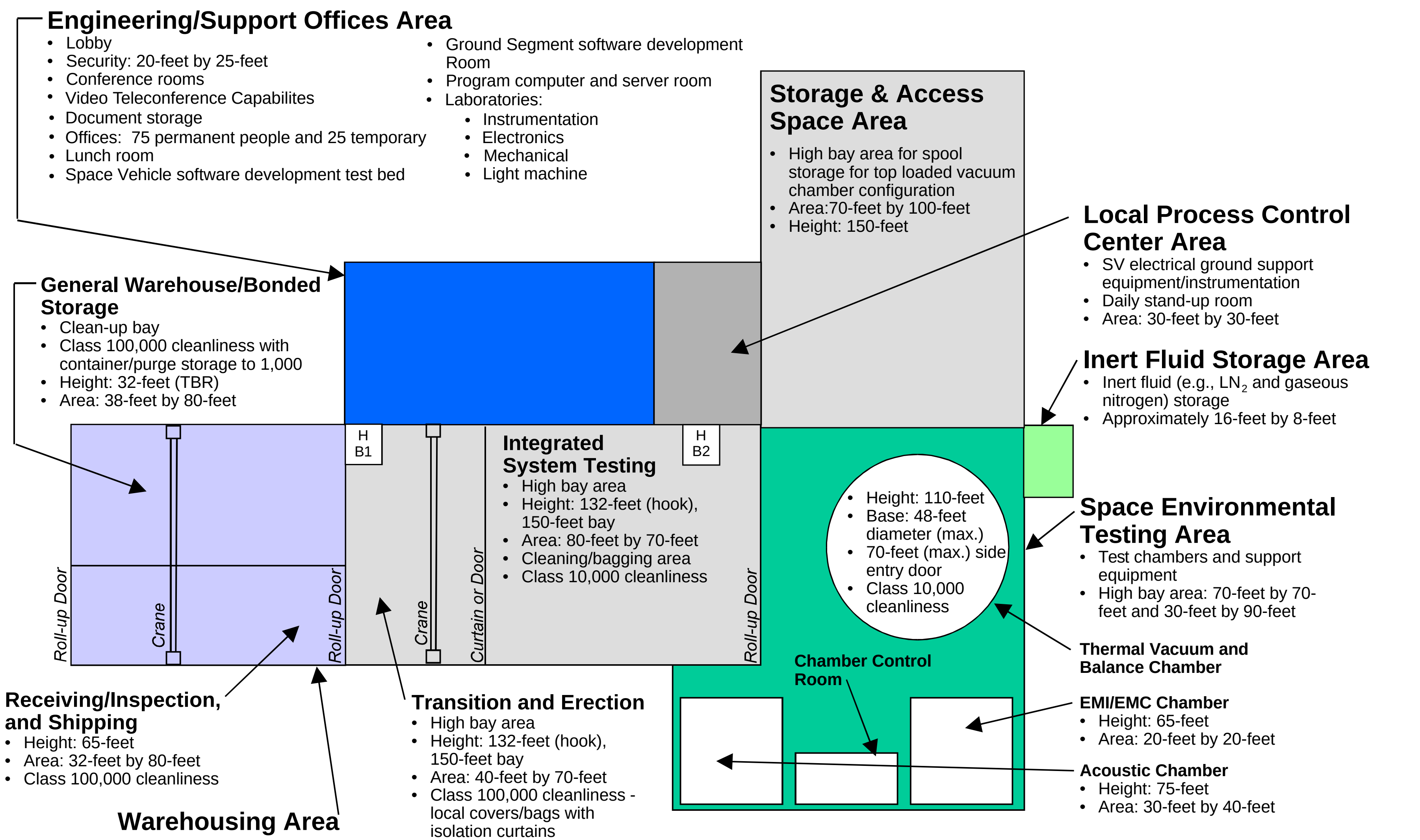

Figure 2-3

Notional Non-Consolidated Integrated Flight Experiment Space Vehicle Assembly, Integration, and Test Facility

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from the waste stream before discharging the residuals into the atmosphere. The 99 percent removal efficiency is a design requirement. Diesel fuel would be used as a fuel source for the boilers to generate the steam. Diesel generators would provide primary electrical power to the PTC and PRS during laser performance testing, and the installation power grid would provide backup power during testing. Approximately 3,500 gallons of fuel per test would be used for steam generation. A 15,000-gallon diesel storage tank would be required. Figure 2-4 illustrates the operation of the PRS.

The PTF requirement would also include support shops and laboratories consisting of machine shops, optical shops, electrical shops, and instrument calibration and repair labs. A plant protection support area would house the personnel and equipment to provide fire, medical, security, and communication services.

Reactant Storage Facility

The RSF would be utilized to store the quantities of nitrogen trifluoride (NF3), fluorine (F2), and deuterium (D2) indicated in Table 2-2. Smaller quantities would be transferred to the PTF for individual laser tests. Storage and handling areas would consist of concrete pads with associated tanks, piping, valves, and related storage and transfer equipment to provide inert gases and reactants to the test chamber and diesel fuel and water to the PRS. The type of reactants, materials, and amounts that would be stored at the facility are listed in Table 2-2. The storage areas would include short- and long-term parking areas for tube trucks that would store reactants and oxidizers. Required emergency response equipment would be included at appropriate locations.

Table 2–2 Estimated STF Complex Storage Requirements

Reactant/Compound	Delivery Method	Storage Mass
Nitrogen Trifluoride (NF_3)	Delivered in 250-cubic foot trailers at 1,250 psia	1,102 pounds
Fluorine (F_2)	Delivered in K-bottles at 400 psia	231 pounds
Deuterium (D_2)	Delivered in 250-cubic foot trailers at 2,500 psia	574 pounds
Helium (He)	Delivered in 1,000-cubic foot trailers at 2,500 psia	441 pounds
Hydrogen (H_2)	Delivered in 250-cubic foot trailers at 2,500 psia	220 pounds
Nitrogen (N_2)	Delivered in 6,000-gallon trailers	1,102 pounds
Diesel Fuel	Delivered by tanker	15,000 gallons
Sodium Hydroxide (NaOH liquid solution)	Delivered in 55-gallon drums	220 gallons
Pressure Recovery System Water	Installation water supply	132,086 gallons
Oxygen (O_2)	Delivered as liquefied compressed gas in K-bottles	110 pounds
White Lime (NaOH)	Delivered in 50-pound bags	3,970 pounds

psia = pounds per square inch absolute

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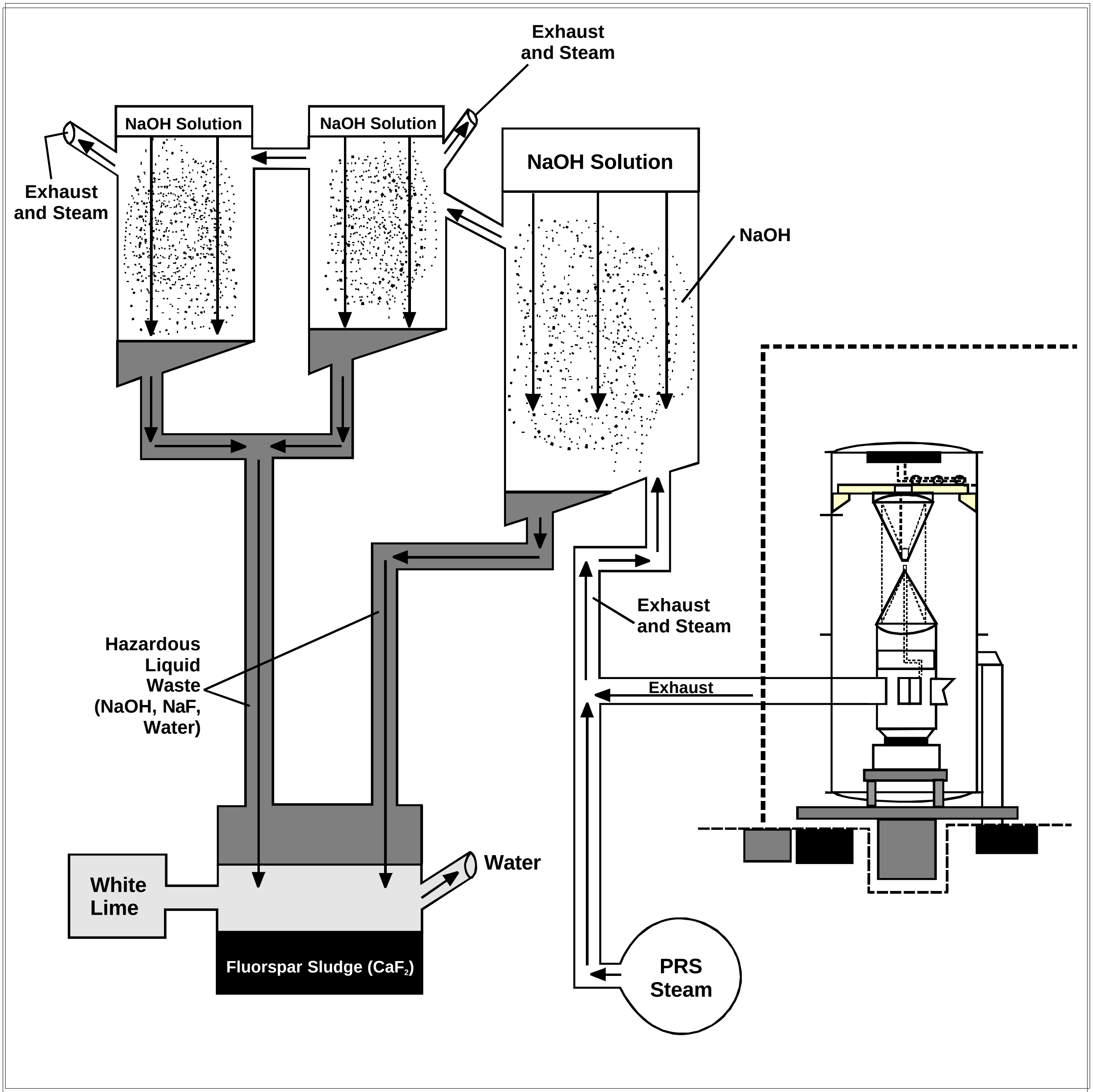

EXPLANATION

NaF = sodium fluoride

NaOH = dilute sodium hydroxide (8% Solution)

PRS = Pressure Recovery System

CaF_2 = Fluorspar Sludge

Figure 2-4

Pressure Recovery System Operational Schematic

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The reactants and other hazardous materials that would be used at the PTF would be shipped via truck or rail from the manufacturing location. Transportation of hazardous materials would be accomplished in accordance with Department of Transportation (DoT) regulations for interstate shipment of hazardous substances (49 CFR Parts 100-199). These regulations require that hazardous materials be shipped in specially designed shipping containers to reduce the potential of a mishap in the event of an accident. In addition, shipments would follow state-designated hazardous materials transportation routes. Installation-specific procedures would also be followed upon arrival. Storage and ventilation requirements of applicable state and federal regulations would be followed, along with the environmental, safety, and health requirements of DoD 5000.2-R, DoD Instruction (DoDI) 4715.9, and AFPD 32-70.

Remote Control Facility

The RCF requirement would provide for remote operations during laser performance testing and would be situated outside the 0.75-mile radius safety zone. The RSF requirement would provide for safe storage of reactant materials. Figure 2-5 illustrates the STF functional chemical storage layout.

Assembly, Integration, And Test Facility

The AI&TF complex would occupy less than 5 acres outside the 0.75-mile safety zone. Both the PTF and AI&TF complexes would include areas for cleaning the shipping containers and equipment before entrance into the receiving and other clean room areas. Cleaning areas would include hot-water truck washers and a truck drying area.

Wastewater from the truck washing would run to grated trench drains and then to an oil/water separator outside the facility before being directed into a sanitary sewer.

The AI&TF complex would include three environmental test chambers: The Acoustic Chamber, the Electromagnetic Interference/Electromagnetic Compatibility (EMI/EMC) Chamber, and the Thermal Vacuum and Thermal Balance (TV/TB) Chamber. No laser test firing would occur at the AI&TF complex.

In the Acoustic Chamber, the IFX test vehicle would be mounted vertically and exposed to an acoustic environment similar to launch conditions. The Acoustic Chamber would be a reinforced concrete structure with dimensions of 30 feet by 40 feet by 75 feet high with acoustic wave generation equipment.

The EMI/EMC Chamber would provide a shielded enclosure where the IFX test vehicle would be tested to simulate system capabilities for space to ground communications and on-orbit operations.

The TV/TB Chamber would simulate on-orbit vacuum and temperature conditions. The TV/TB Chamber would be a vertical stainless steel cylinder approximately 46 feet in diameter by 110 feet high, and will house a test vehicle support fixture, thermal shroud, and other equipment to simulate the space environment. The TV/TB Chamber would have a local control room and a mechanical equipment room to house vacuum pumps and thermal control equipment.

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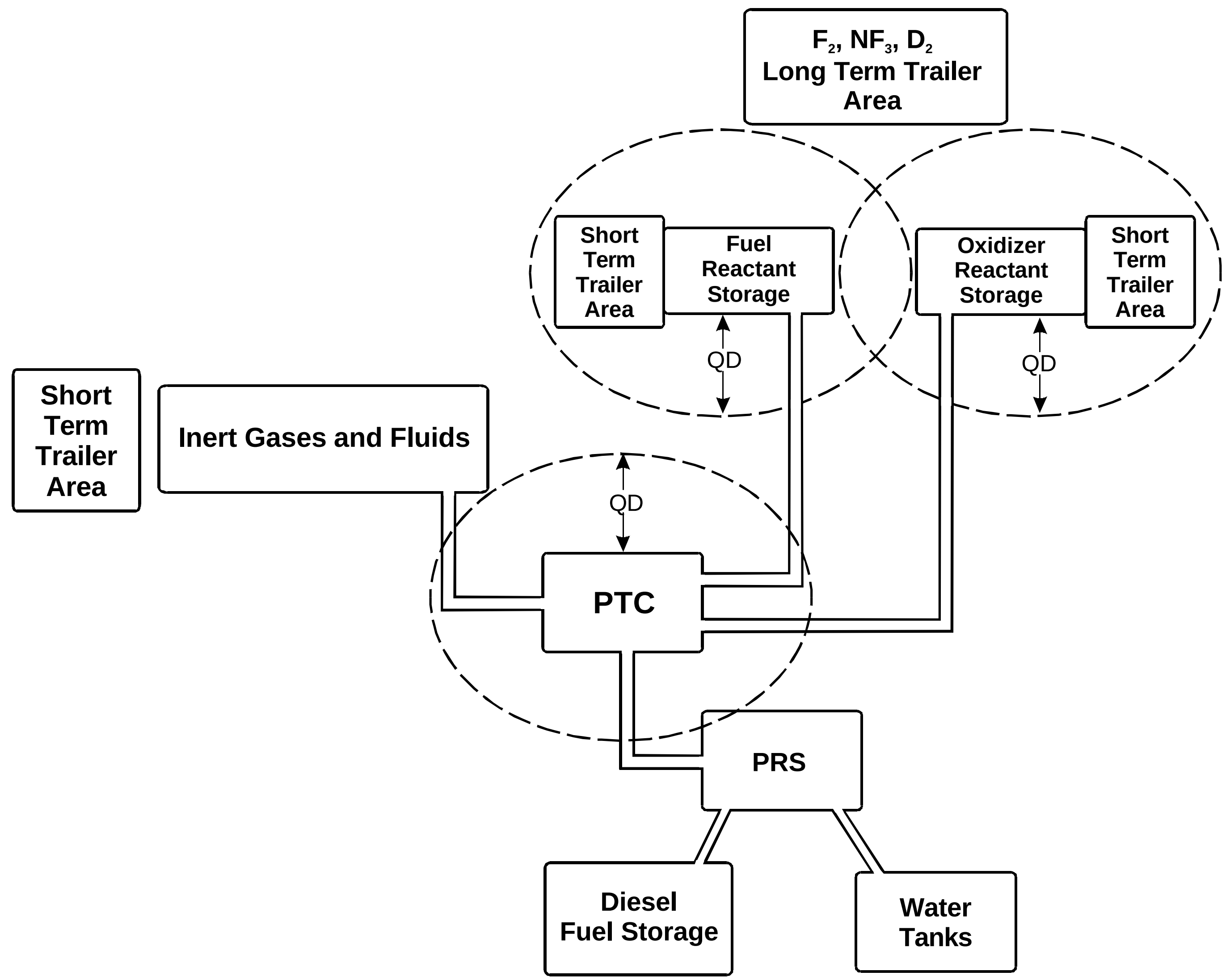

EXPLANATION

PTC = Performance Test Chamber
PRS = Pressure Recovery System
QD = Quantity Distance Safety Zone (to be determined by site specific requirements analysis)
D_2 = Deuterium
F_2 = Fluorine
H_2 = Hydrogen
NF_3 = Nitrogen Trifluoride

Figure 2-5

Chemical Storage Functional Layout

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The AI&TF requirement would also include support shops and laboratories consisting of machine shops, optical shops, electrical shops, and instrument calibration and repair labs. A plant protection support area would house the personnel and equipment to provide fire, medical, security, and communication services.

Other miscellaneous requirements would include a backup electrical power supply. The backup power supply would consist of three 750-kilowatt diesel generators, each with a 200-gallon aboveground diesel tank. In addition, this system would require lead-acid batteries and associated chargers and cables.

Construction Activities

A minimum construction period of approximately 36 months would be required for the PTF. Construction activities are anticipated to begin by the end of fiscal year (FY) 2002. A construction period of approximately 36 months would also be required for the AI&TF. The AI&TF would not be required until after the ITU testing had been performed. Therefore, construction activities for the AI&TF are anticipated to begin in the middle of FY 2007.

Initial construction activities after final design would primarily entail site grading. Construction equipment lay down, personal vehicle parking, temporary mobile offices (trailers), maintenance facilities, and other construction needs would occur in previously disturbed areas or in predetermined construction lay down areas in accordance with construction plans to minimize disturbance to the environment. These areas would be proximate to the PTF. Existing roads would be modified as required to accommodate construction and operations traffic and loads.

A temporary truck wash down area would be provided within the boundaries of the construction lay down areas. The wash down area would include an impoundment to contain collected wastewater. The impoundment would contain an oil/water separator and a sump that would allow water to be directed to a sanitary sewer.

Approximately 12 acres of land would be disturbed during construction activities, including 10 acres for the facilities and up to 2 acres for construction lay down areas. Depending on final design and grading plans, earth movement would involve approximately 10,000 cubic yards of cut and fill material. Unused cut material would be removed from the project area to an approved spoil site. It is expected that construction material would be transported by truck to the site.

2.4.1.2 Consolidated Facilities Requirements

The consolidated facilities requirements are the same in kind, but differ in the amount of space required. Table 2-3 indicates the functional occupancy requirements in square feet of floor space. The descriptions in the previous section for the non-consolidated facilities requirements are applicable to the consolidated facilities requirements. Figures 2-6 through 2-8 illustrate the consolidated facilities functional requirements.

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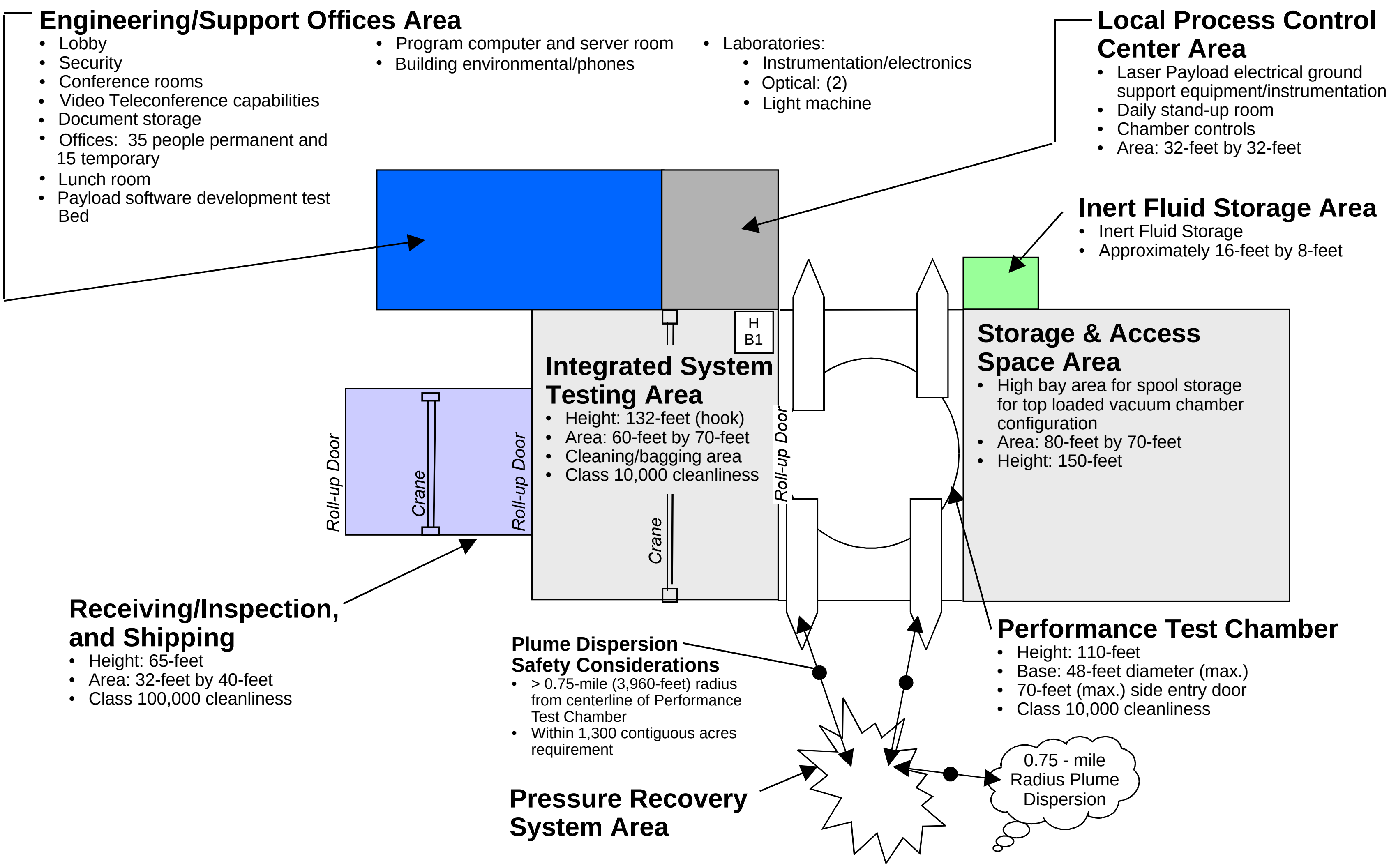

Figure 2-6

Notional Consolidated Performance Test Facility

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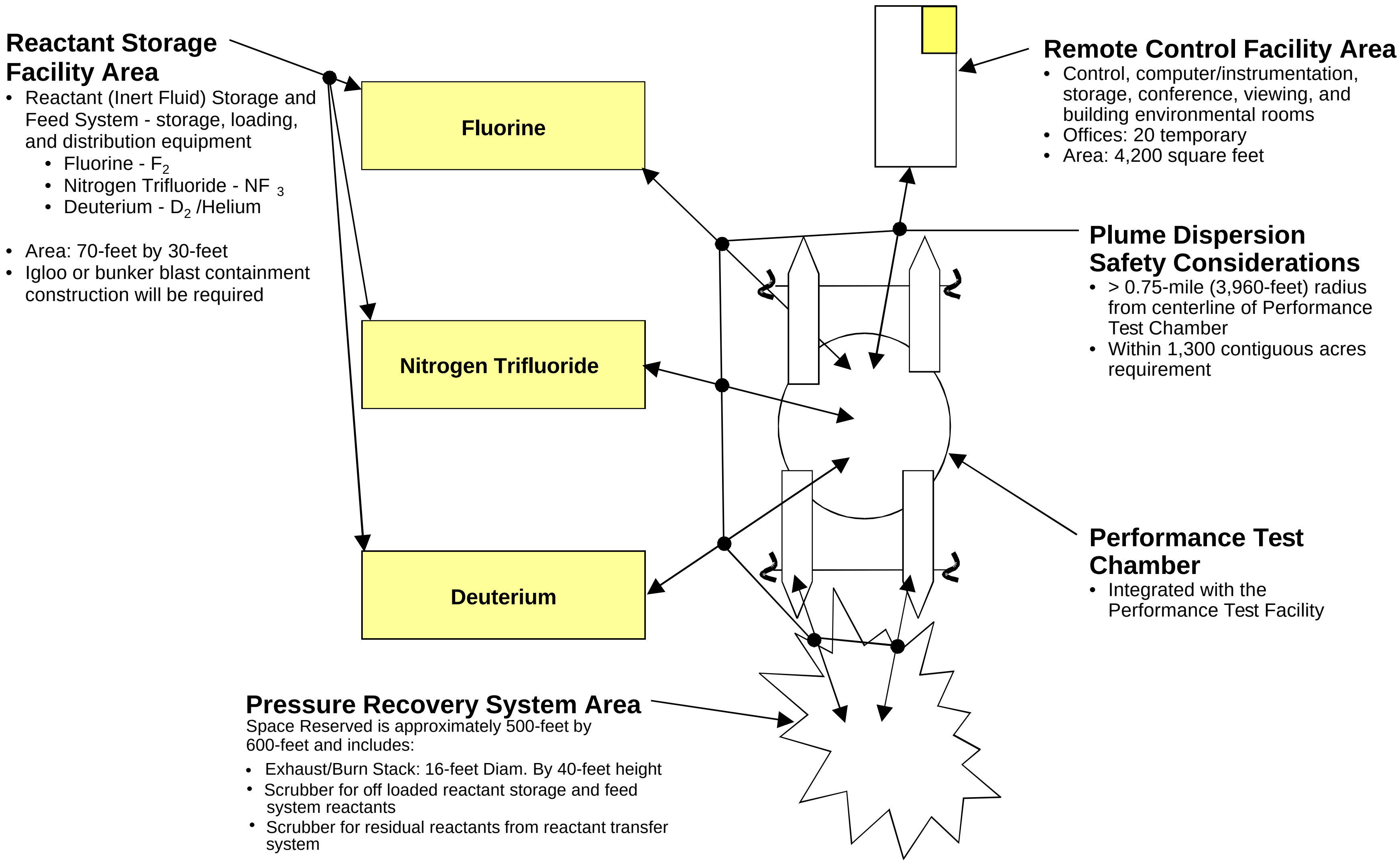

Figure 2-7

Notional Consolidated Support Facilities for Laser Performance Testing

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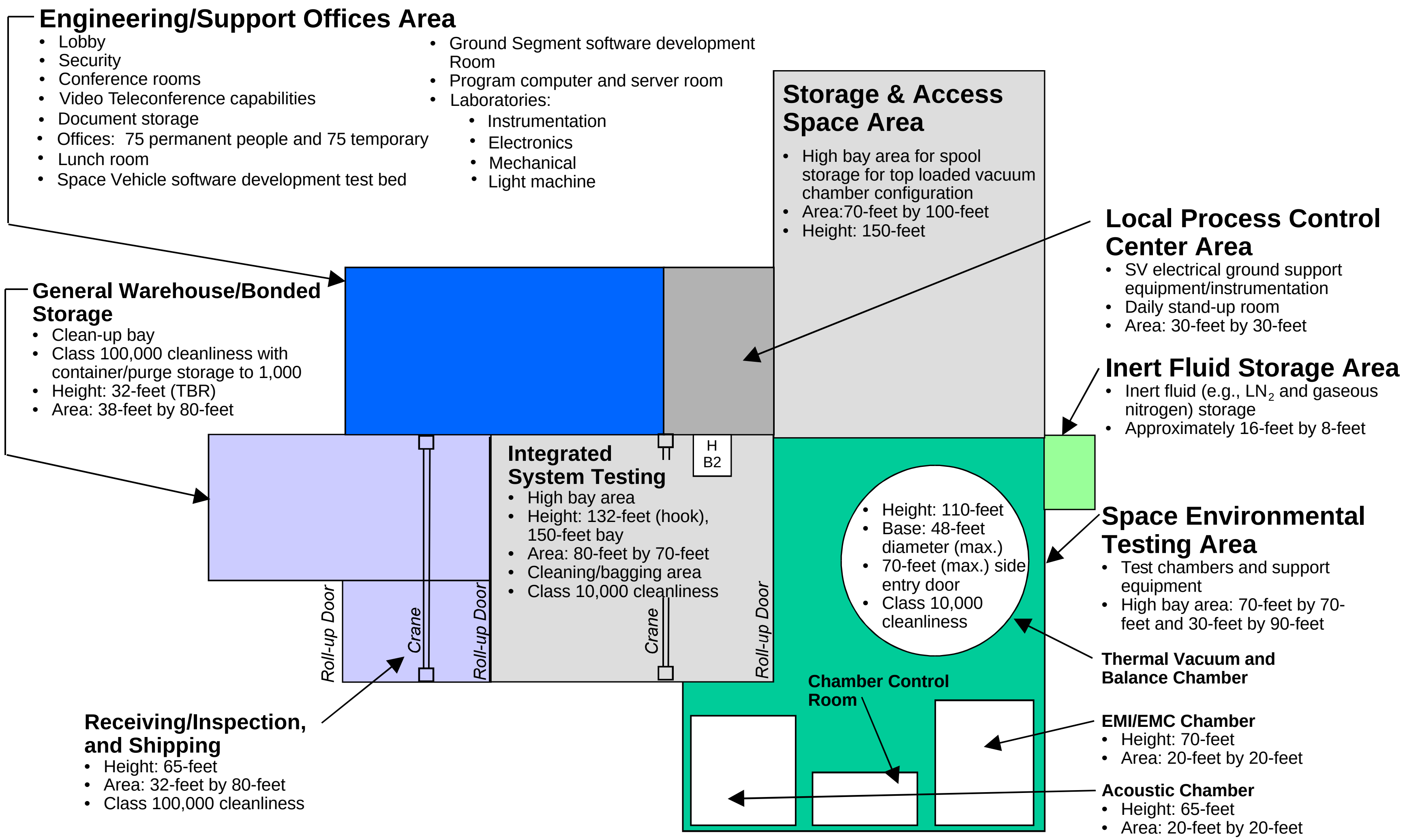

Figure 2-8

Notional Consolidated Integrated Flight Experiment Space Vehicle Assembly, Integration, and Test Facility

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Table 2-3 Consolidated Facilities Requirements

Facility	Space Requirements (square feet)
Performance Test Facility	33,600
Remote Control Facility	4,200
Reactant Storage Facility	6,300
Assembly, Integration, and Test Facility	51,300
Engineering, Warehouse, Administration	31,000
Totals	**126,400**

2.4.2 Test Units

2.4.2.1 Integrated Test Unit

The key features of the ITU are illustrated in Figure 2-9. It would include three of the four elements of a functional SBL space vehicle and all three elements of the Payload Segment: the Beam Director Element (BDE), the Beam Control Element (BCE), and the Laser Payload Element (LPE). Individual elements would be shipped via commercial or DoD carrier from their manufacturing location to the PTF. The ITU would be similar to the IFX test vehicle, but the spacecraft element of a functional SBL space vehicle would be simulated.

The LPE creates the required high power beam using deuterium (D_2), nitrogen trifluoride (NF_3), fluorine (F_2), hydrogen (H_2), and helium (He). The BCE gives robust control of the high power beam with a series of computer-controlled mirrors. The BDE uses a large diameter mirror to focus the laser on a distant target. The laser operates in the infrared light range and would not produce x-ray or other types of penetrating radiation.

2.4.2.2 IFX Test Vehicle

The IFX test vehicle would be potentially a functional space vehicle that includes all four of the elements that would be required for space testing. It includes the Payload Segment (the BDE, BCE, and LPE), and the Spacecraft Element (SCE). The SCE controls the basic spacecraft functions of power generation and distribution, data management, guidance, navigation, controls, and communications. Figure 2-9 illustrates the IFX test vehicle.

2.4.3 Test Operations

Figure 2-10 provides a simplified illustration of the process used to generate a laser beam from excited hydrogen fluoride (HF). The purpose of the ground testing phase of the IFX program is to successfully integrate and demonstrate all elements of a functional SBL space vehicle preparatory to a future potential launch of the IFX test vehicle for on-orbit space testing. The ITU and IFX test vehicle would be used for these tests.

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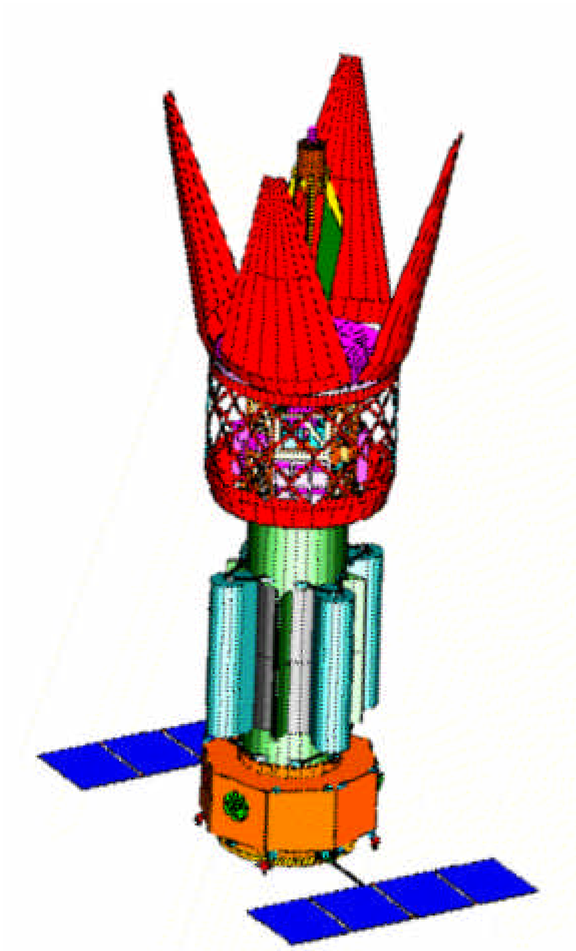

Legend of Abbreviations
BDE - Beam Director Element
IFX - Integrated Flight Experiment
ITU - Integrated Test Unit
N/A - Not Applicable
SV - Space Vehicle
TBD - To Be Determined

Configuration/ Element	ITU	IFX
Stowed		
BDE - diameter	14.8 ft	14.8 ft
Overall Length	49.9 ft	58.0 ft
Outside Diam.	14.8 ft	14.8 ft
Deployed		
BDE Diameter	16.4 ft	16.4 ft
Overall Length	49.9 ft	58 ft
Outside Diam.	14.8 ft	14.8 ft
Overall SV Span	N/A	TBD
Estimated Weight	41,000 Lbs	50,000 Lbs

Figure 2-9

Key Integrated Test Unit and Integrated Flight Experiment Test Vehicle Characteristics

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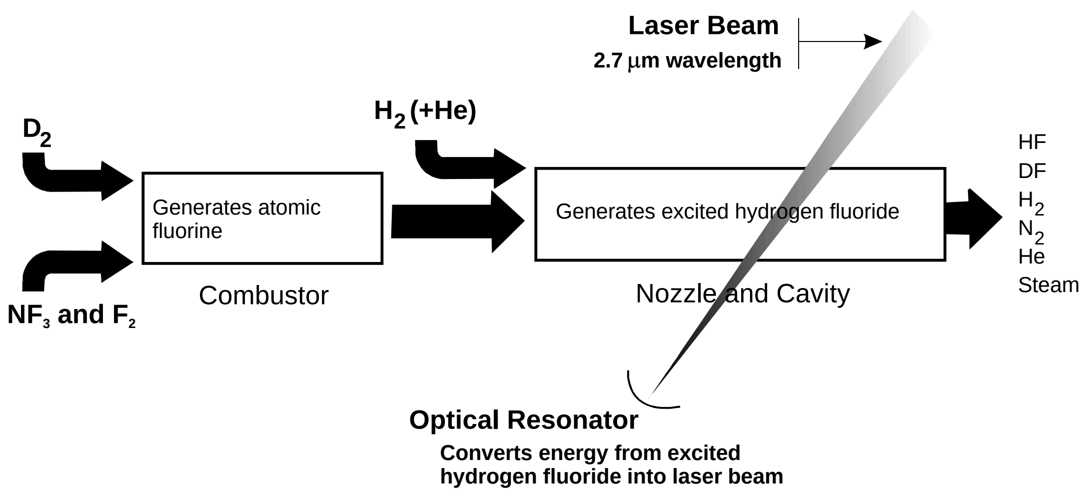

EXPLANATION

NF_3 = nitrogen trifluoride

D_2 = deuterium

H_2 = hydrogen

He = helium

HF = hydrogen fluoride

µM = Microns (10^{-6} meters)

DF = deuterium fluoride

N_2 = nitrogen

Figure 2-10

Chemical Laser Fundamentals

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2.4.3.1 ITU Testing

The first phase of ground testing would involve the LPE and ITU in the PTF. Individual elements would be shipped via commercial or DoD carrier from their manufacturing location and would arrive at the PTF where they would undergo testing and be assembled. The LPE would be tested for function short of actual laser firing.

The next step in the laser performance test would be to load the LPE with chemical reactants. Diesel fuel would be used to heat water to create steam. Steam generators would then be started at the beginning of the test sequence and would be exhausted through the PRS, a multi-stage steam ejector pumping system that would create a vacuum to remove and scrub exhaust gas from the PTC. The PRS would operate for approximately 100 seconds before the high power laser operation began. The laser reactants would be supplied over periods up to 12.5 seconds. The exhaust products of the laser generation would be exhausted into the PRS for scrubbing and exhaust. The laser beam would be directed into diagnostic instruments and into a beam dump.

The steam generators and PRS would continue running during the laser operation and for approximately 40 seconds after completion of the laser firing and laser shutdown. Following laser shutdown, the reactant feed system would be used to purge any remaining reactants by blowing an inert gas such as nitrogen or helium through the lines to push the residual substance out of the system or dilute it to acceptable levels.

Approximately 22 tests would be conducted for the LPE and ITU. Table 2-4 lists the maximum anticipated test emissions for each test.

After LPE testing, the LPE would be integrated with the BCE and BDE to form the ITU. Approximately 24 tests of the ITU would be conducted. At the conclusion of testing, elements of the Payload Segment would be refurbished to begin the assembly of the IFX test vehicle for its phase of ground testing.

2.4.3.2 IFX Test Vehicle Testing

Similar testing and assembly would initially occur for the IFX test vehicle Payload Segment. The SCE would then be integrated and tested with the Payload Segment. This full integrated system testing would test the functional integration of the space vehicle. Both electrical and mechanical tests would be performed.

The assembled IFX test vehicle would then undergo EMC/EMI, acoustic, thermal balance, and thermal vacuum testing at the AI&TF. The tests would confirm the readiness of the IFX test vehicle for potential launch and on-orbit space operations. The IFX test vehicle would then be returned to the PTF for additional high power laser performance testing and final integrated systems testing. A total of 54 laser test firings would be conducted with the IFX test vehicle, producing up to the maximum emissions for each test as noted in Table 2-4. This would conclude the ground testing phase of the IFX program.

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Table 2–4 Laser Performance Test Emissions

Chemical/ Compound	Storage in pounds (or gallons)	Passivate in pounds (or gallons)			Test Products in pounds (or gallons)			Purge in pounds (or gallons)		
		Used and/or Converted	Produced during Test	Exhausted	Used and/or Converted	Produced during Test	Exhausted	Used and/or Converted	Produced during Test	Exhausted
Deuterium (D_2)	574	0	0	0	6	0	0	0.08	0	0.08
Diesel	15,000 gallons	0	0	0	3,500 gallons	0	0	0	N/A	N/A
Fluorine (F_2)	231	11	0	0.55	24	0	0	0	0	0
Helium (He)	441	2	0	2	36	0	36	0.08	0	0
Hydrogen (H_2)	220	0	0	0	18	0	16	0.08	0	0.08
Hydrogen Fluoride (HF)	N/A	0	0	0	0	36	0.0036	0	0	0
Nitrogen (N_2)	1,102	1	0	1	0.2	16	16	0.14	0	0.14
Nitrogen Trifluoride (NF_3)	1,102	0	0	0	82	0	0	0	0	0
Deuterium Fluoride (DF)	N/A	0	0	0	0	60	0.006	0	0	0
Water for PRS steam	26,417 gallons	0	0	0	16,643 gallons	0 gallons (recovered)	9,774 gallons	0	0	0
Water for PRS condensers	132,086 gallons	0	0	0	105,669 gallons	0 gallons	0 gallons	0	0	0
Sodium Hydroxide (NaOH)	220 gallons	0	0	0	55 gallons	0	0	0	0	0

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Table 2-5 provides the types and amounts of hazardous materials and wastes that would be stored, used, and generated at the STF complex. The hazardous quantities shown would be for years during testing. The ITU testing is planned to occur during FY 2008 and FY 2009. The IFX test vehicle testing is planned to occur during FY 2010, FY 2011, and the first half of FY 2012. Hazardous materials will be stored and used in accordance with all applicable government regulations, and hazardous waste will be disposed in accordance with applicable state and federal regulations.

Table 2–5 Estimated STF Complex Hazardous Materials and Hazardous Waste

Hazardous Material	Average Annual Amount Used in pounds	Hazardous Waste	Average Annual Amount Generated in pounds
Solvents	660 gallons	Waste paint and related materials	473
Fluorine	2,783	Waste alcohol	54
Nitrogen Trifluoride	8,602	Waste acid	119
Hydrogen/Deuterium	1,844	Waste base	265
Oxygen	237	Waste ethylene glycol	270
Sodium Hydroxide	880 gallons	Batteries	148

2.4.4 Personnel Requirements

Construction personnel requirements would average approximately 600 for the first 6 months and 400 for the remaining 30 months for the PTF. Construction personnel requirements would average approximately 600 for the first 6 months and 400 for the remaining 30 months for the AI&TF. These totals include design teams, procurement, and fabrication specialists. It is estimated that less than half of these personnel would be required at a specific time at the construction sites during construction and assembly operations.

Personnel located at the sites associated with the IFX ground-test program would vary over time. There would be a maximum of 260 project personnel stationed at the site during key testing periods. Most of these specialists would be temporarily relocated or hired from the local community. During the ITU PTF phase of the project, there would be 35 permanently located specialists at the site with space available for 35 temporary personnel to support the specific test and/or operations. An additional 25 government personnel would be at the site.

During the IFX test vehicle AI&TF phase of the project, there would be 75 permanently located personnel at the AI&TF along with up to 70 personnel at the PTF. Additionally, there would be 175 project engineering, administration, and government staff. Therefore, there would be a maximum of 345 personnel at the site. Table 2-6 summarizes the personnel requirements.

Table 2-6 Personnel Requirements

Facility	Permanent Contractor	Temporary Contractor	Government
Performance Test Facility	35	20	25
Remote Control Facility		15	
Reactant Storage Facility			
Assembly, Integration, and Test Facility	75		
Engineering and Administration	150	0	25
Totals	**260**	**35**	**50**

2.4.5 Stennis Space Center

Figure 2-11 illustrates the location of the STF complex at SSC. Table 2-7 indicates the estimated land use and facilities requirements. SSC is one of ten NASA field centers in the United States. Because of its important role in engine testing for more than three decades, the SSC has been designated NASA's Center of Excellence for rocket propulsion testing, and is responsible for conducting and/or managing all NASA propulsion test programs. SSC includes an area that is owned by SSC (Fee Area), and a 125,001-acre acoustic Buffer Zone around the Fee Area where residential use is not allowed through easements.

The northern portion of SSC contains the Mississippi Army Ammunition Plant (MSAAP). The MSAAP is an autonomous facility owned by the U.S. Army and maintained according to U.S. Army standards. The area includes several igloo munitions bunkers, three of which would be upgraded with chemical monitors for environmental control to support SBL reactant storage requirements. Additionally, the driveways to these bunkers would be raised in elevation and widened to support truck transport and handling of the reactants. Although the NASA owns the MSAAP land, it is provided to the U.S. Army under terms of a 50-year renewable, irrevocable use and occupancy permit with SSC.

The PTF would be located at the site of an advanced solid rocket test facility, including existing Buildings 5001, 5005, and 5008. The rocket test program was cancelled after construction of the facility was essentially complete, but prior to conducting actual testing and development. The IFX ground-test program would use part of the existing facilities and also construct new facilities at the site. A paved and fenced area that was apparently used by the previous program for construction lay down would also be used by the IFX ground-test program for construction lay down.

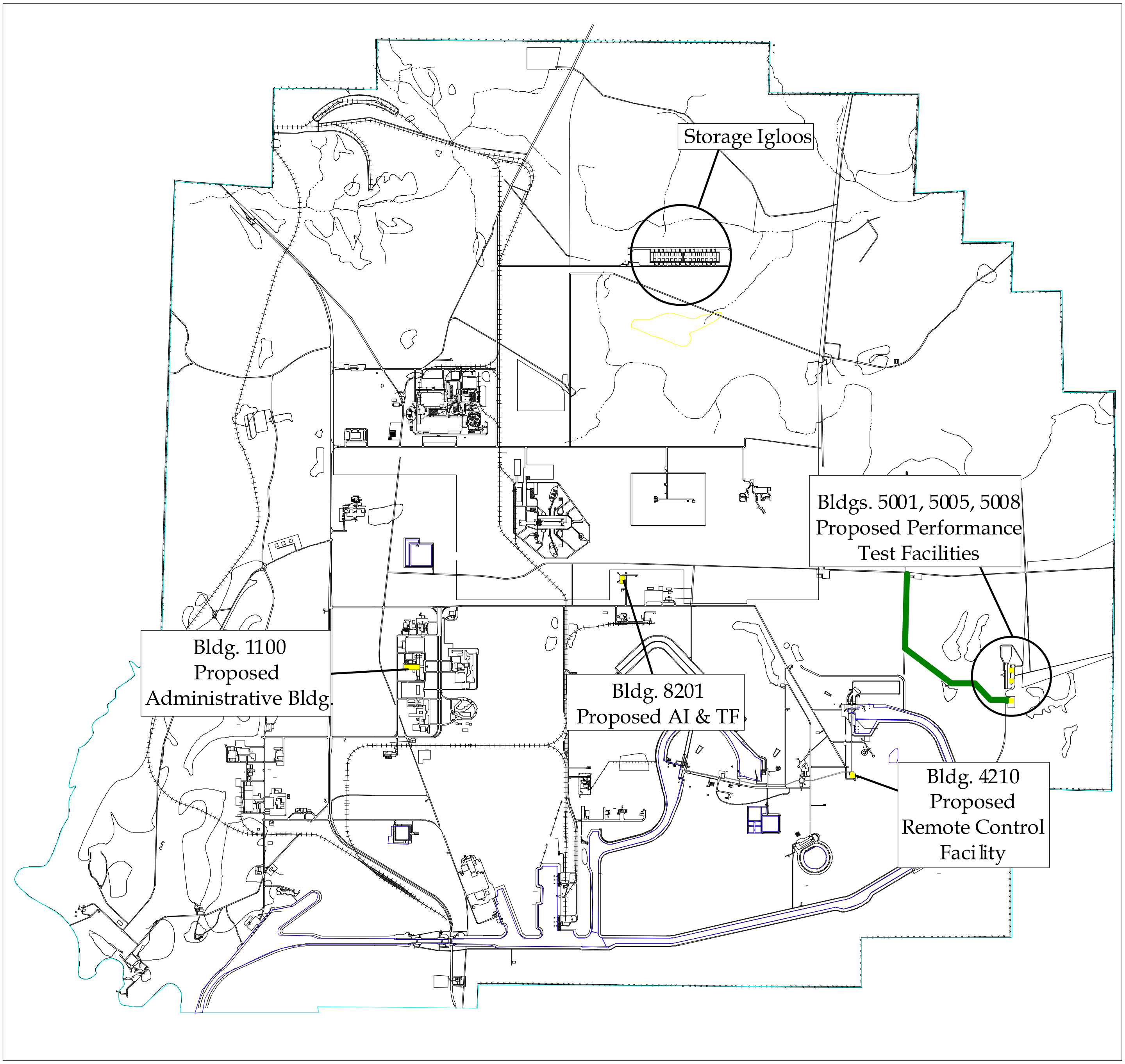

Figure 2-11

Facility Locations
Stennis Space Center, MS

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The Remote Control Facility (RCF) would be located south and west of the PTF outside the 0.75-mile PTF safety zone at an existing facility called the B-Stand. Test and control instruments would be installed in existing Building 4210.

The AI&TF would be a new facility constructed approximately two miles west of the PTF next to existing Building 8201. Building 8201 would be renovated and used for entry to the AI&TF complex and for laboratories. The AI&TF construction would disturb up to four acres of wetlands that would be mitigated in accordance with the SSC wetlands permit and mitigation bank. Construction lay down would occur on existing paved parking areas near Building 8201.

Engineering and administration personnel would be located within the SSC administration area in existing Building 1100. An existing barge dock south of the PTF would provide for barge transport of IFX elements.

The existing water, wastewater, and electricity infrastructure is sufficient to accommodate the STF complex and no utility construction outside the immediate area of the facilities would be required for these utilities. To supply natural gas to the PTF, 13,200 feet of natural gas pipe would be installed along existing roads in wetlands areas. The proposed location of this pipe is shown on Figure 2-12.

Just north of the AI&TF is an existing gravel road extending east to west. This road would be widened and paved to support transport between the AI&TF and the PTF. The widening would be approximately 5 feet and the total length widened and paved would be approximately 3,500 feet.

Approximately 13,200 feet of existing gravel road would also require paving, but not widening, to support transportation.

2.4.6 Redstone Arsenal/Marshall Space Flight Center

Figure 2-13 illustrates the location of the STF complexes at RSA/MSFC. Table 2-8 indicates the estimated land use and facilities requirements. RSA is the home of the U.S. Army Aviation and Missile Command (AMCOM). The AMCOM mission is to develop, acquire, field, and sustain aviation and missile systems to guarantee the readiness of the Army's technologically superior systems on the battlefield. MSFC is situated within the RSA boundaries and is considered a world leader in space propulsion and transportation systems. MSFC is making significant contributions to the International Space Station and is NASA's lead center for microgravity research. The space optics center is developing advanced optics manufacturing technologies, and MSFC is managing technology demonstration programs for reusable launch vehicles.

The PTF would be constructed in the southern portion of the RSA in a former munitions storage bunker area. Several of the existing bunkers would be demolished in the course of construction of the PTF. The nearest bunker to the center of the PTF would be Building 8339. The RSF would be located at least 0.75-miles from the PTF within selected munitions storage bunkers.

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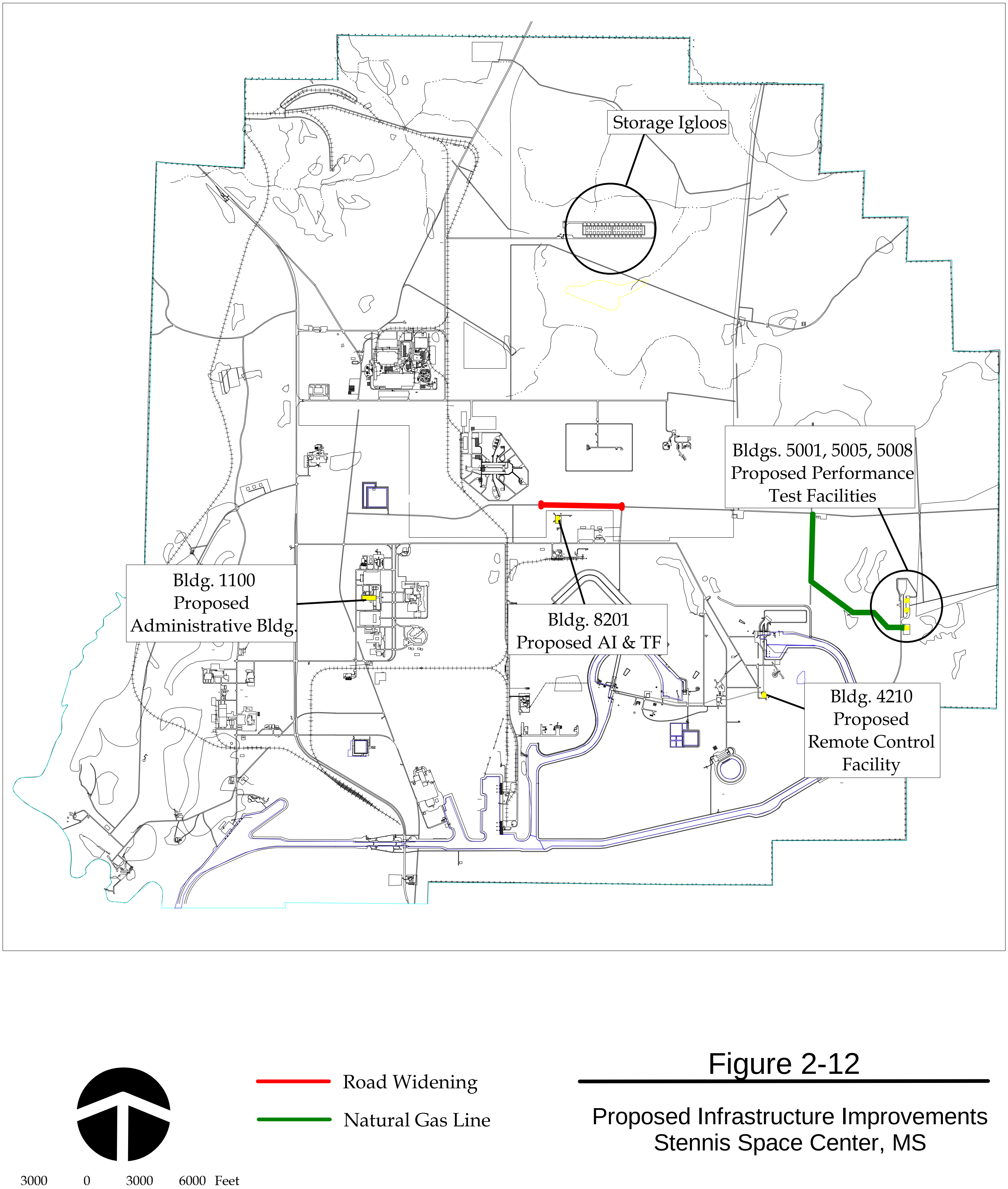

Figure 2-12

Proposed Infrastructure Improvements
Stennis Space Center, MS

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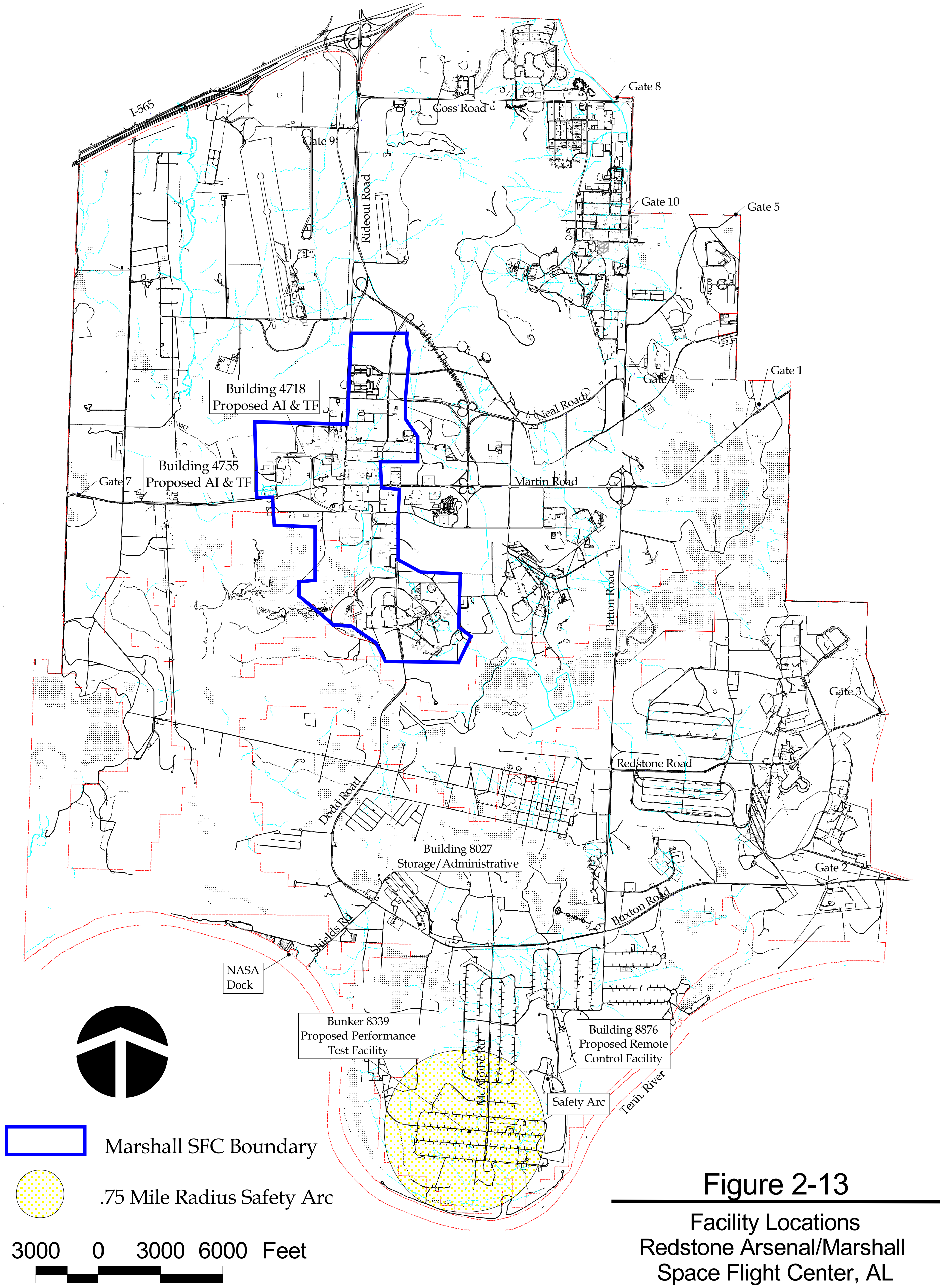

Figure 2-13

Facility Locations
Redstone Arsenal/Marshall
Space Flight Center, AL

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Table 2-7 Stennis Space Center Land and Facility Use

Facility	Land Use (acres)			Facilities (ft²)		
	Disturbed Land (acres)	Undisturbed Land (acres)	Total Land (Acres	Existing Facilities (ft^2)	New Facilities (ft^2)	Total Facilities (ft^2)
Performance Test Facility	9.6	0.3	9.9	25,345	13,955	39,300
Remote Control Facility	0	0.1	0.1	4,200	-	4,200
Reactant Storage Facility	0	0.2	0.2	6,300	-	6,300
Assembly, Integration, and Test Facility	2.5	4.0	6.5	6,000	50,900	56,900
Engineering, Warehouse, Administration	0	0.7	0.7	31,000	-	31,000
Totals	**12.1**	**5.3**	**17.4**	**72,845**	**64,855**	**137,700**

Note: The AI&TF construction would disturb up to four acres of wetlands.

The RCF would utilize and expand an existing rocket test remote control facility, Building 8876, outside the 0.75-mile PTF safety zone to the northeast. Test and control instruments would be installed in this building.

The AI&TF would be split between existing Buildings 4718 and 4755 within MSFC. Thermal vacuum testing would occur in Building 4718, and acoustic and EMI/EMC testing would occur in Building 4755.

Existing Building 8027 north of the PTF off Buxton Road would fulfill engineering, administration, and warehouse needs. An existing dock on the Tennessee River northwest of the PTF would provide barge transport of IFX elements.

The existing utility infrastructure including water, wastewater, natural gas, electricity, and roads is sufficient at MSFC to accommodate the use of Buildings 4718 and 4755, and no utility construction outside the immediate area of the facilities would be required. The utility infrastructure at Buildings 8027 and 8876 at RSA would also be sufficient to support the IFX ground-test program.

To accommodate the PTF in the former munitions bunker area at RSA, 15,750 feet of electrical primary line, 13,000 feet of natural gas pipe, 10,500 feet of water distribution and wastewater collection pipe, and a new wastewater lift station would be installed along existing roads as shown on Figure 2-14. These facilities would be located along the south side of Buxton Road and the east side of MacAlpine Road. Approximately 5,950 feet of fiber optic communication line would be installed from Building 8876 to the PTF, with 4,250 feet along existing roads and 1,700 feet in a new utility easement that would not follow existing roads or utility easements.

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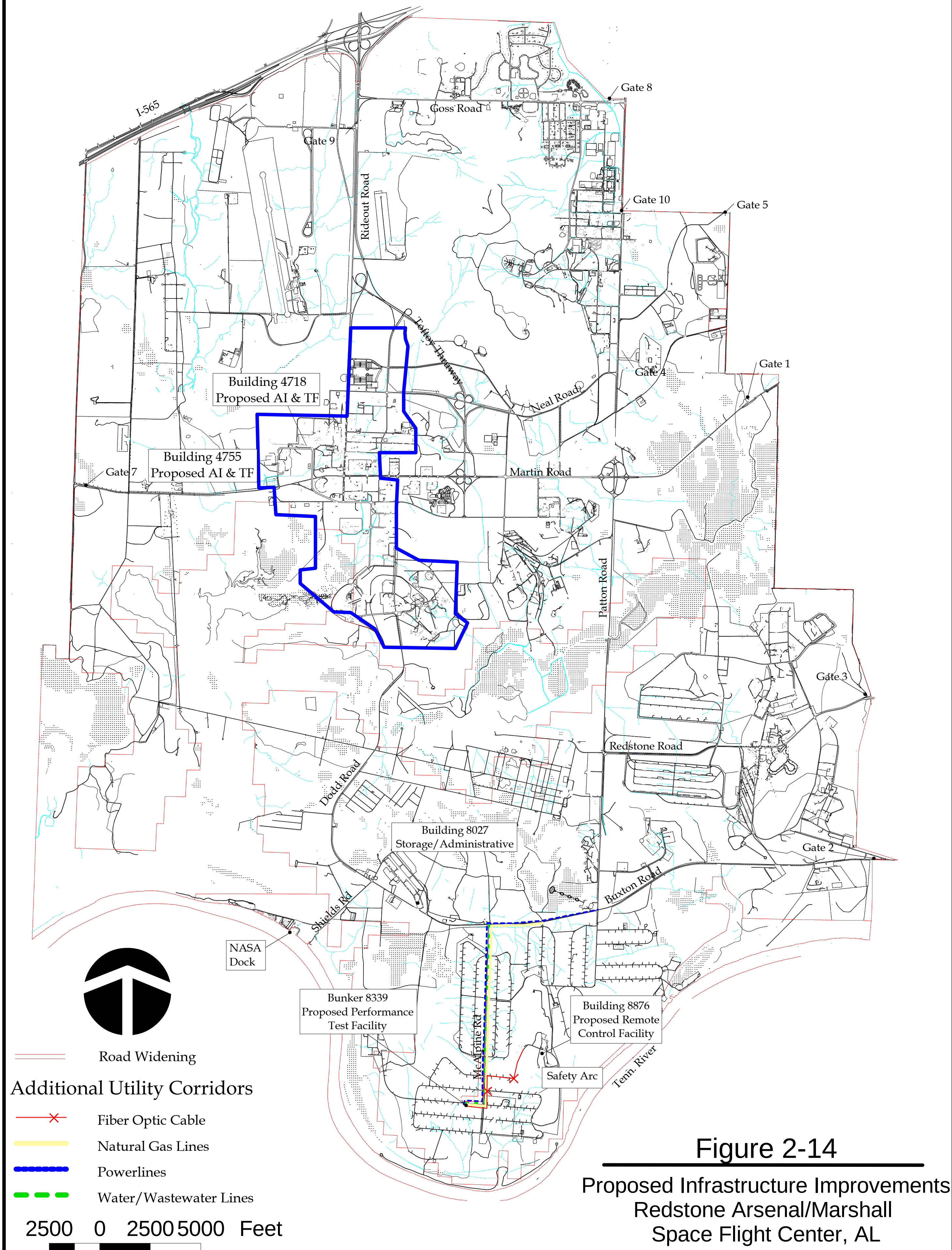

Figure 2-14

Proposed Infrastructure Improvements
Redstone Arsenal/Marshall
Space Flight Center, AL

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Table 2-8 Redstone Arsenal/Marshall Space Flight Center Land and Facility Use

	Land Use (acres)			Facilities (ft^2)		
Facility	Disturbed Land (acres)	Undisturbed Land (acres)	Total Land (Acres)	Existing Facilities (ft^2)	New Facilities (ft^2)	Total Facilities (ft^2)
Performance Test Facility	9.9	0	9.9	-	39,300	39,300
Remote Control Facility	0.2	0.1	0.3	1,000	3,200	4,200
Reactant Storage Facility	0	0.2	0.2	6,300	-	6,300
Assembly, Integration, and Test Facility	1.5	0.5	2.0	35,700	21,200	56,900
Engineering, Warehouse, Administration	0	0.7	0.7	31,000	-	31,000
Totals	**11.6**	**1.5**	**13.1**	**74,000**	**63,700**	**137,700**

The southern portion of McAlpine Road to Blueberry Road in the former munitions bunker area would be reconstructed and widened by approximately 12 feet to accommodate transportation for the IFX ground-test program. The length of road would be approximately 2,250 feet. A further 3,500 feet of road along Blueberry Road would be reconstructed and widened by approximately 20 feet.

2.4.7 Cape Canaveral Air Force Station

Figure 2-15 illustrates the location of the PTF complexes at CCAFS. Table 2-9 indicates the estimated land use and facilities requirements. The CCAFS is the main DoD launch facility for equatorial launches and supports all the major DoD launch programs.

The PTF would be constructed at the site of ESA-60, a former NASA complex on CCAFS. The existing facilities on the site would be renovated and reused, but the main PTF would be constructed in a vacant area in the center of the ESA-60 facilities.

The RCF would be located in existing Building 1777 northeast of the ESA-60 complex. Test and control instruments would be installed in this building.

The AI&TF would be located in the Solid Motor Assembly Building (SMAB). The SMAB currently supports the Titan IV launch program. Reactants would be stored in one of the existing Fuel Storage Areas (FSA) south of ESA-60 at a distance greater than 1,300 feet. Engineering, warehouse, and administration facilities would be situated in existing facilities at CCAFS with locations to be determined.

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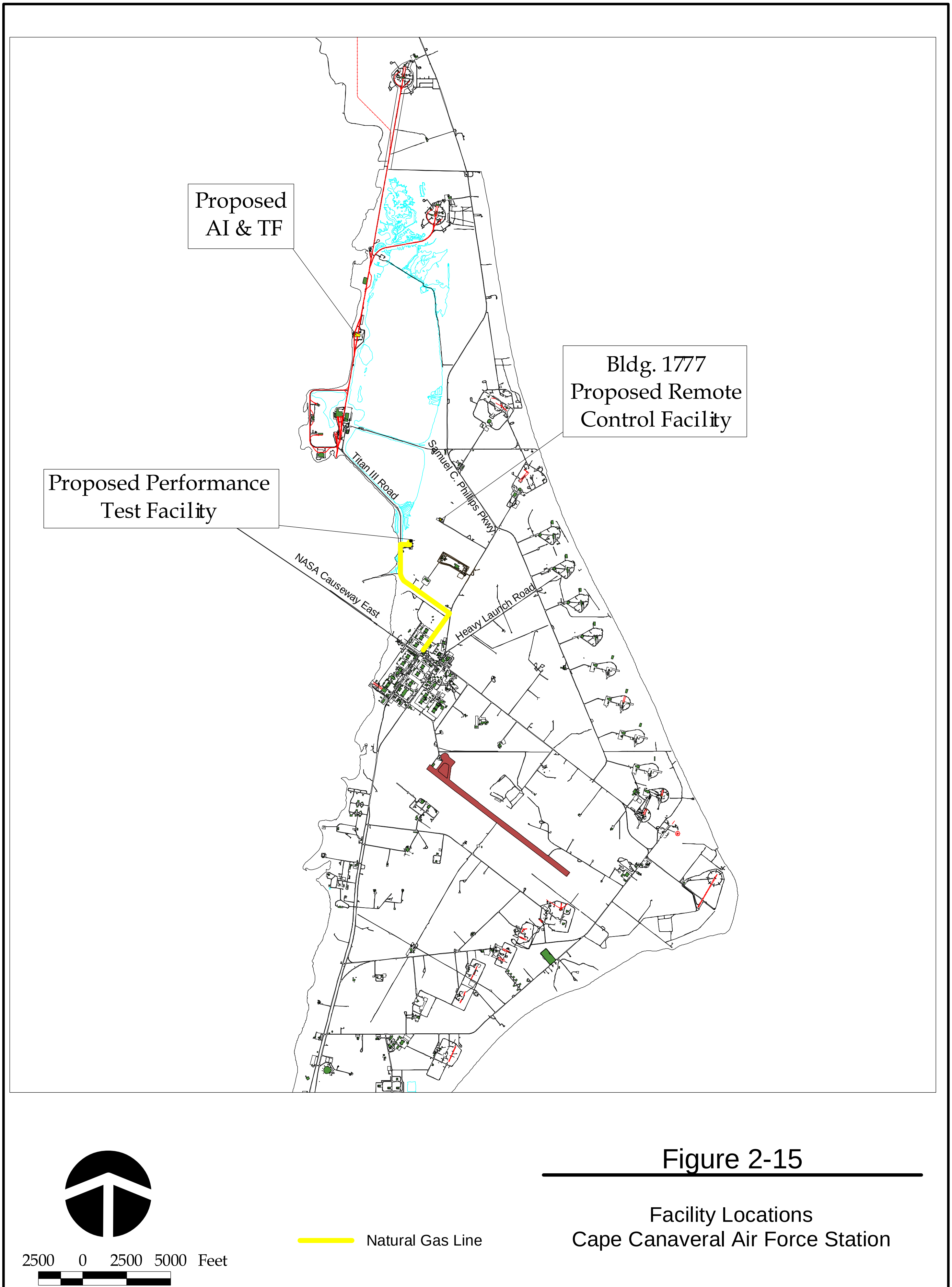

Figure 2-15

Facility Locations
Cape Canaveral Air Force Station

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The existing utility infrastructure, including water, wastewater, natural gas, electricity, and roads is sufficient to accommodate the STF complex, and no utility construction outside the immediate area of the facilities would be required with the exception of natural gas. Approximately 9,600 feet of natural gas line would be extended along existing roads to the PTF as shown in Figure 2-16. Additional fiber optic communication lines would be installed in existing conduit.

2.5 DESCRIPTION OF THE NO-ACTION ALTERNATIVE

Under the No-action Alternative, the IFX ground testing portion of the overall SBL program would not occur, and no facilities would be constructed or renovated. The proposed locations at each candidate site would continue in their present or planned use as described in installation master plans.

2.6 OTHER CUMULATIVE ACTIONS ANNOUNCED

There would be no cumulative effects associated with the no-action alternative.

At SSC, no new programs or extensive construction projects are foreseeable that would create cumulative impacts with the IFX ground-test program. Personnel levels are forecast to remain constant.

At RSA, no new programs or changes in personnel are anticipated which would create cumulative personnel impacts. The military construction program for RSA includes construction projects that would overlap with the IFX ground-test program and use additional land at the post not already occupied by facilities. The current Real Property Master Plan Land Use Analysis (Redstone Arsenal, 1999c) identified numerous construction and demolition projects that would overlap the timeframe for construction of the IFX facility. Based on an analysis of the construction projects, approximately 161,000 square feet of facilities would be added annually, on average, balanced against 97,000 square feet of demolition annually, for a net annual addition of 64,000 square feet. Approximately 23 net acres of additional land would be used by the additional facilities annually. These additions would occur over the approximate twelve-year period when construction and operation of the SBL would occur.

At MSFC, the Engine Technology Support Program for NASA’s Advanced Space Transportation Program would create cumulative impacts with the IFX ground-test program.

At CCAFS, the Evolved Expendable Launch Vehicle (EELV) program would create cumulative impacts with the IFX ground-test program.

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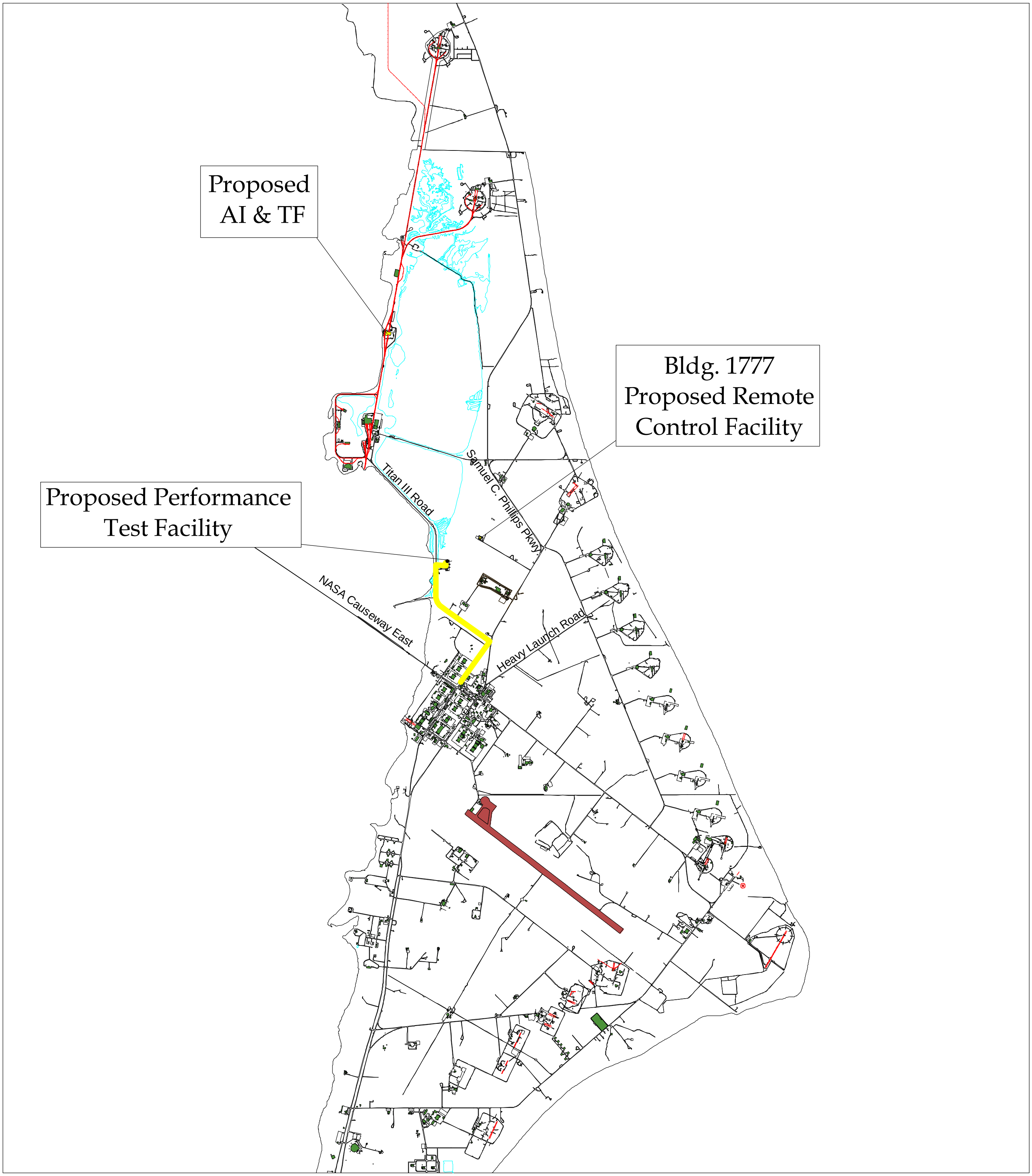

Natural Gas Line

3000 0 3000 6000 Feet

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Figure 2-16

Proposed Infrastructure Improvements
Cape Canaveral Air Force Station

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Table 2-9 Cape Canaveral Air Force Station Land and Facility Use

Facility	Land Use (acres)			Facilities (ft^2)		
	Disturbed Land (acres)	Undisturbed Land (acres)	Total Land (Acres	Existing Facilities (ft^2)	New Facilities (ft^2)	Total Facilities (ft^2)
Performance Test Facility	8.9	0	8.9	11,400	22,200	33,600
Remote Control Facility	0	0.1	0.1	4,200	-	4,200
Reactant Storage Facility	0.2	0	0.2	6,300	-	6,300
Assembly, Integration, and Test Facility	1.0	0.2	1.2	43,300	8,000	51,300
Engineering, Warehouse, Administration	0	0.7	0.7	31,000	0	31,000
Totals	**10.1**	**1.0**	**11.1**	**96,200**	**30,200**	**126,400**

2.7 COMPARISON OF ENVIRONMENTAL EFFECTS FOR ACTION ALTERNATIVES

Table 2-10 compares the environmental effects of the Proposed Action with the no-action alternative at each installation.

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Table 2-10 Comparison of Proposed and No Action Alternatives

Resource Category	No-action Alternative for SSC	SSC Alternative	No-action Alternative for RSA/MSFC	RSA/MSFC Alternative	No-action Alternative for CCAFS	CCAFS Alternative
Air Quality	SSC is currently in attainment area and complies with air quality regulations.	Construction emissions would be temporary and not affect attainment status. Criteria pollutant increases in AQCR range from 0 to 0.04 percent and would not be regionally significant. Risk Management Plan would be prepared. Employment of meteorological and/or procedural operational constraints on laser testing would occur to assure the protection of personnel.	RSA/MSFC is in attainment area and complies with air quality regulations.	Construction emissions would be temporary and not affect attainment status. Criteria pollutant increases in AQCR range from 0 to 7.6 percent and would not be regionally significant. Risk Management Plan would be prepared. Employment of meteorological and/or procedural operational constraints on laser testing would occur to assure the protection of personnel.	CCAFS is in attainment area and complies with air quality regulations.	Construction emissions would be temporary and not affect attainment status. Criteria pollutant increases in AQCR range from 0 to 0.8 percent and would not be regionally significant. Risk Management Plan would be prepared. Employment of meteorological and/or procedural operational constraints on laser testing would occur to assure the protection of personnel.
Airspace	There are no current adverse effects on airspace.	No adverse effects on airspace from STF complex.	There are no current adverse effects on airspace.	No adverse effects on airspace from STF complex.	There are no current adverse effects on airspace.	Notification and coordination with FAA would be required, but adverse effects to airspace would not be expected.
Biological Resources	SSC contains four major plant communities and over half of the installation is wetlands. SSC manages wetlands impacts through mitigation banking.	Approximately 8 acres of freshwater wetlands would be filled. Mitigation of wetlands would be required in accordance with the mitigation banking provisions of the SSC permit. USFWS has indicated that no adverse effects to protected species are likely.	RSA is 40 percent forested. Diverse habitats support large variety of wildlife. Approximately 20 percent is wetlands.	No wetlands would be affected. USFWS has indicated that no adverse effects to protected species are likely.	Protection of species and habitat would continue with current management practices.	Construction would occur in previously disturbed areas and lighting would comply with the CCAFS lighting policy to protect sea turtle nesting. USFWS has indicated that no adverse effects to protected species are likely.

Table 2-10 Comparison of Environmental Effects for Action Alternatives *(...continued)*

Resource Category	No-action Alternative for SSC	SSC Alternative	No-action Alternative for RSA/MSFC	RSA/MSFC Alternative	No-action Alternative for CCAFS	CCAFS Alternative
Cultural Resources	There are three National register sites at SSC which are managed in accordance with the installation Historic Preservation Plan.	No known cultural resources would be affected.	RSA contains numerous cultural resource sites and properties.	Site 1Ma 630 requires additional archaeological investigation and consultation with SHPO. Site 1Ma649 along east side of McAlpine Road must be avoided. Munitions igloos that would be demolished are considered eligible for the National Register. Preliminary coordination with SHPO indicates that documentation and preservation of a portion of the munitions complex would allow construction to proceed.	CCAFS contains numerous cultural resource sites and properties.	No effect to National Register listed or eligible resources are anticipated.
Geology and Soils	Four main soil types comprise 65 percent of the installation. There would be no effect on geology or soils.	Construction would occur in accordance with best management practices to minimize erosion. No adverse effects anticipated.	Six main soil types are present. There would be no effect on geology or soils.	Construction would occur in accordance with best management practices to minimize erosion. No adverse effects anticipated.	Eleven different soil types are present. There would be no effect on geology or soils.	Construction would occur in accordance with best management practices to minimize erosion. No adverse effects anticipated.

Table 2-10 Comparison of Environmental Effects for Action Alternatives *(...continued)*

Resource Category	No-action Alternative for SSC	SSC Alternative	No-action Alternative for RSA/MSFC	RSA/MSFC Alternative	No-action Alternative for CCAFS	CCAFS Alternative
Hazardous Materials and Hazardous Waste Management	Hazardous materials are managed in accordance with comprehensive emergency response and contingency plans. NASA is the largest generator of hazardous waste, and tenant organizations are responsible for their own hazardous waste management.	Additional 1,511 lbs of hazardous waste per year, and any asbestos-containing material (ACM) or lead-based paint, would be disposed in accordance with applicable regulations.	Hazardous materials are managed in accordance with comprehensive emergency response and contingency plans. Hazardous waste is disposed through the Defense Reutilization and Marketing Office.	Additional 1,511 lbs of hazardous waste per year, and any ACM or lead-based paint, would be disposed in accordance with applicable regulations. Potential contaminants at STF facility sites would have to be addressed before and during construction and renovation activities, but will not serve as a hindrance to the long-term operation of the facilities.	Hazardous materials are managed in accordance with comprehensive emergency response and contingency plans. NASA is the largest generator of hazardous waste, and tenant organizations are responsible for their own hazardous waste management.	Additional 1,511 lbs of hazardous waste per year, and any ACM or lead-based paint, would be disposed in accordance with applicable regulations. PCB contaminants at ESA-60 site (PTF) will be cleaned to Florida Department of Environmental Protection standards. Potential contaminants at ESA-60 would have to be addressed before and during construction and renovation activities, but will not serve as a hindrance to the long-term operation of the facilities.
Health and Safety	SSC has mutual aid agreements with off-site governments. SSC complies with OSHA and NASA health and safety requirements.	Establishment of safety zones and evacuation of personnel during laser tests would comply with health and safety requirements.	RSA has mutual aid agreements with off-site governments. RSA and MSFC comply with OSHA and Army health and safety requirements.	Establishment of safety zones and evacuation of personnel during laser tests would comply with health and safety requirements.	CCAFS has mutual aid agreements with off-site governments. CCAFS complies with OSHA and Air Force health and safety requirements.	Establishment of safety zones and evacuation of personnel during laser tests would comply with health and safety requirements. Operational conflicts with other programs would be minimized through required scheduling.

Table 2-10 Comparison of Environmental Effects for Action Alternatives *(...continued)*

Resource Category	No-action Alternative for SSC	SSC Alternative	No-action Alternative for RSA/MSFC	RSA/MSFC Alternative	No-action Alternative for CCAFS	CCAFS Alternative
Land Use and Aesthetics	SSC Master Plan includes eight major land use types. SSC is not in the area covered by the Coastal Zone Management Program.	No land use incompatibilities. Additional restrictions in SSC Buffer Zone would be necessary during tests to ensure no public presence in laser safety zone. Minor impact on aesthetics.	RSA/MSFC land use plan includes eight major land use types. RSA/MSFC is not in the area covered by the Coastal Zone Management Program.	No land use incompatibilities. Additional restrictions would be necessary during tests to ensure no public presence in laser safety zone. Minor impact on aesthetics.	CCAFS land use plan includes six major land use types. CCAFS is in the area covered by the Coastal Zone Management Program.	No land use incompatibilities. Additional restrictions would be necessary during tests to ensure no public presence in laser safety zone. Minor impact on aesthetics. Consistent with Florida coastal zone regulations.
Noise	Noise levels would continue per current conditions with episodic engine test events.	Construction noise would be temporary. Operational noise would include levels of 83 dBA at edge of laser safety zone, causing interference with outdoor speech communication, but no adverse effects.	Noise levels would continue per current conditions with episodic engine test events.	Construction noise would be temporary. Operational noise would include levels of 83 dBA at edge of laser safety zone, causing interference with outdoor speech communication, but no adverse effects.	Noise levels would continue per current conditions with episodic launch events.	Construction noise would be temporary. Operational noise would include levels of 83 dBA at edge of laser safety zone, causing interference with outdoor speech communication, but no adverse effects.
Socioeconomics	SSC economic impact on region is $405 million annually.	Construction expenditures would total over $200 million and operations would add $25 million of economic benefit annually, ceasing with the end of construction and the IFX ground-test program.	RSA/MSFC payroll exceeds $1 billion and NASA and military spending account for over half of the Huntsville area economy.	Construction expenditures would total over $200 million and operations would add $25 million of economic benefit annually, ceasing with the end of construction and the IFX ground-test program.	CCAFS economic impact on region is approximately $1.4 billion.	Construction expenditures would total over $200 million and operations would add $25 million of economic benefit annually, ceasing with the end of construction and the IFX ground-test program.

Table 2-10 Comparison of Environmental Effects for Action Alternatives *(...continued)*

Resource Category	No-action Alternative for SSC	SSC Alternative	No-action Alternative for RSA/MSFC	RSA/MSFC Alternative	No-action Alternative for CCAFS	CCAFS Alternative
Transportation	Transportation resources are sufficient.	Levels of service on regional roads would not be degraded. Air, rail, and barge transport systems would not be adversely affected.	Transportation resources are sufficient.	Levels of service on regional roads would not be degraded. Air, rail, and barge transport systems would not be adversely affected.	Transportation resources are sufficient.	Levels of service on regional roads would not be degraded. Air, rail, and barge transport systems would not be adversely affected.
Utilities	Current systems are adequate.	Increased utility demands can be accommodated within current system capacities.	Current systems are adequate.	Increased utility demands can be accommodated within current system capacities.	Current systems are adequate.	Increased utility demands can be accommodated within current system capacities.
Water Resources	Water quality is good. 100-year floodplain exists along major streams.	Construction would be subject to storm water permit requirements that would require implementation of best management practices to control pollution of waters. 0.04 percent of installation would be converted to impervious cover.	Water quality of area streams is suitable for most uses. 100- year floodplain exists along Tennessee River and major streams.	Construction would be subject to storm water permit requirements that would require implementation of best management practices to control pollution of waters. 0.03 percent of installation would be converted to impervious cover.	Water quality is generally good near CCAFS. 100-year floodplain exists along coast.	Construction would be subject to storm water permit requirements that would require implementation of best management practices to control pollution of waters. 0.07 percent of installation would be converted to impervious cover.
Environmental Justice	No low-income or minority populations would be disproportionately affected.	No low-income or minority populations would be disproportionately affected.	No low-income or minority populations would be disproportionately affected.	No low-income or minority populations would be disproportionately affected.	No low-income or minority populations would be disproportionately affected.	No low-income or minority populations would be disproportionately affected.

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CHAPTER 3

AFFECTED ENVIRONMENT

This section describes the environmental resource areas for the alternative sites. The affected environment is described succinctly in order to provide a context for understanding the potential impacts for actions at these sites. Those components of the affected environment that have the greatest potential for impacts are described in greater detail.

Available literature (such as EAs, environmental impact statements, and base master plans) was acquired, and data gaps (questions that could not be answered from the literature) were identified. To fill the data gaps and to verify and update available information, installation personnel and federal, state, and local regulatory agencies were contacted. Cited literature, telephone interviews, and other referenced material are presented in Section 5.0.

Fourteen (14) broad environmental resource areas were considered to provide a context for understanding the potential effects of the Proposed Action and to provide a basis for assessing potential impacts. Several of these environmental resources are regulated by federal and/or state environmental statutes, many of which set specific guidelines, regulations, and standards. These standards provide a benchmark that assists in determining the degree of environmental impacts under the NEPA evaluation process. The compliance status of each potential site, with respect to environmental requirements, was included in the information collected on the affected environment. The environmental resource areas are: air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste, health and safety, land use and aesthetics, noise, socioeconomics, transportation, utilities, water resources, and environmental justice.

3.1 STENNIS SPACE CENTER

The following sections discuss the affected environment or baseline conditions at SSC. This discussion includes the locations proposed for use by the IFX ground-test program as well as adjacent areas that have the potential to be impacted by program activities.

3.1.1 Air Quality and Regulations

Air quality in any given region is measured by the concentration of various pollutants in the atmosphere, typically expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Air quality is not only determined by the types and quantities of atmospheric pollutants, but also by surface topography, the size of the air basin, and by the prevailing meteorological conditions.

The Clean Air Act (CAA) of 1970 directed the United States Environmental Protection Agency (USEPA) to develop, implement, and enforce strong environmental regulations that would ensure cleaner air for all Americans. In order to protect public health and welfare, the USEPA developed concentration-based standards called National Ambient Air Quality Standards (NAAQS). The promulgation of the CAA was driven by the failure of nearly 100 cities to meet the NAAQS for ozone and carbon monoxide and by the inherent limitations in previous regulations to effectively deal with these and other air quality problems. The USEPA established both primary and secondary NAAQS under the provisions of the CAA. Primary standards define levels of air quality necessary to protect public health with an adequate margin of safety. Secondary standards define levels of air quality necessary to protect public welfare (i.e., soils, vegetation, property, and wildlife) from any known or anticipated adverse effects.

NAAQS are currently established for six air pollutants (known as "criteria air pollutants") including carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur oxides (SO_X, measured as sulfur dioxide, SO_2), lead (Pb), and particulate matter. Particulate matter standards incorporate two particulate classes: 1) particulate matter with an aerodynamic diameter less than or equal to 10 micrometers (PM_{10}), and 2) particulate matter with an aerodynamic diameter less than or equal to 2.5 micrometers ($PM_{2.5}$). Only PM_{10} is regulated by the rule.

SO_2 in the atmosphere is converted to various conjugated sulfur compounds which form physically harmful vapors or micro droplets (e.g., sulfuric acid) when combined with particulate matter and water. Most SO_X compounds are irritants to the upper respiratory tract, and prolonged exposure can cause permanent lung damage. In addition, suspended SO_X compounds in the atmosphere scatter visible light resulting in a brownish haze and reduced visibility.

Although O_3 is considered one of the criteria air pollutants and is measurable in the atmosphere, it is considered a secondary pollutant since O_3 is typically not emitted directly from most emissions sources. O_3 is formed in the atmosphere by photochemical reactions involving previously emitted pollutants or ozone precursors; therefore, O_3 is not considered when calculating emissions. Ozone precursors consist primarily of nitrogen oxides (NO_X) and volatile organic compounds (VOCs) which are directly emitted from various emission sources. For this reason, an attempt is made to control O_3 through the control of NO_X and VOCs. On June 5, 1998 the USEPA issued the final rule identifying areas where the 1-hour NAAQS for ozone is no longer applicable. Under this rule, the 1-hour standard will not apply to areas in which no violation of the previous 1-hour ozone standards has occurred. However, in areas in which past violations have occurred, the 1-hour ozone standard will continue to apply.

The CAA does not make the NAAQS directly enforceable. However, the Act does require each state to promulgate a state implementation plan (SIP) that provides for implementation, maintenance, and enforcement of the NAAQS in each air quality control region (AQCR) in the state. The CAA also allows states to adopt air quality standards that are more stringent than the federal standards. As promulgated in the Mississippi

Administrative Code, Title 30, Chapter 101.21 as amended, the State of Mississippi has adopted NAAQS as the Mississippi standards listed in Table 3.1-1.

Table 3.1-1 National and State Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Primary NAAQS[a,b,c]	Secondary NAAQS[a,b,d]
Carbon Monoxide	8-hour 1-hour	9 ppm (10 mg/m^3) 35 ppm (40 mg/m^3)	No standard No standard
Lead	Quarterly	1.5 μg/m^3	1.5 μg/m^3
Nitrogen Dioxide	Annual	0.0543 ppm (100 μg/m^3)	0.0543 ppm (100 μg/m^3)
Ozone	1 hour[e]	0.12 ppm (235 μg/m^3)	0.12 ppm (235 μg/m^3)
PM_{10}	Annual 24-hour	50 μg/m^3 150 μg/m^3	50 μg/m^3 150 μg/m^3
Sulfur Oxides (measured as SO_2)	Annual 24-hour 3-hour	0.03 ppm (80 μg/m^3) 0.14 ppm (365 μg/m^3) No standard	No standard No standard 0.50 ppm (1,300 μg/m^3)

PM_{10} Particles with aerodynamic diameters less than or equal to a nominal 10 micrometers

a The 8-hour primary and secondary ambient air quality standards are met at a monitoring site when the average of the annual fourth-highest daily maximum 8-hour average ozone concentration is less than or equal to 0.08ppm.

b The NAAQS are based on standard temperature and pressure of 25 Celsius and 760 millimeters of mercury.

c National Primary Standards: The levels of air quality necessary to protect the public health with an adequate margin of safety. Each state must attain the primary standards no later than three years after the state implementation plan is approved by the USEPA.

d National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant. Each state must attain the secondary standards within a "reasonable time" after the state implementation plan is approved by the USEPA.

Mississippi also has a standard for total suspended particulates of 150 μg/m^3.

3.1.1.1 Meteorology

The climate at SSC is typically temperate and rainy with hot summers. The average annual temperature is approximately 66°F, with a winter average of 53°F and a summer average of 74°F. During the June through August period, temperatures will normally exceed 95°F on more than half the days. A relative humidity greater than 70 percent is also normal during the same time frame.

Rainfall averages approximately 60 inches per year, but this average varies by up to approximately 20 inches in any given year. There is no period specifically definable as a wet season, but July and August are typically the wettest months and October is normally the driest. Fog is a frequent occurrence from mid-October to May, with heavy fog limiting ground visibility to 0.25 mile or less an average of 42 days annually.

Surface winds normally blow from the south and southeast approximately two-thirds of the year, and predominantly from the north the remainder. Upper level winds generally prevail from the west and southwest. Hurricanes normally form during the June through November timeframe. The Gulf coast averages one tropical cyclone per year, approximately two-thirds of which are of hurricane strength (winds in excess of 75 miles per hour). However, only a fraction of the hurricanes that enter the Gulf actually cause damage to the coast (through tidal surge or storm landfall) (National Aeronautics and Space Administration, 1997d).

3.1.1.2 Regional Air Quality

The USEPA classifies the air quality within an AQCR according to whether or not the concentrations of criteria air pollutants in the atmosphere exceed primary or secondary NAAQS. All areas within each AQCR are assigned a designation of attainment, nonattainment, unclassifiable attainment, or not designated attainment for each criteria air pollutant. An attainment designation indicates that the air quality within an area is as good or better than the NAAQS. Nonattainment indicates that air quality within a specific geographical area exceeds applicable NAAQS. Unclassifiable and not designated indicates that the air quality cannot be or has not been classified on the basis of available information as meeting or not meeting the NAAQS and is therefore treated as attainment. Before a nonattainment area is eligible for reclassification to attainment status, the state must demonstrate compliance with NAAQS in the nonattainment area for three consecutive years and demonstrate, through extensive dispersion modeling, that attainment status can be maintained in the future even with community growth.

Federal actions must comply with the USEPA Final General Conformity Rule published in 40 CFR 93, subpart B (for Federal agencies) and 40 CFR 51, subpart W (for state requirements). The Final Conformity Rule, which took effect on January 31, 1994, requires all Federal agencies to ensure that proposed agency activities conform with an approved or promulgated SIP or Federal implementation plan (FIP). Conformity means compliance with a SIP or FIP for the purpose of attaining or maintaining the NAAQS. Specifically, this means ensuring the Federal activity does *not*: 1) cause a new violation of the NAAQS; 2) contribute to an increase in the frequency or severity of violations of existing NAAQS; 3) delay the timely attainment of any NAAQS; or 4) delay interim or other milestones contained in the SIP for achieving attainment.

The Final General Conformity Rule *only* applies to Federal actions in designated nonattainment or maintenance areas, and the rule requires that total direct and indirect emissions of nonattainment criteria pollutants, including ozone precursors, be considered in determining conformity. The rule does not apply to actions that are *not* considered regionally significant and where the total direct and indirect emissions of nonattainment criteria pollutants do not equal or exceed *de minimis* threshold levels for criteria pollutants established in 40 CFR 93.153(b). A Federal action would be considered regionally significant when the total emissions from the proposed action equal or exceed 10 percent of the nonattainment area's emissions inventory for any criteria air pollutant. If a Federal action meets *de minimis* requirements and is *not* considered a regionally significant action, then it does not have to go through a full conformity determination. Ongoing activities currently being conducted are exempt from the rule so long as there is no increase in emissions above the *de minimis* levels as the result of the Federal action.

SSC is located in Hancock County within the Mobile-Pensacola-Panama City-Southern Mississippi Interstate AQCR 5. AQCR 5 covers a three state region and includes the Alabama counties of Baldwin, Escambia, and Mobile; the Florida counties of Bay, Calhoun, Escambia, Gulf, Holmes, Jackson, Okaloosa, Santa Rosa, Walton, and Washington; and the Mississippi counties of Adams, Amite, Clairborne, Clarke, Copiah, Covington, Forrest, Franklin, George, Green, Hancock, Harrison, Hinds, Jackson, Jasper, Jefferson, Jefferson Davis, Jones, Lamar, Lauderdale, Lawrence, Lincoln, Madison, Marion, Newton, Pearl River, Perry, Pike, Rankin, Scott, Simpson, Smith, Stone, Walthall, Warren, Wayne, and Wilkinson. The USEPA has designated the air quality within Hancock County as better than NAAQS for total suspended particulates (TSP) and SO_2, and unclassified for CO, Pb, NO_2, O_3, and PM_{10}. Pending new standards could change the future designation for ozone attainment for some of these counties.

3.1.1.3 Air Emissions Sources

Potential stationary sources of criteria pollutant and hazardous air pollutant emissions at SSC include several generators and backup generators, boilers, flare systems for testing engine components, machine shops, and fabrication facilities. In addition, limited amounts of Class 1 Ozone Depleting Substances (ODSs) are still in use as refrigerants and cleaners. Existing stocks of Class 1 ODSs are being used to recharge older refrigeration units. At the end of service life, refrigeration units are being retrofitted or replaced with units using Class 2 ODSs. Since 1993, SSC dramatically reduced its use of Class 1 ODSs and terminated its use of halon (National Aeronautics and Space Administration, 1997d). The operational release of hydrogen fluoride during laser testing and the potential accidental release of nitrogen trifluoride or fluorine is addressed in Appendix A.

The MSAAP is not included in the SSC Title V Air Permit. The MSAAP is operated in compliance with a separate Synthetic Minor Operating Permit. Air emissions are regulated well below the permitted limits. Typical sources include natural gas space heaters and boilers, and diesel and propane emergency generators. The permitted stationary point and area emission source inventory for the AQCR 5 is presented in Table 3.1-2 for comparative purposes.

Table 3.1-2 Stationary Emissions Inventory for the Mobile-Pensacola-Panama City-Southern Mississippi Interstate AQCR

Air Pollutant Emission Source[a]	CO (tpy)	VOC (tpy)	NO_x (tpy)	SO_x (tpy)	PM_{10} (tpy)	Pb (tpy)
AQCR 5 Emissions Inventory[a]	74,603	28,078	110,835	208,375	7,231	7.4

tpy tons per year
a Source: U.S. Environmental Protection Agency, 2000

3.1.2 Airspace

3.1.2.1 Airspace Designations

There are two categories of airspace or airspace areas above the continental United States. They are regulatory and non-regulatory. Within these two categories, the Federal Aviation Administration (FAA) has established various classes of airspace that fall under the generic terms of controlled and uncontrolled airspace. Controlled airspace is airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification, and within which all aircraft operations are subject to certain pilot qualifications, operating rules, and equipment requirements. Controlled airspace is a generic term that identifies five different classes of airspace: Class A, Class B, Class C, Class D, and Class E airspace areas. Airspace that is not designated as A, B, C, D, or E, is Class G (or uncontrolled) airspace. The Class F designation is not used in the United States. Special use airspace is a type of airspace that is designated where there is a need to confine certain activities because of their nature, or wherein limitations may be placed on non-participating aircraft. Prohibited areas, restricted areas, warning areas, alert areas, and military operations areas (MOA) are special use airspace areas that are depicted on aeronautical charts.

There are five distinct airspace classes established for the control of aircraft. Class A airspace is that airspace between 18,000 and 60,000 feet above mean sea level (msl), wherein all aircraft must operate under instrument flight fules (IFR), unless otherwise authorized by air traffic control (ATC). Class B airspace is controlled airspace from the surface to 10,000 feet msl surrounding the nation's busiest airports, within which all aircraft are subject to the operating rules and pilot and equipment requirements specified by the FAA. An air ATC clearance is required to operate in Class B airspace. Class C airspace is that airspace from surface to 4,000 feet above the airport elevation surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of IFR operations or passenger enplanements wherein ATC provides radar vectoring and sequencing on a full-time basis for all IFR and visual flight rule (VFR) aircraft. Class D airspace is normally that airspace from the surface to 2,500 feet above the airport elevation surrounding those airports with an operating tower. The configuration of each Class D airspace area is individually tailored to allow for the safe and efficient handling of traffic and to contain instrument procedures serving the airport. Class E Airspace is controlled airspace extending upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace up to but not including, 18,000 feet msl, excluding those areas designated as Class A, Class B, Class C or Class D airspace. Within the United States, all airspace above 60,000 feet msl is Class E airspace. Class G airspace is uncontrolled airspace.

Federal airways are Class E airspace and are based on a centerline that extends from one navigational aid or an intersection to another navigational aid (or through several navigational aids or intersections) specified for the airway. Each airway includes the airspace within parallel boundary lines four nautical miles either side of the airway centerline. The airway includes that airspace extending upward from 1,200 feet above ground level (agl) to, but not including, 18,000 feet msl. Jet Routes are established in Class A airspace between 18,000 feet msl and 45,000 feet msl, inclusive, between the navigational aids and intersections specified for that route.

3.1.2.2 Flight Rules and Runway Orientations

Rules of flight and ATC procedures have been established which govern how aircraft must operate within each type of designated airspace. All aircraft operate under either IFR or VFR. IFR aircraft (primarily commercial, military aviation, and business-related general aviation) operate within controlled airspace and are tracked and separated by the ATC system. VFR aircraft (primarily general aviation light aircraft) are not normally tracked by ATC but fly under a “see and avoid” concept in which pilots are responsible for their own separation from other air traffic. Airspace around the busier airports is more stringently controlled and may require all aircraft (including VFR) to be in contact with and monitored by an ATC agency while transiting through the area or approaching and departing the airport.

The type and dimension of individual airspace areas established within a given region and their spatial and procedural relationship to each other is contingent upon the different aviation activities conducted in that region. When any significant change is planned for this region, such as airport expansion, a new military flight mission, etc., the FAA will reassess the airspace configuration to determine if such changes will adversely affect (1) air traffic control systems or facilities; (2) movement of other air traffic in the area; (3) airspace already designated and used for other purposes (i.e., MOAs or restricted areas). Therefore, considering the limited availability of airspace for air traffic purposes, the given region may or may not be able to accommodate any significant airport or airspace area expansion plans.

A given geographical area may also encompass several different types of airspace that apply not only to normal IFR and VFR aircraft operations, but to military flight training operations as well. MOAs and restricted areas are the most common types of airspace designated for defense related activities. In addition there are military Low Altituden Tactical Navigation (LATN) flight training areas within controlled airspace and below the floor of the federal airway system. The purpose of a LATN area is to provide aircrews an area of sufficient size to allow random selection of navigation points for routes to drop zones that encounter a variety of terrain and provide more realistic and flexible low-level training.

Although not designated as special use airspace, the FAA and DoD have established MTRs to allow military aircrews to accomplish navigation training. There are three types of MTRs. Routes flown using IFR procedures (IR routes) allow aircraft to operate below 10,000 feet msl at speeds in excess of 250 knots (288 mph) along DoD/FAA mutually developed and published routes in IFR conditions. Routes flown using VFR procedures (VR routes) are guided by the same restrictions as IR routes but are limited to VFR conditions. SR routes are slow speed low altitude training routes that operate below 1,500 feet agl at airspeeds of 250 knots (288 mph) or less. Guidance for development and publication of SR routes is provided in applicable DoD directives, and not coordinated with FAA.

Runways are identified by magnetic orientation and the direction of aircraft traffic. Thus, Runway 13 has a magnetic orientation of 130 degrees and traffic flowing in a southeasterly direction. Each runway has two ends and, therefore, the number for one end is 180 degrees different than the other end (360 degrees divided by two equals 180 degrees). Therefore, a single runway oriented 130 degrees/310 degrees and is identified as Runway 13/31. When traffic is flowing southeasterly, Runway 13 is in use; when traffic flow is to the northwest, Runway 31 is used. Some airports have two or three parallel runways. To differentiate the runways, they are identified as Left (L), Right (R), and Center (C) (in those cases where there are three runways). Thus, an airfield oriented 130 degrees/310 degrees with two parallel runways is identified as Runway 13L/31R and 13R/31L, while three parallel runways are identified as Runways 13L/31R, 13C/31C, and 13R/31L.

3.1.2.3 Obstructions Affecting Navigable Airspace

Objects affecting navigable airspace are routinely studied and analyzed by the FAA. ATC personnel administer the obstruction evaluation program with coordinated assistance from local airport authorities, military agencies, and others. The guidelines, procedures, and standards for the obstruction evaluation program are established in the Federal Aviation Regulations (FAR) by Title 14, Code of Federal Regulation (CFR) Part 77. FAR Part 77 requires notification to the FAA Administrator if the proposed construction or alternation exceeds the notice criteria requiring a notice to be filed:

- Any construction or alteration of a structure of more than 200 feet agl.
- Any construction or alteration of a structure of greater height than an imaginary surface extending outward and upward at a slope of 100 to 1 for a horizontal distance of 20,000 feet from the nearest point on the runways of nearby airports with at least one runway more than 3,200 feet in actual length.
- When requested by the FAA, any construction or alteration of a structure that would be in an instrument approach area or might exceed a standard of FAR Part 77, Subpart C.

Each person who is required to notify the FAA Administrator shall send one executed FAA Form 7460-1, Notice of Proposed Construction or Alteration, to the Manager, Air Traffic Division, FAA Regional Office having jurisdiction over the area within which the construction or alteration will be located. This notice must be submitted at least 30 days before the earlier of the date the proposed construction or alteration is to begin *or* the date an application for construction permit is to be filed.

The FAA acknowledges in writing the receipt of each Notice of Proposed Construction or Alteration submitted. The acknowledgement states that an aeronautical study of the proposed construction or alteration has resulted in a determination that the construction or alteration:

- Would not exceed any standard of FAR Part 77, Subpart C, and would not be a hazard to air navigation;
- Would exceed a standard of FAR Part 77, Subpart C, but would not be a hazard to air navigation; or
- Would exceed a standard of FAR Part 77, Subpart C, and further aeronautical study is necessary to determine whether it would be a hazard to air navigation. It is presumed the construction or alteration would be a hazard to air navigation pending completion of any further study.

Notification to the FAA Administrator is *not* required when the construction or alteration of a structure would be shielded by existing structures of a permanent and substantial character or by natural terrain or topography features of equal or greater height, and would be located in a congested area of a city, town, or settlement where it is evident beyond all reasonable doubt that the structure so shielded will not adversely affect safety in air navigation.

3.1.2.4 Regional Airspace

Regional airports include Stennis International Airport, located approximately 9 miles east-southeast, and Picayune Pearl River County Airport, located approximately 6 miles northwest of the nearest proposed siting locations. The longest runway at Stennis International and Picayune Pearl River County airports are 8,500 feet and 5,000 feet, respectively, whereas the airport elevations are 23 feet and 62 feet msl, respectively. Numerous transmission towers are in the areas adjacent to the proposed siting locations with the highest tower within 5 miles at 410 feet agl (National Oceanic and Atmospheric Administration, 1999).

Airspace above the proposed siting locations at SSC is uncontrolled airspace from the surface up to 1,200 feet agl and controlled airspace from 1,200 feet agl and above. There is restricted airspace R-4403 located above the southern portion of SSC. The R-4403 airspace is continuously controlled by the Houston Air Route Traffic Control Center from the surface up to 5,000 feet msl (National Oceanic and Atmospheric Administration, 1999).

3.1.3 Biological Resources

Biological resources include native and introduced plants and animals within the area potentially affected by construction activities and operations. For discussion purposes, these are divided into vegetation, wildlife (including aquatic species), threatened or endangered species, and sensitive habitats. For this analysis, scientific names are only provided the first time that threatened and endangered species are mentioned in the text.

The vegetation and wildlife subsections focus on those species expected to occur in habitats on the project area sites, and birds and mammals of any offshore waters that could potentially be affected by proposed activities. Sensitive species (that is, state species of special concern, and regionally rare and declining species) are included in this discussion. Federally and state-listed threatened and endangered species are discussed under a separate subsection.

Sensitive habitats include wetlands, plant communities that are unusual or of limited distribution, and important seasonal use areas for wildlife (for example, migration routes, breeding areas, crucial summer/winter habitats). Sensitive habitats also include critical habitat as protected by the Endangered Species Act and sensitive ecological areas as designated by state or federal rulings.

A description of biological resources at SSC is presented in this section. The analysis addresses areas that may be affected by project activities, such as construction, noise, and human presence.

3.1.3.1 Vegetation

Four major plant communities have been documented within SSC. Pine savanna is the major vegetation type, occurring in uncleared portions of the installation and the surrounding Buffer Zone. Slash pine is the dominant species within this community. Other common species include cypress, loblolly pine, swamp tupelo, red maple, oak, and sweet gum. The underbrush is composed of species such as holly, bayberry, huckleberry, wax myrtle, grasses, and cane. Bottomland hardwood forest wetlands occur in low, poorly drained soils. The dominant species include black gum, swamp tupelo, and cypress. Underbrush species within the bottomland hardwood wetlands include ash, dogwood, leatherwood, Virginia willow, poison ivy, honeysuckle, and grapes (John C. Stennis Space Center, 1998).

Pitcher plant bogs and swamps are unique to the southeast coastal plains and are found in low-lying, poorly drained areas with acidic soils on SSC. Mature trees in this community, if present, are cypress species. Other dominant species include orchids, sundews, pitcher plants, pipeworts, and yellow-eyed grass. Grasslands occur often in areas where land has been burned or cleared for construction. The most common grass species include broomsedges and panic grasses. Pipeworts, milkworts, and sedges may occur in low, wet areas. Rabbit tobacco and goldenrod may be found in drier grasslands (John C. Stennis Space Center, 1998).

Forested cover, including pine, cypress-gum swamps, mixed pine and hardwoods, and bottomland hardwood forest wetlands dominate the western portion of SSC. Common species include loblolly, longleaf, and slash pines; black, willow, water, southern red, post, and laurel oaks; black and sweet gums; hickories; and tulip trees (John C. Stennis Space Center, 1998).

The majority of the MSAAP land is dominated by pine flatwoods. Mixed hardwood species such as tupelo, red maple, and pond cypress occur in more poorly drained areas. Shrub species include holly, sweet bay, and wax myrtle. Many grass and rush species also occur in the MSAAP area (U.S. Department of the Army, 1976; Headquarters, U.S. Army Armament, Munitions and Chemical Compound, 1990).

3.1.3.2 Wildlife

Aquatic wildlife on the installation includes fish, amphibians, and reptiles. Spotted gar, threadfin shad, and longear sunfish are sport fish found in Mike's River west of the MSAAP. Pirate perch, banded pygmy sunfish, flyer, lake chubsucker, grass pickerel, green sunfish, and black bullhead were found only in Wolf Branch or Lion Branch during a 1995 ecological survey. Several species of frogs, salamanders, turtles, and snakes occur in aquatic environments on the installation (John C. Stennis Space Center, 1998).

A total of 22 terrestrial amphibians were documented in the Western Fee Area (the main part of the complex) during surveys performed in 1994 and 1995. Green frogs, tree frogs, spring peepers, bullfrogs, longtail salamanders, and dwarf salamanders are some of the species documented during these surveys. Thirty-three terrestrial and aquatic reptiles have been identified in the Western Fee Area. Surveys conducted in 1991 and 1994 documented 14 species of snakes, 6 species of lizards, and the alligator. Black racer, black rat snake, cottonmouth, fence lizard, and green anole were some of the species observed (John C. Stennis Space Center, 1998).

Between 25 and 34 species of mammals have been documented in the Western Fee Area. White-tailed deer, muskrat, raccoon, bobcat, coyote, opossum, squirrel, skunk, and red fox are some of the mammals identified. A large number of birds also nest and forage in the Western Fee Area. Herons, egrets, ducks, grebes, northern bobwhites, osprey, and woodpeckers are some of the birds that nest on the installation (John C. Stennis Space Center, 1998).

A diverse population of mammals, birds, and reptiles inhabit the MSAAP area. White-tailed deer, squirrel, eastern cottontail rabbit, bobwhite quail, and mourning dove are some of the most common species. Gray fox, opossum, raccoon, beaver, and other furbearers are also common in the area (John C. Stennis Space Center, 1998).

3.1.3.3 Threatened and Endangered Species

SSC contains habitat utilized by a large number of federally and state-listed species. Table 3.1-3 lists the species known to occur within or near SSC's boundaries.

The Louisiana quillwort (*Isoetes louisianensis*), a federally endangered and state-imperiled species, has been observed in neighboring counties, but not on SSC.

The bald eagle has been identified at SSC by the Mississippi Department of Wildlife, Fisheries, and Parks and may occur within the MSAAP. It is usually found along coasts, rivers, and large lakes. The red-cockaded woodpecker, listed as endangered by the U.S. Fish and Wildlife Service (USFWS) and the Mississippi Department of Wildlife, Fisheries, and Parks, may also occur within SSC and the MSAAP area. The Mississippi sandhill crane (*Grus canadensis pulla*) has a very limited range that includes pine savanna areas of SSC. The brown pelican (*Pelecanus occidentalis*) may occur within SSC and the MSAAP area (John C. Stennis Space Center, 1992; John C. Stennis Space Center, 1998; U.S. Department of the Army, 1976).

The Gulf sturgeon has been documented in deep pools in the Pearl River. A small population of the gopher tortoise (*Gopherus polyphemus*) has been documented in the Buffer Zone at the northern edge of the SSC Fee Area. They have also been reported as occurring in other areas within the northern and northeastern areas of the Buffer Zone. The federally threatened and state-endangered eastern indigo snake has been identified by the Mississippi Department of Wildlife, Fisheries, and Parks at SSC. Government agencies released indigo snakes in Harrison and Marion counties in Mississippi, which may account for sightings at SSC.

Table 3.1–3 Species with Federal or State Status Potentially Occurring at the Stennis Space Center

Scientific Name	Common Name	Status: State	Status: Federal
Plants			
Isoetes louisianensis	Louisiana quillwort [(1)]	S1	E
Fish			
Acipenser oxyrhynchus desotoi	Gulf sturgeon	E	T
Reptiles and Amphibians			
Alligator mississippiensis	American alligator	–	T (S/A)
Drymarchon corais couperi	Eastern indigo snake [(2)]	T	E
Gopherus polyphemus	Gopher tortoise [(2)]	E	T
Birds			
Grus canadensis pulla	Mississippi sandhill crane	E	E
Haliaeetus leucocephalus	Bald eagle	E	T
Pelecanus occidentalis	Brown pelican	E	E
Picoides borealis	Red-cockaded woodpecker [(2)]	E	E
Mammals			
Felis concolor coryi	Florida panther	E	E
Ursus americanus luteolus	Louisiana black bear [(2)]	E	T

Source: John C. Stennis Space Center, 1998; National Aeronautics and Space Administration/GB Tech, 1998
(1) Found in surrounding counties
(2) Not observed on SSC during 1998 survey
– Not listed
S1 Critically imperiled because of extreme rarity (5 or fewer occurrences) or vulnerable to extirpation
E Endangered
T Threatened
T(S/A) Similarity of Appearance to a Threatened Taxon. This is a special designation under the Endangered Species Act, which refers to "similarity of appearance" cases. - The Act states that "The Secretary may, by regulation of commerce or taking, and to the extent he deems advisable, treat any species as an endangered species or threatened species even though it is not listed pursuant to section 4 of this Act if he finds that-
(A) such species so closely resembles in appearance, at the point in question, a species which has been listed pursuant to such section that enforcement personnel would have substantial difficulty in attempting to differentiate between the listed and unlisted species;
(B) the effect of this substantial difficulty is an additional threat to an endangered or threatened species; and
(C) such treatment of an unlisted species will substantially facilitate the enforcement and further the policy of this Act."

The American alligator (*Alligator mississippiensis*) has been sighted at SSC in the main canal, canal branches, lakes, ponds, and lagoons. The alligator is common in Lion Branch (John C. Stennis Space Center, 1992; John C. Stennis Space Center, 1998; U.S. Department of the Army, 1976).

The endangered Florida panther (*Felis concolor coryi*) has not been documented as occurring at SSC, but several sightings and vocalizations have been reported. It occurs most often in wilderness areas of forest and swamp, with a range from southern Florida along the Gulf of Mexico to eastern Louisiana. The federally threatened and state-endangered Louisiana black bear (*Ursus americanus*) is generally found in forests or swamps. Bear tracks have been found, and eyewitness accounts of bear sightings in the Fee Area and Buffer Zone have been reported (John C. Stennis Space Center, 1992; John C. Stennis Space Center, 1998).

3.1.3.4 Environmentally Sensitive Habitats

Freshwater wetlands are the primary environmentally sensitive habitat on the SSC. Wetlands occupy a large portion of both the Fee Area and the Buffer Zone. Wetlands are associated with the East Pearl River on the western Fee Area and the Jourdan River on the eastern Fee Area boundary, as well as an extensive associated system of tributaries (National Aeronautics and Space Administration, 1997b). Isolated freshwater wetlands also occur away from the main stream channels in depressions and flat areas. Figures 3.1-1 and 3.1-2 show wetlands near the proposed STF facility locations.

A variety of definitions for wetlands have been developed by different organizations and agencies. For purposes of this EA, however, the definition applied by the U.S. Army Corps of Engineers (USACE) has been employed. Wetlands that meet the USACE definition are referred to in this EA as "jurisdictional wetlands." To qualify as a jurisdictional wetlands, a site must meet specific criteria for hydrology, soils and vegetation (so called "Three Parameter Method, also called the Routine On-site Method) (U.S. Army Corps of Engineers, 1987). All three parameters must be present for an area to qualify as a USACE jurisdictional wetlands. The USACE completed a wetlands delineation of the SSC in June 1991 using the Three Parameter Method. A large portion of SSC meets the USACE definition of wetlands.

Wetlands primarily exist along natural stream courses such as Turtleskin Creek, and Wolf and Lion Branches within the MSAAP area. Wetlands vegetation is also located in man-made drainage ditches throughout the area and in isolated depressions and low-lying flat areas of the floodplain. The majority of the wetlands within the study area are bottomland hardwood forests, as previously described. Emergent and scrub/shrub wetlands also occur within the SSC site.

A Wetlands Special Area Management Plan was developed by NASA and the USACE to provide for wetlands mitigation to compensate for the filling of jurisdictional wetlands during construction activities within the SSC Fee Area. A 1,124-acre site on NASA property was selected as the wetlands mitigation area. Hydric soils and a pitcher plant bog dominate the area (U.S. Army Corps of Engineers, 1990; John C. Stennis Space Center, 1992; John C. Stennis Space Center, 1998). The mitigation bank would be used to offset losses of wetlands caused by construction projects on the SSC, and has the current capacity to mitigate over 200 acres of additional wetlands impacts. Use of the bank is governed by the Section 404 Clean Water Act permit process, which is managed by the Vicksburg District, USACE. Any project that involves disposal of dredged or fill material requires the applicant to meet the requirements of a general Section 404 permit from the USACE. Under the general permit, the SSC has an agreement with the USACE whereby SSC may use the bank for projects to offset losses of wetlands up to 25 acres. If the acreage exceeds this amount, coordination with the Vicksburg USACE would be

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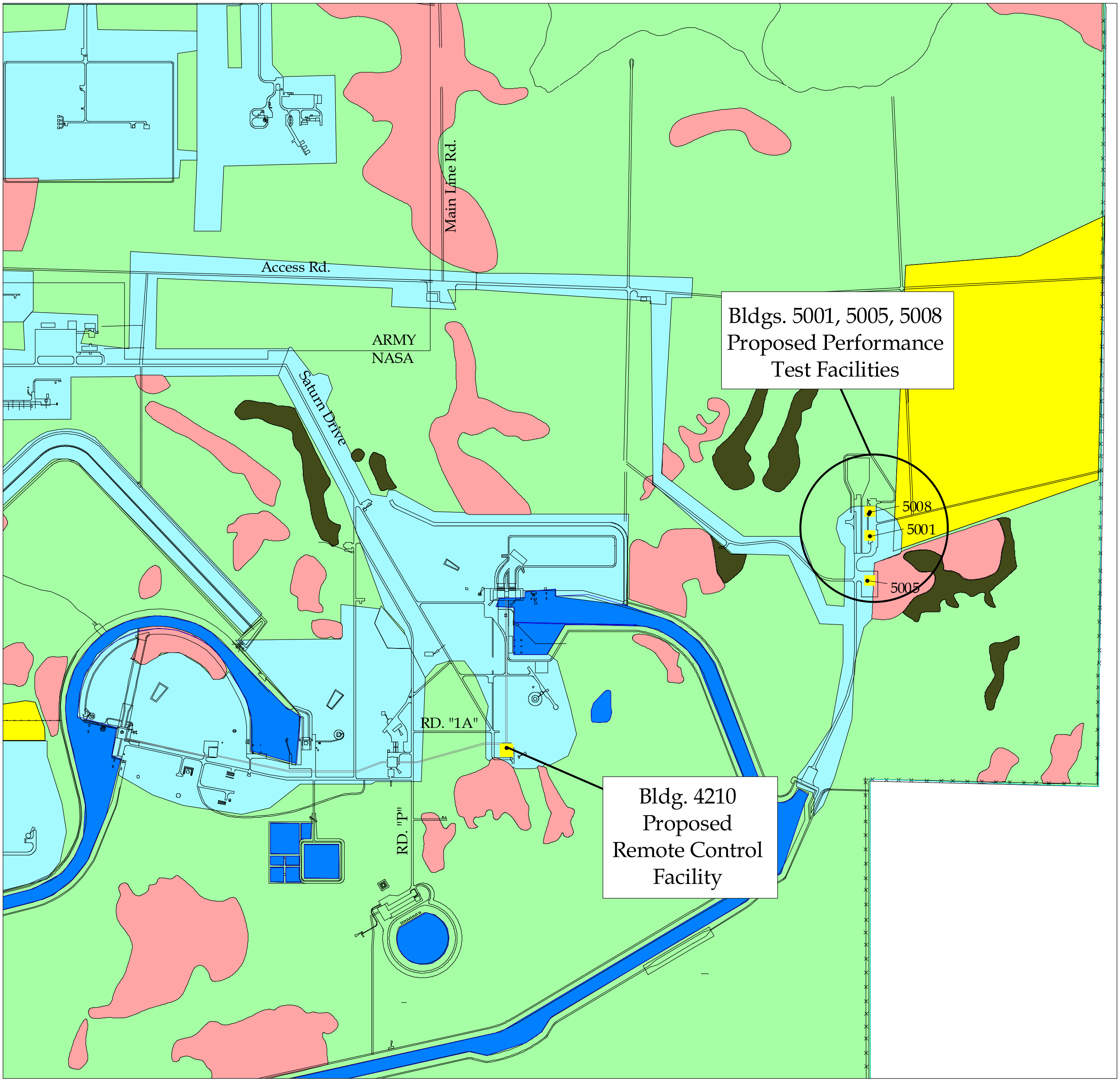

Upland Soils
Non-Wetlands
Wetlands
Mitigation Area
Water
Hydric Inclusive Soils
(Potential Wetland)

Figure 3.1-1

Wetlands Adjacent to
Proposed PTF & RCF
Stennis Space Center, MS

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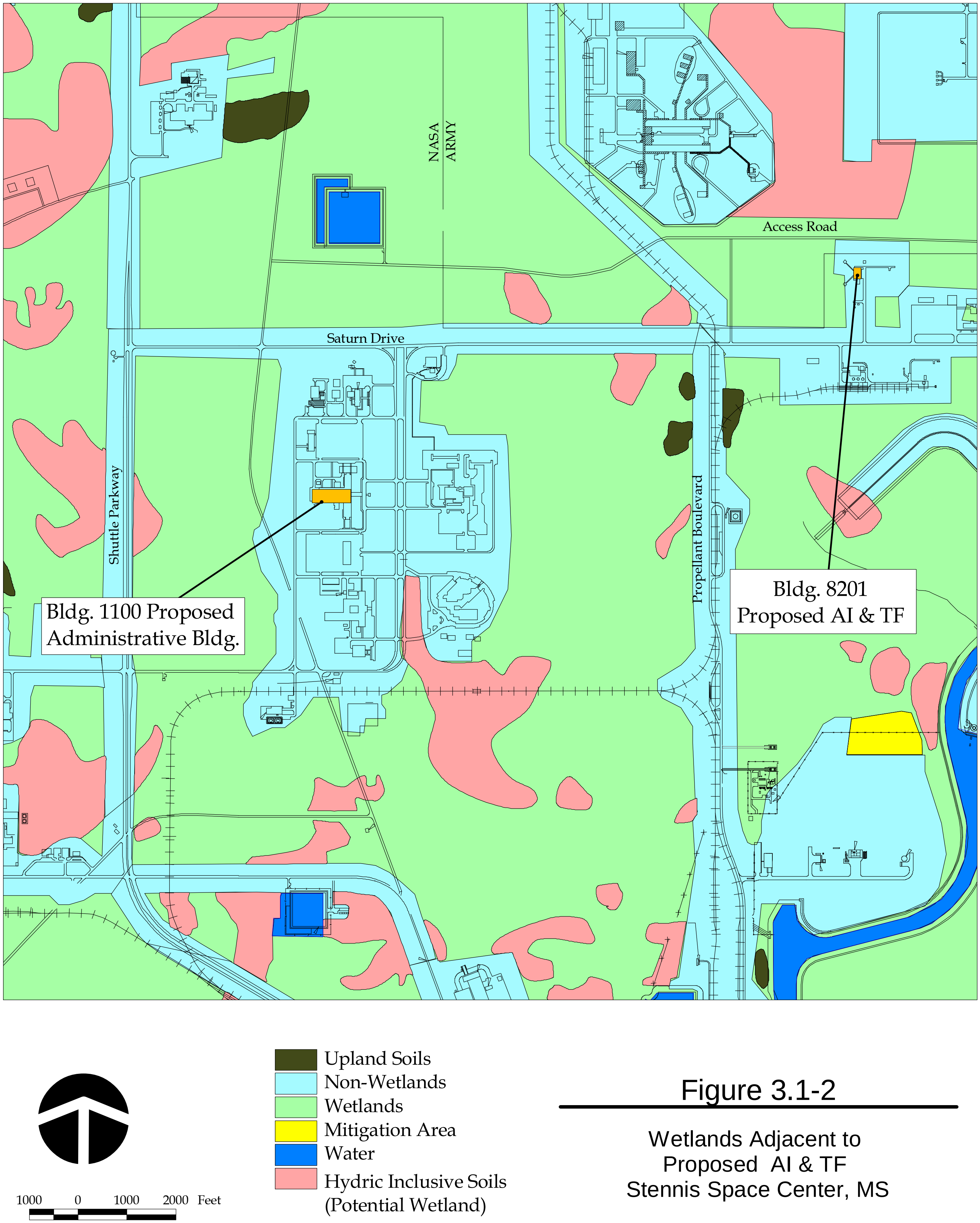

Figure 3.1-2

Wetlands Adjacent to
Proposed AI & TF
Stennis Space Center, MS

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required. The SSC currently has three Section 404 wetlands permits issued by the USACE for construction projects on the facility, including one general permit. General permits are a specific type of Section 404 permit that is already issued by the USACE for certain types of construction projects and organizations, with the assumption that the applicant meets the various conditions for mitigation that are previously established.

3.1.4 Cultural Resources

Cultural resources include prehistoric and historic sites, structures, districts, artifacts, or any other physical evidence of human activity considered important to a culture, subculture, or community for scientific, traditional, religious, or any other reason. For ease of discussion, cultural resources have been divided into archaeological resources (prehistoric and historic), historic buildings and structures, and native populations/ traditional resources (for example, Native American sacred or ceremonial sites).

Numerous laws and regulations require that possible effects to cultural resources be considered during the planning and execution of federal undertakings. These laws and regulations stipulate a process of compliance, define the responsibilities of the federal agency proposing the action, and prescribe the relationship among other involved agencies (for example, the State Historic Preservation Officer [SHPO] the Advisory Council on Historic Preservation). In addition to NEPA, the primary laws that pertain to the treatment of cultural resources during environmental analysis are the National Historic Preservation Act (especially Sections 106 and 110), the Archaeological Resources Protection Act, the American Indian Religious Freedom Act, and the Native American Graves Protection and Repatriation Act (NAGPRA).

Only those cultural resources determined to be potentially significant under cultural resources legislation are subject to protection from adverse impacts resulting from an undertaking. To be considered significant, a cultural resource must meet one or more of the criteria established by the National Park Service that would make that resource eligible for inclusion in the National Register of Historic Places (National Register). The term "eligible for inclusion in the National Register" includes all properties that meet the National Register-listing criteria specified in Department of Interior regulations 36 CFR 60.4. Therefore, sites not yet formally evaluated may be considered potentially eligible to the National Register and, as such, are afforded the same regulatory consideration as nominated properties. Whether prehistoric, historic, or traditional, significant cultural resources are referred to as historic properties.

The areas affected at SSC, as well as all alternative locations, encompass all areas of ground disturbance and all buildings and structures subject to modification as a result of IFX ground-test program activities. For the purposes of this analysis, this is synonymous with the Area of Potential Effect as defined under cultural resources legislation.

3.1.4.1 Prehistoric and Historic Archaeological Resources

Archaeological investigations at SSC and the region of the Pearl River Basin indicate that human occupation of the area first occurred approximately 12,000 years ago. Occupation within the region is divided into three periods: the Paleo-Indian Period

(10,000 BC to 6000 BC), the Archaic Period (6000 BC to 2000 BC), and the Post-Archaic Period (2000 BC to AD 1700) (U.S. Army Corps of Engineers, 1988b).

The recorded history of the area began in 1699 with the arrival of the French explorer Pierre LeMoyne Sieur d'Iberville. French domination of the area lasted until 1763 when, according to the Treaty of Paris, areas east of the Mississippi River were ceded to Great Britain. Ownership of the region changed hands several times between 1779 and 1817, when Mississippi became a state and the majority of the population was either English or American.

During the early 1800s, settlement patterns were located primarily along the Pearl River and, in 1830, the county seat was moved to Gainesville. Large sawmills were built at Gainesville and Logtown in the 1840s, and during the late 1800s and early 1900s, the railroad and Pearl River were primary systems for the transportation of cotton and lumber. The river was also heavily used by Confederate troops during the Civil War (Stennis Space Center, 1997a). The timber mill at Pearlington is believed to have been the largest in the world at the time and the most important commercial center in south Mississippi during this period; however, shortly after the turn of the century, the timber industry began to wane and most of the mills closed. The agricultural and timber industry eras were essentially over by the end of World War II (U.S. Army Corps of Engineers, 1988b), but logging is still an important industry in and around the SSC area, with a large portion of the land in the Buffer Zone continually harvested for timber.

Construction of the MSAAP was begun in 1978 and completed in 1988. SSC and the associated Buffer Zone were established in 1961 and encompassed five existing towns: Napoleon, Santa Rosa, Logtown, and Westonia located in the Buffer Zone, and the town of Gainesville, located within the Fee Area. Most of the buildings were removed when the land was acquired for construction.

Archaeological investigations of the SSC region are believed to have begun in 1974 with a reconnaissance-level survey by an archaeologist from Louisiana State University; however, reports of this survey are unsubstantiated, and no report is extant (National Aeronautics and Space Administration, 1995b). The next survey was undertaken in 1984 by the National Park Service and was confined to the MSAAP. No sites were recorded; however, the survey was limited and no systematic transects or subsurface testing was conducted.

In 1988, the Mobile District of the USACE conducted systematic investigations of four locations at the SSC for the Advanced Solid Rocket Motor EA and reconnaissance-level examination of the remainder of the Fee Area (including a resurvey of the MSAAP). Except for the Gainesville and Logtown townsites, no archaeological sites were located anywhere within the boundary of the Fee Area, and three previously recorded sites reported from the Pearl River floodplain area at Gainesville could not be relocated.

Other archaeological surveys conducted in the area include a survey of a proposed 40-acre landfill in the Buffer Zone conducted by the Mobile District Corps of Engineers in 1981, and a 3-acre survey of an area north of Igloo Road conducted by Giardino in

1997, specifically for the previous LTF program. No archaeological sites were recorded during either survey (National Aeronautics and Space Administration, 1997b).

Consultation with the Mississippi SHPO conducted after the 1988 survey indicated that, based on negative surveys of "virtually all of the high potential zones for archaeological remains (except for the Gainesville and Logtown townsites which are located along the Pearl River floodplain), no further historic properties investigations are recommended for lands owned in fee by NASA at the Stennis Space Center." The Mississippi SHPO formally concurred with these recommendations in December 1989 (Headquarters, U.S. Army Armament, Munitions and Chemical Command, 1990; National Aeronautics and Space Administration, 1997b). In addition, in September 1998, an archaeological survey of the two previous LTF proposed locations was conducted by Mason Technologies, Inc. No archaeological materials were found during the survey, and a survey report was submitted to the Mississippi SHPO for review. The Mississippi SHPO concurred with the findings (Mississippi Department of Archives and History, 1998).

3.1.4.2 Historic Buildings and Structures

Historic buildings and structures at the SSC would be associated with any historic activities such as farmsteads; homesteads; small communities; remains of buildings, structures, or other features associated with the cotton or timber industry; Civil War sites; and/or sites associated with the MSAAP.

Of the facilities at SSC, nine predate the SSC establishment in 1961. Seven of these have been determined ineligible for listing in the National Register by the Mississippi SHPO, and the remaining two are located away from STF complex construction areas (National Aeronautics and Space Administration, 1997b). These two sites are comprised of the two extinct towns of Gainesville and Logtown. Of the SSC post-1961 facilities, there is currently one National Register-listed property, the Rocket Propulsion Test Complex, which consists of three test stands, each of which is considered a National Historic Landmark. Building 4210 is part of the B-Stand area, but is not considered part of the Historic Landmark designation. It will be evaluated in the year 2013 for historic significance in accordance with the SSC Historic Preservation Plan.

In June 1994, a meeting between the Chief Architectural Historian for the Mississippi SHPO and SSC was held to determine the need for additional historic buildings and structures surveys. Discussions resulted in an agreement that an overall architectural assessment of the installation was not required. The agreement also indicated that all Man in Space-associated 1960s-era buildings and structures would be considered potentially significant and would be formally evaluated in terms of National Register eligibility for their role in NASA's Man in Space theme when they reach 50 years in age (the year 2013).

3.1.4.3 Native Populations/Traditional Resources

At the time of European contact (1699), the SSC region was populated by the Choctaw. Primarily agriculturists, the Choctaw material culture is most often recognized by double-weave (baskets within baskets) swamp cane and oak basketry (Environmental Laser, 1997).

In 1830, the Indian Removal Act authorized relocation of many Native American tribes to the western United States. One of the most notable of the relocations involved the Five Civilized Tribes of the Choctaw, Chickasaw, Creek, Cherokee, and Seminole. Of the five tribes, the Choctaw fared the best because of their willingness to comply with the government's action.

Nonetheless, the Treaty of Dancing Rabbit Creek (also in 1830) forcibly relocated most of the Choctaw Nation from their homeland in Mississippi, west to what is now known as southeastern Oklahoma; a few remained, but lost all rights to their land. Over 20,000 Choctaw were moved on this long journey, but only 7,000 survived the relocation along what has come to be called the "Trail of Tears."

Today, the Choctaw population has increased from the 7,000 survivors to more than 70,000, the majority of whom live in and around the community of Durant, Oklahoma (Environmental Laser, 1997). The Mississippi Band of Choctaw Indians numbers around 8,000. This federally-recognized tribe is located in east-central Mississippi near Philadelphia. The Mississippi Band of Choctaw Indians is now the largest employer in Neshoba County, Mississippi, and one of the ten largest in the state (Mississippi Band of Choctaw Indians, 1997).

Important traditional resources sites are subject to the same regulations and are afforded the same protection as other types of historic properties. Traditional sites associated with the Choctaw could include archaeological and burial sites, mounds, ceremonial areas, caves, rockshelters, hillocks, water sources, plant habitat or gathering areas, or any other natural area important to this culture for religious or heritage reasons. By their nature, traditional resources sites often overlap with (or are components of) archaeological sites. As such, any archaeological sites in the vicinity of SSC could also be considered traditional resources sites or contain traditional resources elements. Currently, no traditional cultural properties have been identified at SSC.

3.1.5 Geology And Soils

This section provides an overview of the physiography, geology, soils, and geologic hazards in the vicinity of SSC.

3.1.5.1 Physiography

SSC lies in the Eastern Gulf Coastal Plain region of the United States within the Pine Meadow geomorphic unit. The topography of the area is mostly low and flat, with some slight variations in elevation. Most of the area has a slope of less than 2 percent. The elevation varies from near sea level in the south to approximately 35 feet msl in the north portion of the Buffer Zone (National Aeronautics and Space Administration, 1997d). Fee Area elevations range from approximately 5 to 30 feet msl (John C. Stennis Space Center, 1992).

3.1.5.2 Geology

Within the SSC area, Holocene alluvium, Quaternary coastal deposits, and the Citronelle Formation occur at the surface. These surface soils contain locally heavy concentrations of organic material and organic staining. Well-preserved wood has been found at depths of approximately 50 feet, which indicates geologically recent subsidence typical of the delta area of the Gulf Coast. The Citronelle formation is composed of sands and gravel with lesser amounts of clay (National Aeronautics and Space Administration, 1997d).

The base of the Citronelle formation is generally about 150 feet deep in the SSC area. Underlying the Citronelle formation is over 2,000 feet of undifferentiated sediments composed of clays, slits, and sands with thick gravel layers. The individual layers commonly reach 100 feet in thickness. Bedrock in the SSC area is thought to be as much as 10,000 to 12,000 feet below the surface (National Aeronautics and Space Administration, 1997d).

3.1.5.3 Soils

The soil groupings throughout SSC are complex and varied. A majority of the soils in the SSC, including the proposed PTC Complex and I&T Complex areas, are of the Atmore, Smithton, and Escambia soil groupings. Wetlands habitats are associated with the Escambia loam, Atmore silt loam, Guyton silt loam, and Smithton fine sandy loam soil types. These four soil types account for over 65 percent of the soils on the SSC. Wetlands therefore occupy a major portion of this facility. These soils are generally composed of poorly to somewhat poorly drained silty and loamy soils of moderate permeability with slow to medium runoff characteristics. They are generally acidic with high organic matter and weathered clay mineralogy (John C. Stennis Space Center, 1992).

The SSC also contains several small areas that would meet the requirements for classification as Prime and Unique Farmland. However, regulations preclude designation of Prime and Unique farmland that has already been committed to urban development on the SSC. These areas are defined as those lands which include dedicated facilities such as the SSC where a comprehensive land use plan has been adopted and the land committed to nonagricultural uses.

3.1.5.4 Geologic Hazards

Unstable Soils

Soil types on SSC exhibit low shrink/swell susceptibility and low to moderate susceptibility to water and wind erosion (Iowa State University Statistical Laboratory, 1998). Consequently, soils would not be considered unstable on SSC.

Seismicity

SSC is located in a seismic zone 0, meaning that seismic disturbances are rare and associated risks are considered low (National Aeronautics and Space Administration, 1997d). There are no known areas of volcanic activity within the State of Mississippi.

3.1.6 Hazardous Materials and Hazardous Waste Management

Hazardous materials and wastes are those substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (42 U.S.C. Sections 9601-9675), the Toxic Substances Control Act (15 U.S.C. Sections 2601-2671), and the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA) (42 U.S.C. Sections 6901-6992). In general, this includes substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, may present substantial danger to public health or welfare, or to the environment when released into the environment. In addition, hazardous substances and hazardous chemicals are regulated by the Emergency Planning and Community Right to Know Act (EPCRA) (42 U.S.C. Sections 11001-11050). Transportation of hazardous materials is regulated by the U.S. DoT regulations within 49 CFR.

The following subsections discuss hazardous materials, hazardous waste, pollution prevention, remediation sites, storage tanks, asbestos, polychlorinated biphenyls (PCBs), and lead-based paint. Hazardous materials and hazardous waste management encompass all geographic areas exposed to the possibility of a release of hazardous materials or hazardous wastes or that may be affected by an IRP site.

3.1.6.1 Hazardous Materials Management

Numerous types of hazardous materials are used to support the various missions, research, operations, and general maintenance at SSC. These materials include common building paints, industrial solvents, and certain chemicals used in the scientific and photographic labs. Propellant and oxidizer are used to test rocket engine components. Hazardous materials are also used by on-station contractors to support station construction and operations (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). Contractors at the MSAAP use hazardous materials such as solvents and paints, chlorine, sulfuric acid, oils, sodium hydroxide, and sulfide solutions in maintenance activities.

Hazardous materials management is the responsibility of each individual or organization. Individual contractors may obtain hazardous materials through their own organizations, local purchases, or other outside channels.

Emergency response to spills or releases of hazardous materials is governed by the requirements of CERCLA, EO 12580, and EPCRA. Under CERCLA, NASA, the resident agencies at SSC, and contractors are responsible for reporting releases of reportable quantities to the National Response Center within 24 hours. SSC implements this program through NASA Management Instruction 1040.1C, which provides a comprehensive emergency plan. Routine and accidental releases as well as quantities of listed chemicals stored onsite are reported annually in accordance with Section 313 of EPCRA (John C. Stennis Space Center, 1998). MSAAP maintains a Spill Contingency Plan. The SSC Fire Department is trained to handle hazardous materials (EDAW, Inc., 1998b).

Federal Oil Pollution Prevention regulations require the preparation of a Spill Prevention, Control, and Countermeasure (SPCC) Plan for aboveground petroleum storage tanks with a capacity greater than 660 gallons or 1,320 gallons in aggregate. SSC has a limited number of tanks to which this requirement applies. SSC maintains an SPCC Plan as part of the contingency Plan (SPG 4130.3C). This plan also covers propane tanks on SSC (John C. Stennis Space Center, 1998). MSAAP maintains an SPCC Plan as well as a Spill Contingency Plan. Coordination and communication between MSAAP and SSC are elements in these plans (McNeely, 1998).

3.1.6.2 Hazardous Waste Management

Hazardous waste management at SSC is regulated under 40 CFR 260-280 and the Mississippi Department of Environmental Quality's hazardous waste program. These regulations are implemented through the SSC Environmental Resources Document and through MSAAP's Hazardous Waste Management Plan and Waste Handling Procedure.

NASA is the only Large Quantity Generator at SSC. Six resident agencies are classified as Small Quantity Generators and maintain their own USEPA identification numbers. MSAAP generates only small quantities of hazardous waste and has no RCRA permits at present. Tenants at MSAAP may use an Army hazardous waste disposal contract for disposal to the treatment, storage, and disposal facilities. Table 3.1-4 summarizes the RCRA status for NASA and resident agencies at SSC.

All hazardous waste generated is labeled with the appropriate USEPA identification number and is transported, treated, and disposed of under this number. All individuals or organizations at SSC are responsible for administering the applicable regulations and plans regarding hazardous waste and for complying with applicable regulations regarding the temporary accumulation of waste at the process site. MSAAP-generated wastes are handled in accordance with the applicable requirements.

Table 3.1–4 RCRA Status for NASA and Resident Agencies

Generator	Status	Building
U.S. Geological Survey	Conditionally Exempt SQG	2101
NASA John C. Stennis Space Center	LQG and Burner Blender	1100
Naval Oceanographic Office	SQG	1002A
University of Southern Mississippi Center for Marine Sciences	Conditionally Exempt SQG	1103
Naval Research Lab	Conditionally Exempt SQG	1000
U.S. Environmental Protection Agency	Conditionally Exempt SQG	1105
NOAA National Data Buoy Center	SQG	3203, 3205

SQG= Small Quantity Generator
LQG= Large Quantity Generator

Individual contractors and organizations maintain hazardous waste satellite accumulation points and 90-day hazardous waste accumulation areas in accordance with 40 CFR 262.34. All hazardous wastes placed in the accumulation areas must by shipped offsite for treatment, storage, and disposal within 90 days of the start of accumulation (satellite accumulation areas are not subject to the 90-day rule). NASA conducts independent audits of the treatment, storage, and disposal facilities it uses (John C. Stennis Space Center, 1998). MSAAP maintains a hazardous waste accumulation area in Building 9157. MSAAP hazardous waste accumulation is currently far below capacity since the facility was originally designed for ammunition manufacturing and the larger quantities of hazardous waste associated with that mission. Currently, MSAAP's hazardous waste generation is very low, typically consisting of spent fluorescent bulbs and two to three 55-gallon drums of paint and solvent wastes per year (McNeely, 1998).

3.1.6.3 Pollution Prevention

SSC has a waste minimization program that involves hazardous product substitution, waste stream segregation, material handling improvement, alterations in production scheduling, and increased recycling activities. SSC also has an ongoing program to evaluate the use of solvents/degreasers in parts washers, with the goal of finding suitable alternative solvents to reduce adverse environmental impacts and employee exposures. Recent efforts include the installation of a new deionized water/ultrasonic verification system that reduces usage of Freon 113, and the installation of a new enclosed parts washer to reduce usage of 1,1,1-trichloroethane (John C. Stennis Space Center, 1998).

3.1.6.4 Remediation

SSC is in the process of investigating potential historical spills, releases, and disposal incidents under CERCLA as amended by the Superfund Amendments and Reauthorization Act, which mandated that the USEPA establish a listing of federal facilities where hazardous waste has been generated and/or stored, treated, or disposed of in the past. Under the CERCLA site investigation process, preliminary assessments are conducted to determine whether further investigation is warranted. These assessments were conducted for 40 sites at SSC. Twenty-six of these sites were found to be clean or have contamination that could be easily removed in early removal activities. They are now No Further Action (NFA) sites per the concurrence of the Mississippi Department of Environmental Quality. Fourteen sites required additional investigation. The results of these investigations indicated that nine of the sites required clean up actions, four will become NFA sites, and one will become a long-term monitoring site.

3.1.6.5 Storage Tanks

Underground storage tanks (UST) are subject to federal regulations within RCRA, 42 U.S.C. 6991, and USEPA regulations, Title 40 CFR 265. The Hazardous and Solid Waste Amendments of 1984 mandated these regulations. Aboveground storage tanks are subject to regulation under the Clean Water Act (CWA) (33 U.S.C. 1251-1578) and oil pollution provisions (40 CFR 112).

The Mississippi Department of Environmental Quality has adopted the federal UST program and is the administering agency for USTs at SSC. SSC undertook replacing and upgrading USTs in 1992. Currently, SSC contains three USTs and twenty-four aboveground storage tanks (AST) that are subject to federal regulations. SSC has upgraded all USTs and ASTs to meet or exceed regulatory standards. MSAAP does not contain any UST. All ASTs at MSAAP meet or exceed the regulatory standards (John C. Stennis Space Center, 1998).

3.1.6.6 Asbestos

USEPA and the Occupational Safety and Health Administration (OSHA) regulate asbestos-containing material (ACM) abatement. Asbestos fiber emissions into the ambient air are regulated in accordance with Section 112 of the CAA, which established the National Emissions Standards for Hazardous Air Pollutants. These regulations address the demolition or renovation of buildings with ACM. OSHA regulations cover worker protection for employees who work around or abate ACM.

The SSC Asbestos Hazard Control Plan was issued in September 1997. The program is intended to serve as an operations and maintenance plan for managing asbestos in place by monitoring and maintaining its condition, ensuring proper cleanup of fibers previously released, and preventing further release. On-going monitoring has shown that the measured concentration of asbestos in SSC buildings is less than 0.01 fibers per cubic centimeter. The current OSHA standard for asbestos workers is 0.10 fibers per cubic centimeter.

3.1.6.7 Polychlorinated Biphenyls

Commercial PCBs are industrial compounds produced by chlorination of biphenyls. PCBs persist in the environment, accumulate in organisms, and concentrate in the food chain. PCBs are used in electrical equipment, primarily in capacitors and transformers, because they are not electrically conductive.

Disposal of PCBs is regulated by the Toxic Substances Control Act, which banned the manufacture and distribution of PCBs in 1978, with the exception of PCBs used in enclosed systems. By federal definition, PCB equipment contains 500 ppm PCBs or greater, whereas PCB-contaminated equipment contains PCB concentrations of greater than 50 ppm, but less than 500 ppm. The USEPA, under the Toxic Substances Control Act, regulates the removal and disposal of all sources of PCBs containing 50 ppm or more; the regulations are more stringent for PCB equipment than for PCB-contaminated equipment.

In March 1989, SSC implemented a program to replace transformers with PCB-contaminated fluid or to rebuild such transformers with non-PCB material and dispose of PCB-contaminated fluid. Existing transformers were retro-filled with non-PCB electrical insulating oil and reclassified to ensure compliance with USEPA regulations of 40 CFR 761. Due to the minimal load on the transformers and the leaching of trapped PCB-contaminated fluids, there are currently several large pad-mounted transformers at SSC that are PCB-contaminated. All other pole-mounted and smaller pad-mounted transformers containing PCBs have been removed. SSC conducts an annual PCB status report to monitor the remaining contaminated transformers. In addition, there are fluorescent lighting fixtures with PCB-containing ballasts that are replaced with non-PCB ballasts upon failure. Disposal of PCB wastes is in accordance with state and federal regulations (John C. Stennis Space Center, 1998).

PCB-contaminated equipment could occur at the existing facilities proposed for modification for the STF complex. PCB contamination in transformers and other equipment must be verified or tested before proceeding with facility modifications.

3.1.6.8 Lead-Based Paint

Human exposure to lead has been determined to be an adverse health risk by agencies such as OSHA and USEPA. Sources of exposure to lead include dust, soils, and paint. Waste containing levels of lead exceeding a maximum concentration of 5.0 milligrams per liter, as determined using the USEPA Toxic Characteristic Leaching Procedure that simulates the leaching behavior of landfill wastes, is defined as hazardous under Title 40 CFR 261. If a waste is classified as hazardous, disposal must take place in accordance with USEPA and state hazardous waste rules.

Lead-based paints have never been used on SSC (John C. Stennis Space Center, 1998).

3.1.7 Health and Safety

SSC has entered into a mutual aid agreement with every city within a 50-mile distance to provide assistance in the event of an on station emergency (EDAW, Inc., 1998b). Each organization may request equipment and manpower in the event of a fire or other emergency. In an emergency that may affect off-station areas, SSC contacts the appropriate county emergency management staff.

NASA provides guidance to contractors for health and safety through NASA Federal Acquisition Regulation Supplement. Health and safety programs for construction and support activities must be at least as effective as OSHA programs. Contractor health and safety programs must meet at least the minimums required by OSHA (National Aeronautics and Space Administration, 1993).

The Safety and Mission Assurance Directorate ensures the health and safety of NASA employees and other personnel at SSC through program audits and site inspections. Customers consult with this Directorate to plan and implement operations requirements safely and effectively.

3.1.8 Land Use and Aesthetics

This section describes the land uses and aesthetics for the area potentially affected by the location of the STF complex at SSC. The MSAAP in the north portion of the SSC Fee Area is also considered.

3.1.8.1 Regional Land Use

Regional land use includes the area outside the SSC Fee Area (the main part of the complex). This area includes the Buffer Zone (125,071 acres), which surrounds the entire SSC complex and is composed of land owned mostly by private individuals with scattered parcels of government land. The Buffer Zone is approximately 6 miles wide. The purpose of the Buffer Zone is to provide an acoustical and safety protection zone between operations being conducted at SSC and nearby communities. This zone is primarily in Hancock County but does extend into the neighboring Saint Tammany Parish in Louisiana to the west and into Pearl River County, Mississippi, to the northwest. All activities within the Buffer Zone are subject to specific easement provisions that specify that habitable structures cannot be built within the Buffer Zone. However, other uses such as farming, ranching, mining activities, wildlife management areas, and commercial forestry are allowed and are currently underway in the Buffer Zone. McLeod Park and Stennis International Airport are areas classified for special or unique land use within and along the perimeter of the Buffer Zone. McLeod Park is located on the Jourdan River to the east of the SSC near Kiln, Mississippi, and Stennis International Airport is located southeast of the SSC near I-10 at State Highway 43. While the SSC Fee Area and Buffer Zone occupy approximately 36 percent of Hancock County, they are not affected by the comprehensive plans or zoning laws of Hancock or surrounding counties, as they are under federal control (John C. Stennis Space Center, 1998).

3.1.8.2 On-Base Land Use

The SSC Fee Area (13,800 acres) is comprised of government land entirely in the western sector of Hancock County, Mississippi. Within this area are two major use areas as described in the *John C. Stennis Space Center Facilities Master Plan* (National Aeronautics and Space Administration, 1997d). These areas are the NASA-controlled area of the Stennis Space Center Complex and the MSAAP area that NASA currently leases to the Army.

The NASA-controlled area of SSC consists of eight land use types. These land uses are the propulsion testing area; the test support area; waterways and canals; the engineering and administration area; utility areas; recreation areas; maintenance, supply, and security areas; and open areas (National Aeronautics and Space Administration, 1997d).

The Army-leased MSAAP area, which is located in the north-central portion of the Fee Area of SSC, consists of 4,337 acres. The land use types within MSAAP are of an industrial nature, but are not specified in the *John C. Stennis Space Center Facilities Master Plan* (National Aeronautics and Space Administration, 1997d). The land uses include an ammunition production plant located in the southwestern section of the MSAAP, weapon storage igloos located in the northeastern section, office buildings located in the southern section, a small landfill near the center of the MSAAP (closed in July 1996 according to state and federal regulations), and various roads and rail lines scattered throughout MSAAP. Currently, private commercial operations occur at the weapons storage igloos and adjacent building, as well as a small building in the north central section of the MSAAP (National Aeronautics and Space Administration, 1998). The remainder of the land in the MSAAP is considered open and consists of commercial pine forests.

The State of Mississippi has an approved Coastal Zone Management Program. While portions of Bayou LaCroix, Mulatto Bayou, and the Pearl River in the Buffer Zone are designated as areas under the influence of the Coastal Zone Program, none of the areas in the SSC are under the program.

3.1.8.3 Aesthetics

Aesthetics include the general visual environment surrounding the proposed facilities and areas of the facilities visible from off-station areas.

The visual environment in the vicinity of the proposed STF complex is characterized by the space center activities that occur on the grounds. The PTF is proposed to be located in the southeastern portion of the SSC. The area around the proposed PTF includes tall buildings, such as Stand B, as well as pine forests, the natural landscape in this vicinity. The topography is generally flat, with elevations ranging from 12 feet to approximately 30 feet msl. The area has a low visual sensitivity because of the Buffer Zone around SSC and the flatness of the area limiting any prominent vistas. There are no residences in the Buffer Zone near the PTF.

Since public access to SSC and MSAAP is highly restricted, viewpoints are primarily limited to landowners just to the east of the proposed facility and to visitors at the Visitor's Center.

3.1.9 Noise

3.1.9.1 Noise Descriptors

Noise is defined as "unwelcome or unwanted" sound usually caused by human activity and added to the natural acoustic setting of a locale. It is further defined as sound that disrupts normal activities or diminishes the quality of the environment.

Sound pressure level (L_p) can vary over an extremely large range of amplitudes. The decibel (dB) is the accepted standard unit for measuring the amplitude of sound because it accounts for the large variations in amplitude and reflects the way people perceive changes in sound amplitude. Sound pressure levels are easily measured, but the variability is subjective and physical response to sound complicates the analysis of its impact on people. People judge the relative magnitude of sound sensation by subjective terms such as "loudness" or "noisiness." Table 3.1-5 presents the subjective effect of changes in sound pressure level.

Table 3.1-5 Subjective Effects of Changes in Sound Pressure Level

Change in Sound Level (dBA)	Apparent Loudness
3	Just perceptible
5	Clearly noticeable
10	Half or twice as loud
20	Much quieter or louder

Source: Bies and Hansen, 1988

Different sounds have different frequency content. When describing sound and its effect on a human population, A-weighted (dBA) sound levels are typically used to account for the response of the human ear. The term "A-weighted" refers to a filtering of the sound signal to emphasize frequencies in the middle of the audible spectrum and to de-emphasize low and high frequencies in a manner corresponding to the way the human ear perceives sound. This filtering network has been established by the American National Standards Institute (American National Standards Institute, 1983). The A-weighted noise level has been found to correlate well with people's judgments of the noisiness of different sounds and has been used for many years as a measure of community noise. Figure 3.1-3 depicts the typical A-weighted sound pressure levels for various sources.

Community noise levels usually change continuously during the day. However, community noise exhibits a daily, weekly, and yearly pattern. Several descriptors have been developed to compare noise levels over different time periods. One descriptor is the equivalent sound level (L_{eq}). The L_{eq} is the equivalent steady-state A-weighted sound level that would contain the same acoustical energy as the time varying A-weighted sound level during the same time interval.

Another descriptor, the day-night average sound level (DNL), was developed to evaluate the total daily community noise environment. DNL is the energy average A-weighted acoustical level for a 24-hour period, with a 10 dB upward adjustment added to the nighttime levels (10:00 p.m. to 7:00 a.m.). This adjustment is an effort to account for the increased sensitivity of most people to noise in the quiet nighttime hours. DNL has been adopted by federal agencies including the DoD, USEPA, the FAA, and the Department of Housing and Urban Development (HUD) as the accepted unit for quantifying human annoyance to general environmental noise.

Occasionally the sound exposure level (SEL) is used to supplement the DNL, especially where sleep disturbance is a concern. The SEL value represents the A-weighted sound level integrated over the entire duration of the noise event and referenced to a duration of one second. When an event lasts longer than one second, the computer model produced SEL value will be higher than the highest sound level during the event. The maximum sound level (L_{max}) is the highest instantaneous sound level observed during a single noise event no matter how long the sound may persist. The single event metric has limited use in evaluating sound impacts. SEL has been used to evaluate sleep interference, but does not predict long-term human health effects.

3.1.9.2 Noise Criteria and Regulations

Federal and local governments have established noise guidelines and regulations for the purpose of protecting citizens from potential hearing damage and from various other adverse physiological, psychological, and social effects associated with noise. The following paragraphs describe the guidelines and regulations relevant to the project.

There are no legally established national standards for noise exposure outside the work environment. The Occupational Safety and Health Act of 1970 (Public Law 91-596) was established to "assure safe and healthy working conditions for working men and women." It delegated implementation and enforcement of the law to OSHA.

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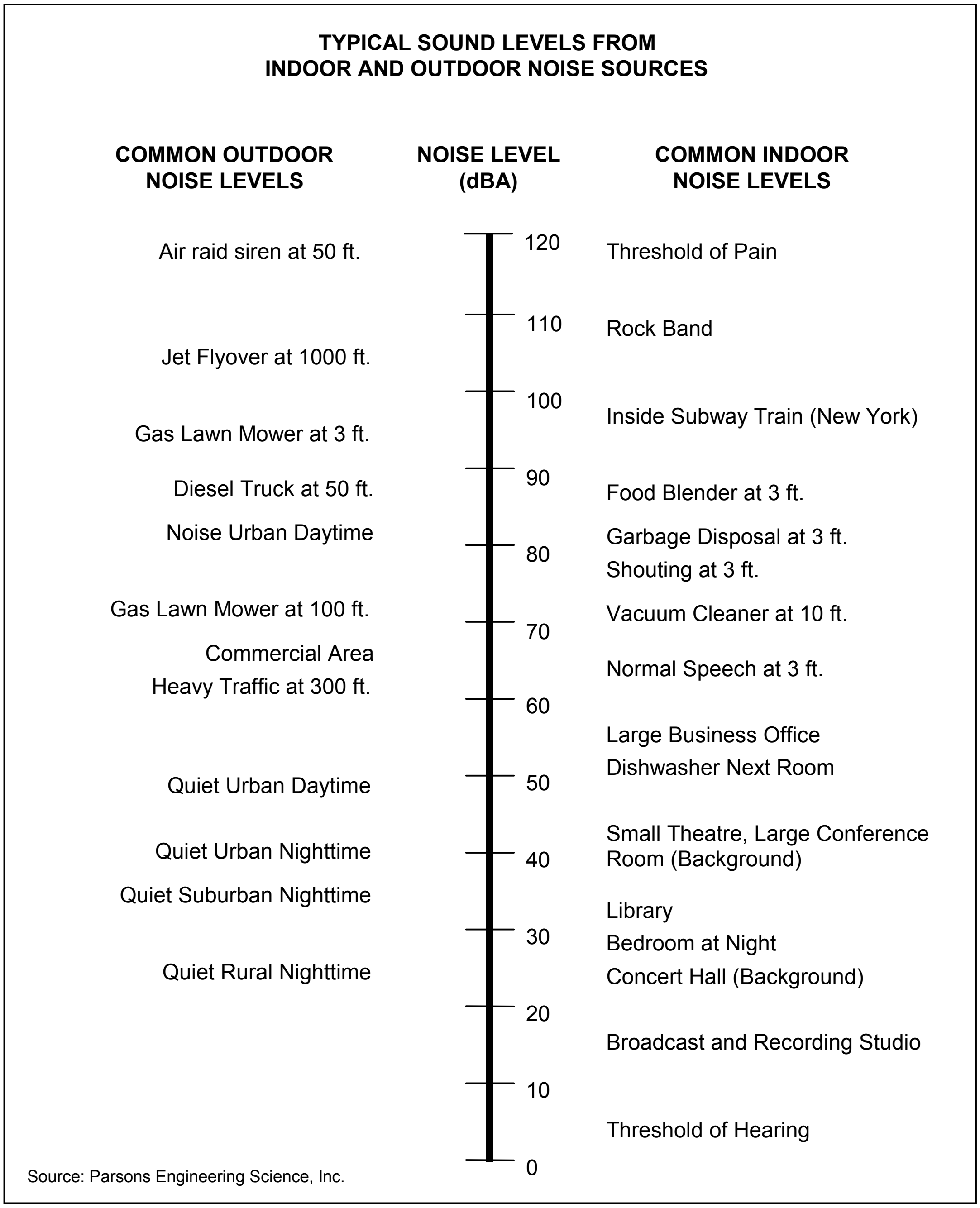
Figure 3.1-3 Typical A-Weighted Noise Levels



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Protection of workers from potentially hazardous occupational noise exposure is provided in 29 CFR 1910.95 of the law. OSHA regulations (Table 3.1-6) require employees exposed to 8-hour time-weighted average levels of noise of 85 dBA and 90 dBA to be monitored and to be provided hearing protection, respectively. For noise levels greater than 90 dBA, hearing protection is required for exposures of shorter duration. Under OSHA regulations, exposure to impulse noise should never exceed a 140 dBA peak sound pressure level.

Table 3.1-6 Permissible Workplace Noise Exposure*

Duration (Hours per Day)	Sound Level dBA Slow Response
8	90
6	92
4	95
3	97
2	100
1 to 1.5	102
1	105
0.5	110
0.25 or less	115

Source: 29 CFR 1910.95, Table G-16
* Exposure to impulsive or impact noise should not exceed 140 dBA peak sound pressure level.

Aside from the OSHA workplace regulations, various agencies have developed criteria and guidelines. According to Air Force, FAA, and HUD criteria, residential units and other noise-sensitive land uses are “clearly unacceptable” in areas where the noise exposure exceeds DNL 75 dBA; “normally unacceptable” in regions exposed to noise between DNL 65 to 75 dBA; and “normally acceptable” in areas exposed to noise where the DNL is 65 dBA or less. However, military family housing is discouraged in the DNL 70-75 dBA range.

The Federal Interagency Committee on Urban Noise developed land-use compatibility guidelines for noise in terms of DNL (U.S. Department of Transportation, 1980). For outdoor activities, the USEPA recommends DNL 55 dBA as the sound level below which there is no reason to suspect that the general population will be at risk from any of the effects of noise (U.S. Environmental Protection Agency, 1974).

Several social surveys have been conducted to determine people’s reactions to their noise environment as a function of DNL occurring outside their homes. Guidelines have been developed for individual land uses based upon information collected in these surveys and from information concerning activity interference. For various land uses, the level of acceptability of the noise environment is dependent upon the activity conducted and the type of building construction (for indoor activities).

Annoyance. When high noise is experienced inside or outside people's homes, as may occur from the overflight of aircraft or the operation of mechanical equipment, a feeling of annoyance may result. The noise may also interfere with the performance of various activities such as conversation, TV watching, etc. The degree to which there is annoyance and/or activity interference depends on the magnitude of the intruding noise, the frequency with which it occurs, and the time of day of occurrence. In response to the Noise Control Act of 1972, which directed the USEPA to establish a recommended measure to describe community noise, DNL was selected as the unit of measure to be used to predict annoyance from noise exposure.

Table 3.1-7 presents the results of over a dozen studies of transportation modes, including airport operations, investigating the relationship between noise and annoyance levels. This relationship has been recommended by the USEPA (U.S. Environmental Protection Agency, 1982), re-evaluated (Fidell et al., 1988), and updated (Finegold et al., 1992) for use in describing people's reactions to semi-continuous (transportation) noise. These data are shown to provide a perspective on the level of annoyance that might be anticipated. For example, 12 to 22 percent of persons exposed to a DNL range of 65 to 70 dBA would be highly annoyed by the noise.

Table 3.1-7 Theoretical Percentage of Population Highly Annoyed by Noise Exposure

DNL Intervals in dBA	Percentage of Persons Highly Annoyed
65-70	12-22
70-75	22-36
75-80	36-54

Source: Federal Interagency Committee on Noise (Federal Interagency Committee on Noise, 1992).

Hearing Loss. Hearing loss is measured in decibels and refers to a permanent auditory threshold shift of an individual's hearing. The USEPA (U.S. Environmental Protection Agency, 1974) has recommended a limiting daily equivalent energy value of L_{eq} of 70 dBA to protect against hearing impairment over a period of 40 years. This daily energy average would translate into a DNL value of approximately 75 dBA or greater. Based on USEPA recommendations (U.S. Environmental Protection Agency, 1974), hearing loss is not expected in people exposed to a DNL of 75 dBA or less. The potential for hearing loss involves direct exposure on a regular, continuing long-term basis to DNL levels above 75 dBA. The Federal Interagency Committee on Urban Noise states that hearing loss due to noise: 1) may begin to occur in people exposed to long-term noise at or above a DNL of 75 dBA; 2) will not likely occur in people exposed to noise between a DNL of 70 and 75 dBA; and 3) will not occur in people exposed to noise less than a DNL of 70 dBA (U.S. Department of Transportation, 1980).

An outdoor DNL of 75 dBA is considered the threshold above which the risk of hearing loss is evaluated. Following guidelines recommended by the Committee on Hearing, Bioacoustics, and Biomechanics, the average change in the threshold of hearing for people exposed to DNL equal to or greater than 75 dBA was evaluated. Results indicated that an average of 1 dBA hearing loss could be expected for people exposed to DNL equal to or greater than 75 dBA. For the most sensitive 10 percent of the exposed population, the maximum anticipated hearing loss would be 4 dBA. These hearing loss projections must be considered conservative as the calculations are based on an average daily outdoor exposure of 16 hours (7:00 a.m. to 10:00 p.m.) over a 40-year period. It is doubtful that any individual would spend this amount of time outdoors within a DNL zone equal to or greater than 75 dBA contours.

Speech Interference. One of the ways that noise affects daily life is by prevention or impairment of speech communication. In a noisy environment, understanding of speech is diminished when speech signals are masked by intruding noises. Reduced speech intelligibility may also have other effects. For example, if the understanding of speech is interrupted, performance may be reduced, annoyance may increase, and learning may be impaired. Research suggests that noises that exceed an L_{max} of approximately 60 dBA interfere with speech communication (Pearsons and Bennett, 1974; Crook and Langdon, 1974). Increasing the level of noise to 80 dBA reduces the intelligibility to zero, even if people speak in loud voices.

Sleep Interference. Effects of noise on sleep are of concern, primarily in assuring suitable residential environments. When evaluating sleep disturbance, studies have correlated SEL values with the percent of people awakened. The US Air Force has developed a dose-response model to predict "percent awakened" as a function of single event noise levels. This model is based on a statistical adjustment of the most recent inclusive analysis of published sleep disturbance studies (Pearsons et al., 1989). The equation for percent awakened is:

$$\text{Percent Awakened} = 7.079 \times 10^{-6} \times SEL_{(indoor)}^{3.496}$$

The Federal Interagency Committee on Noise (FICON) recommends this relationship be used in environmental assessments and environmental impact statements when supplemental analysis of potential sleep disturbance is necessary. Most of these relationships, however, do not reflect habituation and, therefore, would not address long-term sleep disturbance effects. SEL takes into account an event's sound intensity, frequency content, and time duration, by determining the total A-weighted sound energy spectra of the event and incorporating it into a single number. Unlike DNL, which describes the daily average noise exposure, SEL describes normalized noise from a single noise event.

Sleep disturbance rates are unlikely to be affected by noise below 90 dBA SEL, and for events with SELs in the range of 90 to 100 dBA, the chance of an average person being awakened is about 1 in 75 (1.33 percent). Although events with SEL>100 dBA are more likely to result in sleep disturbance, no specific dose-response relationship between SEL and percent awakening is suggested.

Animals. Studies of aircraft noise and sonic booms, both in the US and overseas, have addressed acute effects, including effects of startle responses (sheep, horses, cattle, fowl), and effects on reproduction and growth (sheep, cattle, fowl, swine), parental behaviors (fowl, mink), milk letdown (dairy cattle, dairy goats, swine), and egg production. High noise may trigger a startle response which raises the heart rate, but heart rate returns to normal in a very short time. There are good dose-response relationships describing the startle tendency to various levels of noise. However, studies have determined that there would be no long-term behavioral or breeding effects.

Studies on wildlife have shown that noise levels as high as 95 dBA have little or no effect on turkey vultures, great egrets, and grebes. Noise levels between 85 to 95 dBA could disturb or agitate the ring-necked duck, coot, gadwall, purple gallinule, and pintail duck (Newman and Beatie, 1985). Noise levels within the range of 110 to 135 dBA would affect the nesting of turkeys (Jeannoutot and Adams, 1961). Another study, using low flying F-16 aircraft, has shown that noise levels of up to 100 dBA would not alter the reproductive behavior of great egret, snowy egret, tricolor heron, little blue heron, and cattle egret (Black et al., 1984).

3.1.9.3 Background Noise Levels off SSC

SSC is surrounded by a large, approximately 125,071-acre, uninhabited Buffer Zone consisting of mostly forest, pasture lands, and wetlands. This Buffer Zone provides protection from noise and vibrations resulting from rocket tests to nearby communities. Several communities in Mississippi are situated just outside the Buffer Zone, including Pearlington to the south; Waveland and Bay St. Louis to the southeast; Kiln to the east; and Picayune to the northwest. The communities of Slidell and Pearl River, Louisiana, are southwest of SSC. These cities would be expected to have noise levels typical of an urban environment with levels between 45 and 80 dBA. Outside the cities, noise levels would be typical of a rural environment with noise levels between 45 and 50 dBA.

Noise created by static testing of large engines has affected the local environment surrounding SSC. Historically, the only measure of SSC's effect on the local ambient noise levels has been complaints by citizens in the communities surrounding the facility. During the Saturn V rocket testing program, NASA logged 160 complaints, of which 57 resulted in formal administrative claims. To reduce the number of complaints during the testing of the Space Shuttle Main Engines, SSC implemented a pre-test prediction of the Overall Sound Pressure Level at the Buffer Zone boundary and at acoustic focusing points beyond the Buffer Zone. If the predicted Overall Sound Pressure Level is greater than 120 dBA, no firing is approved until meteorological conditions improve. If the predicted Overall Sound Pressure Level is between 110 and 120 dBA, firing is at the discretion of the project manager. Since this program has been implemented, there have been no noise complaints that could be attributed to rocket test firing operations (John C. Stennis Space Center, 1997).

3.1.9.4 Background Noise Levels on SSC

The major noise sources at SSC are associated with static rocket motor testing. When tests are not being conducted, the noise levels at SSC are very low. The sources of continuous noise at the facility are diesel generators, pumps, boilers, and automotive traffic. The effects of the diesel generators, pumps, and boilers are minimal because they are contained within structures. Traffic noise is highest during the morning and evening as employees are transporting themselves to and from work. One-hour noise measurements taken at SSC in 1974 when no rocket tests were being conducted showed noise levels between 41 and 45 dBA. Static rocket tests on SSC can produce noise levels exceeding 140 dBA in SSC's Fee Area (John C. Stennis Space Center, 1997).

3.1.10 Socioeconomics

This section provides a socioeconomic overview of the region surrounding SSC. It includes an overview of population and employment in the area.

3.1.10.1 Region of Influence

For purposes of this analysis, the region surrounding SSC is defined as the area that includes those communities within an approximate one-hour drive from the proposed test site. Driving time was delineated using a computer program that assumes a journey carried out within the legal speed limits and in moderate traffic densities. While the drivetime polygon covers all or part of nine counties or parishes, five constitute the majority of the defined region. These five counties or parishes are Hancock, Harrison, and Pearl River counties in Mississippi, and Orleans and St. Tammany parishes in Louisiana, and they include the communities of Picayune, Gulfport, and Slidell, as well as part of eastern New Orleans.

Each of the five jurisdictions that comprise the major part of the 60-minute drive time rank within the top 20 most populated of 146 counties and parishes in Mississippi and Louisiana. Orleans Parish, which contains part of New Orleans, had the highest population in Louisiana in 1995, while Harrison ranked second in Mississippi.

3.1.10.2 Population

In 1997, there was a population of 443,584 within a 60-minute drive of the SSC. This population is forecast to increase 1.6 percent annually to 480,853 by 2002. A straight-line projection suggests that the population will grow to 504,701 by 2005.

Those referred to as economically active constitute about 71 percent of the regional population. Despite a discernible trend in the aging of the local population, this proportion remains constant through 2005.

3.1.10.3 Employment

In 1993, there were 312,490 non-federal jobs in these five counties and parishes. If the forecast composite growth rate in jobs for the States of Louisiana and Mississippi was applied to the five-county/parish area, there would be approximately 361,000 jobs in the region by 2005. This would constitute an increase in non-federal jobs of more than 15 percent during that period.

The SSC Complex, including MSAAP, employed 4,357 personnel in 1999. Over 50 percent of the employees at SSC are professional. Over 70 percent of the employees live in Mississippi, with Pearl River and Hancock Counties prevailing. Most of the remaining employees live in St. Tammany Parish, Louisiana. The 1999 payroll for SSC was $267,000,000.

SSC has a major economic influence on the region. It is estimated that the SSC has a direct economic impact of $405 million for the area within a 50-mile radius.

3.1.11 Transportation

The area analyzed for transportation potentially affected by the IFX ground-test program at SSC includes key federal, state, and local roads within Hancock County that access SSC and any contiguous waterways. This section also describes area rail networks and airway facilities.

3.1.11.1 Roadways

The evaluation of existing roadway conditions focuses on capacity which reflects the network's ability to serve traffic demand and volume. Capacity is stated in terms of vehicles per hour, and is the maximum number of vehicles that can be effectively processed by a segment of roadway or intersection during one hour (U.S. Air Force, 1998). Capacity can also be converted to a daily figure.

Roadway capacity is a function of several factors including the number of lanes, lane and shoulder width, traffic control devices (e.g., traffic signals), and percentage of trucks. For two-lane roads, capacity analysis is conducted for both directions; for multilane highways, capacity analysis considers a single direction only.

To determine how well a section of roadway operates, capacity is compared to the volume of traffic carried by the section. Traffic volumes may be distinguished as (1) average annual daily traffic, the total two-way daily volume averaged for a full year; (2) average daily traffic (ADT), the total two-way daily traffic averaged for a period of time less than 1 year; and (3) peak-hour volume, the amount of traffic that occurs in the typical peak hour.

An assessment of peak-hour volumes and roadway capacity is conducted to establish the Level of Service (LOS) during the peak hour. LOS can also be represented as a daily average. The LOS, a qualitative measure describing operational conditions within a traffic stream, ranges from A to F. A range of volume-to-capacity ratios defines each level. LOS A, B, and C are considered good operating conditions where minor or tolerable delays are experienced by motorists. LOS D and E represent acceptable but below-average conditions. LOS F represents an unacceptable situation of unstable stop-and-go traffic.

Off-installation Network

Primary access routes to SSC include I-10, I-59, US-90, and State Highway 607 (SH-607). I-10 is the primary corridor linking Biloxi, Gulfport, Bay St. Louis, and other coastal cities with New Orleans. I-59 intersects I-10 near Slidell, Louisiana and extends northwest to Hattiesburg, Mississippi and further northwest into Alabama. Both I-10 and I-59 have interchanges convenient to the two SSC entrances. The only direct access points to SSC are provided from I-59 (north gate) and from I-10 (south gate) by SH-607. I-10 and SH-607 intersect about 3 miles south of SSC and I-59 intersects SH-607 approximately 6 miles north of the SSC. Site access is also possible via SH-43 located along the north and northwest boundaries of the Buffer Zone. South of SSC, SH-607 connects to US 90, providing access to major Gulf Coast population centers. All these

Table 3.1–8 Stennis Space Center Area Roadways

Roadway	From	*Daily Capacity	**1999 ADT	LOS
OFF BASE ROADS				
1-10	East of MS 43/603	88,000	35,000	A
	West of MS 607	88,000	31,000	
	West of MS 603	88,000	31,000	
I-59	North of MS 607	88,000	22,000	A
	South of MS 607	88,000	22,000	
US 90	East of MS 607	44,000	9,6000	A
	West of MS 607	19,500	3,400	
MS 43	West of MS 603	19,500	4,300	A
MS 603	North of I-10	44,000	9,900	A
	South of I-10	44,000	17,000	
Roadway	**From**	***Daily Capacity**	****1999 ADT**	**LOS**
OFF BASE ROADS				
MS 607	North of I-10	44,000	5,900	A
	Northwest of SSC	44,000	5,200	
	South of I-10	44,000	7,500	
	Between SSC and I-59	44,000	3,100	
MS 604	US 90 to MS 607	19,500	1,100	A
ON BASE ROADS				
Balch Boulevard	Between Road J and Saturn Drive			
Saturn Drive				
Trent Lott Parkway				

*Capacities provided by Jim Wilkinson of the GRPC MPO
**Volumes provided by David Taylor of the GRPC MPO

Source: Gulf Regional Planning Council

roads are maintained by the State of Mississippi (Wilkinson, 1998). Table 3.1-8 describes the characteristics of various off-installation roadways. All major roadways are operating at a very high level of service; there are no federal, state or local roadways programmed for improvement in the near future. Figure 3.1-4 shows the regional transportation network for SSC.

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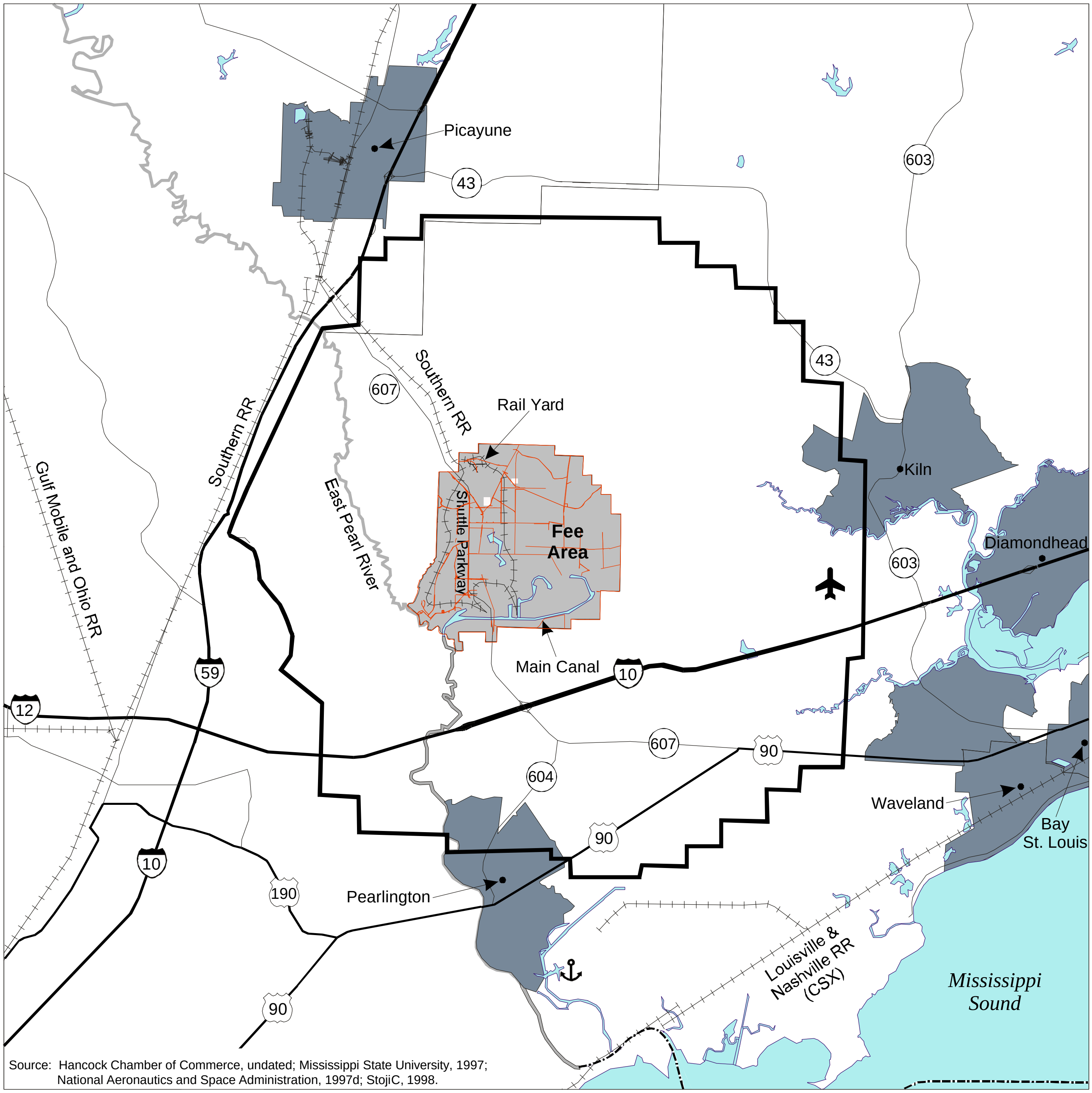

Source: Hancock Chamber of Commerce, undated; Mississippi State University, 1997; National Aeronautics and Space Administration, 1997d; StojiC, 1998.

EXPLANATION

Roads
Interstate Roads
U.S. Highways
State Highways
Railways
Stennis International Airport and Industrial Park
Port Bienville
SSC Buffer Zone
Intracoastal Waterway

Scale 1:250,000

0 3.2 6.3 Kilometers

0 2 3.9 Miles

NORTH

Figure 3.1-4

Transportation Network

Stennis Space Center, MS

0022ltf

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On-installation Network

There are approximately 31 miles of primary roads and 15 miles of secondary roads on SSC. Primary roads are designed to carry wheel loads of up to 12,000 pounds; secondary roads, 10,000 pounds. Most roads serving the docks, test stand, and warehouse areas are hard-surfaced, primary roads (National Aeronautics and Space Administration, 1997b). Five major roads serve SSC traffic needs: Shuttle Parkway (a portion of SH-607), Endeavor Boulevard, Road J, Balch Boulevard, and Saturn Drive. Shuttle Parkway, a major route, is the only roadway traversing the entire Fee Area. Balch Boulevard is located on the east side of the present Engineering and Administration Area, connecting Road J and Saturn Drive. There are 25 miles of paved roads at the MSAAP. The on-installation roads are operating at an adequate level of service.

3.1.11.2 Waterways

Off-installation

The MSAAP is 20 miles from the nearest full-service, shallow-water port, Port Bienville, and 45 miles from the deep-water Port of Gulfport (Operation Enterprise, 1996). Figures for 1996 indicate that the Port of Gulfport had 1.99 million tons of foreign cargo and 0.12 million tons of domestic cargo, for an approximate total of 2.1 million tons (U.S. Army Corps of Engineers, Water Resources Support Center, 1996). The main channel at the Port of Gulfport is 36 feet deep (Compass North America, Inc., 1998).

The SSC canal system accesses the Pearl River waterways. Data for the East Pearl River indicate the total of commodities transported during 1995 was 0.3 million tons. Total trips on the Pearl River in 1995 were 52 vessels with drafts of 6 feet or less. For the East Pearl River, total trips were as follows: foreign - 76 upbound pass and dry cargo vessels and 75 downbound; upbound domestic - 145 tows or tugs, 83 dry cargo vessels, and 174 tankers; downbound domestic - 147 tows or tugs, 83 dry cargo, and 172 tankers (U.S. Army Corps of Engineers, Water Resources Support Center, 1996).

Onsite Facilities

The SSC canal is located 0.5 miles from the proposed PTF site. Within the SSC Fee Area, 9 miles of man-made canal link to the East Pearl River through a lock system (National Aeronautics and Space Administration, 1997b). The Pearl River provides access to the Gulf and the national waterway transportation system via a 21-mile route terminating at the Gulf Intracoastal Waterway (Southern Mississippi Planning and Development District, 1998).

Available dock services include the Claremont II (a 1,200-horsepower push-type tug), a crane with a 200-ton capacity, and a 175-ton auxiliary derrick (National Aeronautics and Space Administration, 1998).

3.1.11.3 Railways

Off-installation

Several railroads service the Gulfport area, including CSX Transportation, Southern Pacific, and Mid-South Railroad, allowing transfer and distribution of cargo to all points in the United States (National Aeronautics and Space Administration, 1997b).

On-installation

Both Norfolk Southern Railway Company's spur from Nicholson into the Fee Area and the SSC Facility Railroad System are downgraded. Five miles of onsite spur lines have not been maintained, but could be refurbished and reactivated. (National Aeronautics and Space Administration, 1997b) Southern Railway also serves the MSAAP, with 10 miles of onsite railroad (requiring refurbishment) and a 10-car rail storage capacity. There are no switching yards, rail maintenance facility, rail car scales, or rolling stock available (Operation Enterprise, 1996). Generally, the railway delivers propellants, cryogenics, and other materials needed for NASA's static rocket engine testing (Department of the Army, 1976). Activation of this rail spur is eligible for Mississippi Major Impact Authority funding (National Aeronautics and Space Administration, 1998).

3.1.11.4 Airways

Off-installation

The nearest air carrier airport providing jet service is Gulfport-Biloxi Regional Airport, approximately 45 miles southeast of SSC. Four major airlines serve Gulfport-Biloxi Regional. An increase in tourism based on gaming resulted in a 174 percent increase in passengers by 1992 (Mississippi Gulf Coast, 1998; Southern Mississippi Planning and Development District, 1998). Air services are described in Table 3.1-9.

Table 3.1–9 Stennis Space Center—Available Airway Facilities

Airport/Airfield	Runway— feet	Flights
Off-installation		
Gulfport-Biloxi Regional [(1)]	14-32, all-weather: 9,000	260,000 [(1)]
	18-36, general aviation: 5,000	
On-installation		
Stennis International	8,500	50 per day average

Source: Mississippi Gulf Coast, 1998; National Aeronautics and Space Administration, 1998; Phillips, 1998.
[(1)] Runway has a rated load class of 132.5 tons, but can handle larger (up to C-17s), depending on weight dispersal.

On-installation

Stennis International, a general aviation airfield, is located in the Buffer Zone and is operated by the Hancock County Port and Harbor Commission. Stennis International is approximately 9.7 miles to the east in Bay St. Louis (Operation Enterprise, 1996). The facility receives special commercial flights. The site also includes a light industrial park (Coast Electric Power Association, 1998). Stennis International is a low-traffic airport, handling some NASA jets and very occasional military traffic (Phillips, 1998).

3.1.12 Utilities

3.1.12.1 Water Supply

Water supplies for SSC include groundwater and surface water (John C. Stennis Space Center, 1998). SSC holds a permit to divert or withdraw from Mississippi public waters for beneficial use; this covers an inlet and pumps that withdraw water from the East Pearl River into the elevated portions of the SSC Access Canal (John C. Stennis Space Center, 1998), providing for both emergency fire suppression and test stand cooling. Potable and industrial water is supplied through six onsite, large capacity wells, three dedicated to potable water. The potable wells have an average capacity of 0.52 million gallons per day (John C. Stennis Space Center, 1998). The average system demand is approximately 0.12 million gallons per day. Assuming a base population of 3,791, the per capita water demand is approximately 32 gallons per day. Industrial water is supplied by three wells capable of producing 7.5 million gallons of water per 10-hour period and 18 million gallons per day (John C. Stennis Space Center, 1998). Testing facilities are supported by a 66 million-gallon water storage reservoir.

Potable water is available at MSAAP at a capacity of 2 million gallons per day via two onsite 1,500-gallon per minute water wells and one 250,000-gallon elevated storage tank (Operation Enterprise, 1996; John C. Stennis Space Center, 1998). The MSAAP permit allows MSAAP to withdraw 0.15 million gallons per day at a maximum rate of 1,500 gallons per minute.

3.1.12.2 Wastewater

The SSC sewage treatment system design was based on an average flow of 30 gallons per capita per 8-hour shift, and a maximum flow of 2.5 times the average (National Aeronautics and Space Administration, 1997b). SSC maintains an NPDES Permit to discharge to surface waters, modified 7 June 1997 and scheduled to expire in 2002 (John C. Stennis Space Center, 1998).

Domestic sewage treatment is available onsite at MSAAP via an extended aeration, activated sludge system. The MSAAP's three wastewater treatment plants (WWTP) are located in one area near the intersection of Andrew Jackson/Leonard Kimble with capacities of 20,000 gallons per day, 50,000 gallons per day, and 80,000 gallons per day. This gives a total capacity of 150,000 gallons per day (Gouguet, W., 1998). Industrial waste treatment is also available at 0.20 million gallons per day (Operation Enterprise, 1996). MSAAP currently uses the 50,000-gallon per day plant, with a current load of 35,000 gallons per day (Gouguet, W., 1998).

3.1.12.3 Solid Waste

Solid waste generated at SSC is either recycled or placed in the onsite, 21-acre Class A landfill; some construction wastes, rubble, and vegetation can be disposed of in the Class II rubbish landfill (National Aeronautics and Space Administration, 1997b). SSC's current solid waste generation rate is 62 cubic yards daily. It is a NASA goal to extend the life of the Class A landfill through waste minimization (John C. Stennis Space Center, 1998). Officially closed, it has a 15- to 20-year lifespan (EDAW, Inc., 1998b), but is utilized by NASA and NASA tenants only.

Solid waste at the MSAAP is typically handled offsite, 30 miles away at the Pecan Grove landfill (Gouguet, W., 1998; Operation Enterprise, 1996). Pecan Grove takes in up to 2,000 tons per day (Lovelace, 1998), of which MSAAP contributes an average of 0.25 ton per day (Gouguet, W., 1998). Both sites are state-of-the-art operations with adequate capacity (John C. Stennis Space Center, 1998). Plans for a permitted industrial waste treatment facility are currently underway.

3.1.12.4 Energy

Electrical

Mississippi Power Company (MPC) provides electrical power to SSC through dual overhead 110-kilovolt (kV) transmission lines. Existing transmission lines are adequate. NASA and MPC jointly own the SSC Main Substation; power capacity is adequate for current SSC demands (National Aeronautics and Space Administration, 1997b), and alternate power is available through the Energy Power Company. The existing 5-year-old substation services all of SSC, from two separate sources via the MPC.

The SSC distribution voltage and MSAAP utility transmission voltage are both 13.8 kV. MPC/Southern Electric supplies the MSAAP's electricity via Army-owned transmission lines and substations (John C. Stennis Space Center, 1998). There are eighteen 2,000-kilovolt-ampere (kVA) electrical substations with a voltage of 480 (Operation Enterprise, 1996). Recent peak monthly usage amounted to over 1.2 million kilowatt-hours (kWh), or 4,096 million British thermal units (MMBtu) per hour. Base demand equates to approximately 5 percent of total capacity, 24 million kWh or 81,910 MMBtu (Havard, J., 1999).

Natural Gas

Natural gas for SSC is obtained through the United Gas Pipeline Company (National Aeronautics and Space Administration, 1997b). Natural gas, supplied by Entex Gas, is available at the MSAAP site (Operation Enterprise, 1996; John C. Stennis Space Center, 1998). System capacity is 13,460 therms per hour, or 1,346 MMBtu/hour (Ham, R., 1999); the average demand is relatively low at 6,000 therms per month, or 833,000 Btu/hour (Mullican, J., 1999).

3.1.13 Water Resources

Water resources include surface water and groundwater and their physical, chemical, and biological characteristics. The water resource section provides an overview of the ground and surface water features, flood hazard areas, and water quality.

The Federal Water Control Amendments of 1972, commonly known as the CWA, established a national strategy to restore and maintain the chemical, physical, and biological integrity of the nation's water. Under the CWA, the USEPA is the principal permitting and enforcement agency. This authority may be delegated to appropriate state agencies. The CWA functions primarily by requiring permits for activities that result in the discharge of water pollutants from both point sources (e.g., discharge pipes, ditches, etc.) and non-point sources (e.g., agricultural lands, construction sites, and dredge and fill operations).

The 1987 amendments to the CWA required the USEPA to establish a National Pollutant Discharge Elimination System (NPDES) permit program for storm water discharges associated with industrial activities. The Mississippi Department of Environmental Quality (MDEQ) has been delegated authority from the EPA to administer this program in the state of Mississippi. Industrial facilities subject to these regulations are permitted either with an individual NPDES permit or through coverage under a general permit. Under Phase 1 of the storm water regulations, coverage under a general construction storm water permit is required for construction activities that result in the disturbance of five acres or more. Coverage under the general construction storm water permit requires the preparation of a Storm Water Pollution Prevention Plan (SWPPP).

Phase II of the storm water regulations became effective December 8, 1999, and construction activities that disturb between one and five acres would require coverage under prospective general construction permits by March 10, 2003.

This section provides an overview of the surface and ground water features, water quality, and flood hazard areas in the vicinity of SSC. The Mississippi Department of Environmental Quality Office of Pollution Control is responsible for management of the NPDES permit process.

3.1.13.1 Groundwater

Several aquifers can be traced through Hancock County. The area is underlain by fresh water-bearing, southward dipping sands. Within these fresh water-bearing sands, one unconfined aquifer is found near the surface, with 10 or more confined aquifers at depth. The fresh water-bearing zone ranges from approximately 2,000 to 3,000 feet thick. Individual aquifers range from 100 to 450 feet in thickness. The sequence of alternating sands and discontinuous clay layers, creating the confining nature of the deeper aquifers, is part of the Coastal Lowlands Aquifer System or the Southeastern Coastal Plain System. The aquifers have plentiful supplies of fresh water (John C. Stennis Space Center, 1998).

3.1.13.2 Surface Water

The two primary surface water bodies around SSC are the East Pearl River and the Jourdan River. The Pearl River flows along the southwest boundary of the Fee Area and the Jourdan River flows in a southeasterly direction through the eastern portion of the Buffer Zone. Tributaries that are hydraulically connected to these two rivers are Mike’s River and Turtleskin Creek in the East Pearl Basin, and Lion and Wolf Branches of Catahoula Creek in the Jourdan Basin. Approximately 8.5 miles of man-made canals in the Fee Area are also connected through locks to the East Pearl River (John C. Stennis Space Center, 1998).

The Pearl River system is one of Mississippi’s principal rivers, draining an approximate area of 8,760 square miles. The river divides into distinct channels west of Picayune, Mississippi, where the main stream is known as the West Pearl River. The Pearl River is formed by the confluence of Hobolochitto Creek and Farrs Slough. The

Pearl River drains to Lake Borgne and eventually to the Mississippi Sound (John C. Stennis Space Center, 1998).

Dead Tiger Creek and Catahoula Creek form the Jourdan River System in the northeast portions of Hancock County, Mississippi. The Lion and Wolf branches are intermittent streams that drain the eastern section of the Buffer Zone. The Jourdan River drains to the Bay of St. Louis and eventually to the Mississippi Sound (John C. Stennis Space Center, 1998).

The southeastern portion of SSC drains into the main access canal. The canal is connected to the East Pearl River through a lock system. A spillway and overflow of the canal drains into Devils Swamp, which discharges into Bayou La Croix and the Bay of St. Louis to the Mississippi Sound (John C. Stennis Space Center, 1998).

The Pearl and Jourdan rivers are designated Inventory Rivers under the Wild and Scenic Rivers Act. Inventory Rivers, although not strictly protected under the act, are protected by guidelines issued in 1980 by the Council on Environmental Quality, which recommends that federal agencies consider the effects of federal actions on these Inventory Rivers (John C. Stennis Space Center, 1998).

A permit provides industrial storm water coverage for SSC (under Mississippi's Land Disposal Storm Water General NPDES Permit) and is applicable to the operation of SSC's non-hazardous waste landfill, allowing storm water associated with industrial activity to be discharged into state waters (John C. Stennis Space Center, 1998).

3.1.13.3 Special Flood Hazard Areas

Special Flood Hazard Areas are defined as areas with a 1 percent or greater chance of equaling or exceeding an established flood level (100-year flood) in any given year. Such areas are typically referred to as floodplains. EO 11988 directs federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modifications of floodplains.

The majority of SSC is in an area of minimal flooding. The documented floodplains at SSC include a 100-year floodplain along the East Pearl River along the western edge of SSC, and 100-year floodplains along the Wolf and Lion branches of Catahoula Creek in northeastern SSC (John C. Stennis Space Center, 1998).

3.1.13.4 Water Quality

Groundwater quality within the SSC area is generally considered good (John C. Stennis Space Center, 1998). Surface water analysis performed by the U.S. Geological Survey indicated that water in area freshwater streams is generally soft and slightly acidic (5.0 to 7.0 pH units), with low concentrations of dissolved solids. However, dissolved solids concentrations in the nearby Pearl and Jourdan Rivers frequently increase with movement of saltwater during high tide. Water quality in the SSC area is similar to the regional surface water quality but is typically more alkaline (7.0 to 8.0 pH units) (John C. Stennis Space Center, 1998).

The waters of the nearby Pearl and Jourdan river systems are generally of good to excellent quality and are classified by the Mississippi Department of Environmental

Quality as supporting recreational uses. Mike's River and the Lion and Wolf branches are classified as supporting fish and wildlife (John C. Stennis Space Center, 1998).

3.1.14 Environmental Justice

An environmental justice analysis is included in this document to comply with the intent of EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. Objectives of the EO include development of federal agency implementation strategies and identification of disproportionately adverse human health or environmental effects on low-income and minority populations potentially impacted by proposed federal actions. Accompanying EO 12898 was a Presidential Transmittal Memorandum that referenced existing federal statutes and regulations to be used in conjunction with EO 12898. One of the federal statutes referenced was NEPA. Specifically, the memorandum indicated that, "Each federal agency shall analyze the environmental effects, including human health, economic and social effects, of federal actions, including effects on minority communities and low-income communities, when such analysis is required by the NEPA 42 U.S.C. section 4321 et. seq."

Most of the environmental effects from the IFX ground-test program at SSC are anticipated to occur in Hancock County, Mississippi or St. Tammany Parish, Louisiana. In developing statistics for the 1990 Census of Population and Housing, the U.S. Department of Commerce, Bureau of Census, identified small subdivisions used to group statistical census data. In metropolitan areas, these subdivisions are known as census tracts.

Tables for the 1990 Census of Population and Housing were used to extract data on low-income and minority populations in Hancock County and St. Tammany Parish. The census reports both on minority and poverty status. Minority populations included in the census are identified as Black; American Indian, Eskimo, or Aleut; Asian or Pacific Islander; Hispanic; or Other. Poverty status (used in this EA to define low-income status) is reported as the number of families with income below poverty level ($12,764 for a family of four in 1989, as reported in the 1990 Census of Population and Housing).

A census tract is considered disproportionate under either of these two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in Hancock County, Mississippi and St. Tammany Parish, Louisiana, the region of comparison, or (2) the percentage of low-income or minority populations in the census tracts exceeds 50 percent. Data for each census tract were compared to data for the regional political jurisdictions surrounding the tracts (Hancock County and St. Tammany Parish). Based on the 1990 Census of Population and Housing, Hancock County had a population of 31,760. Of that total, 7,061 persons, or 22.72 percent, were low-income, and 3,764 persons, or 11.85 percent, were minority. St. Tammany Parish had a population of 144,508. Of that total, 19,546 persons, or 13.72 percent, were low-income, and 20,566 persons, or 14.23 percent, were minority.

Hancock County is subdivided into six census tracts, of which four have a disproportionate percentage of low-income or minority populations (or both). St.

Tammany Parish is subdivided into 33 census tracts, of which 16 have a disproportionate percentage of low-income or minority populations (or both). These census tracts have been determined to have disproportionate low-income and/or minority populations, and therefore may be subject to environmental justice impacts.

3.2 REDSTONE ARSENAL/MARSHALL SPACE FLIGHT CENTER

The following sections discuss the affected environment or baseline conditions at RSA. This discussion includes locations proposed for use by the IFX ground-test program as well as adjacent areas that have the potential to be impacted by program activities.

3.2.1 Air Quality

A general description of the air quality and regulations is presented in Section 3.1.1.

3.2.1.1 Meteorology

The climate at RSA is mild and temperate. The average annual temperature for Madison County is approximately 60°F. Average monthly highs of approximately 80°F generally occur in July, and monthly lows near 40°F can be expected in January. Freezing temperatures seldom continue for more than 48 hours. Precipitation occurs mostly as rain, but some snowfall can be expected each year. Rainfall averages approximately 56 inches annually, while snow varies from less than 1 inch to more than 20 inches. Flooding is possible, but occurs infrequently. The greatest variety of weather normally occurs during the spring, with the majority of the area's thunderstorms occurring before summer (U.S. Army Aviation and Missile Command, 1994).

Winds generally originate from the southeast, though winds from the north, south, or northwest are not uncommon. Wind speed averages 8.5 to 11 miles per hour (U.S. Army Aviation and Missile Command, 1994).

3.2.1.2 Regional Air Quality

Federal actions must comply with the USEPA Final General Conformity Rule published in 40 CFR 93, subpart B (for Federal agencies) and 40 CFR 51, subpart W (for state requirements). The Final Conformity Rule, which took effect on January 31, 1994, requires all Federal agencies to ensure that proposed agency activities conform with an approved or promulgated SIP or Federal implementation plan (FIP). Conformity means compliance with a SIP or FIP for the purpose of attaining or maintaining the NAAQS. Specifically, this means ensuring the Federal activity does *not*: 1) cause a new violation of the NAAQS; 2) contribute to an increase in the frequency or severity of violations of existing NAAQS; 3) delay the timely attainment of any NAAQS; or 4) delay interim or other milestones contained in the SIP for achieving attainment.

The Final General Conformity Rule *only* applies to Federal actions in designated nonattainment or maintenance areas, and the rule requires that total direct and indirect emissions of nonattainment criteria pollutants, including ozone precursors, be considered in determining conformity. The rule does not apply to actions that are *not* considered regionally significant and where the total direct and indirect emissions of nonattainment criteria pollutants do not equal or exceed *de minimis* threshold levels for criteria pollutants established in 40 CFR 93.153(b). A Federal action would be considered regionally significant when the total emissions from the proposed action equal or exceed 10 percent of the nonattainment area's emissions inventory for any criteria air pollutant. If a Federal action meets *de minimis* requirements and is *not* considered a regionally significant action, then it does not have to go through a full conformity determination. Ongoing activities currently being conducted are exempt from the rule so long as there is no increase in emissions above the *de minimis* levels as the result of the Federal action.

RSA is located in Madison County within the Tennessee River Valley-Cumberland Mountains Interstate AQCR 7. AQCR 7 includes the Alabama Counties of Colbert, Cullman, De Kalb, Franklin, Jackson, Lauderdale, Lawrence, Limestone, Madison, Marion, Marshall, Morgan, and Winston; and the Tennessee Counties of Bledsoe, Coffee, Cumberland, Fentress, Franklin, Grundy, Marion, Morgan, Overton, Pickett, Putnam, Scott, Sequatchie, Warren, White, and Van Buren. The USEPA has designated the air quality within Madison County as better than NAAQS for TSP and SO_2, and unclassified for CO, Pb, NO_2, O_3, and PM_{10}.

3.2.1.3 Air Emissions Sources

RSA maintains permits to operate several air pollution emissions sources including boilers, and fuel storage tanks. Operations at RSA are in compliance with current state and federal permits (U.S. Army Materiel Command, 1996). The operational release of hydrogen fluoride during laser testing and the potential accidental release of nitrogen trifluoride or fluorine is addressed in Appendix A.

RSA also has a designated open burn area, which is operated according to conditions imposed by the Alabama Department of Environmental Management (ADEM). RSA is in the process of obtaining a Title V Air Permit. It is likely the permit will not be finalized until after the year 2000. The permitted stationary point and area emission source inventory for the AQCR 7 is presented in Table 3.2-1 for comparative purposes.

Table 3.2-1 Stationary Emissions Inventory for the Tennessee River Valley-Cumberland Mountains Interstate AQCR

Air Pollutant Emission Source[a]	CO (tpy)	VOC (tpy)	NO_x (tpy)	SO_x (tpy)	PM_{10} (tpy)	Pb (tpy)
AQCR 7 Emissions Inventory[a,b]	329	3,344	419	455	808	0

a Source: U.S. Environmental Protection Agency, 2000
b Complete inventory data not available from the USEPA.
c Based on reported TSP value.

3.2.2 Airspace

A general description of the airspace designations, flight rules, and the criteria used to determine if a structure would be an obstruction to navigable airspace is provided in Sections 3.1.2.1 through 3.1.2.3.

Regional Airspace

Regional airports include Redstone Army Airfield, located approximately 1.1 miles north-northwest, and Huntsville International Airport, located approximately 2 miles west of the nearest proposed siting locations. The longest runway at Redstone Army Airfield and Huntsville International Airport are 7,300 feet and 10,000 feet, respectively, and the airport elevations are 685 feet and 629 feet msl, respectively. Existing obstructions on RSA include elevations of 850 feet msl, 1,060 feet msl, 965 feet msl, and 939 feet msl (National Oceanic and Atmospheric Administration, 2000a).

The proposed siting locations at RSA are within both the Huntsville International Class C airspace and the Redstone Army Airfield Class D airspace. The Class C airspace is in effect from 0600-2300 from the surface to up and including 4,600 feet msl, excluding areas beneath the outer veils. During ineffective hours, the Class C airspace reverts to Class E airspace. The proposed siting locations at RSA are also located within restricted airspace R-2104A, D, controlled by the FAA's Memphis Air Route Traffic Control Center. The altitude for R-2104A is from surface to 12,000 feet msl, time of use is intermittent 0600–2200, Monday–Saturday, 6 hours in advance or by Notice to Airmen (NOTAM). The altitude for R-2104D is from 12,000 feet msl to 30,000 feet msl, time of use is by NOTAM 6 hours in advance (National Oceanic and Atmospheric Administration, 2000a).

3.2.3 Biological Resources

A definition of biological resources is presented in section 3.1.3. A description of biological resources at RSA and MSFC is presented in this section. The focus is primarily on RSA since only two buildings would be affected at MSFC through renovation and additions. Biological resources at MSFC are similar to RSA. The analysis addresses areas that may be affected by project activities, such as construction, noise, and human presence.

3.2.3.1 Vegetation

A variety of vegetation communities can be found on RSA and MSFC. Within these communities, the Alabama Natural Heritage Program lists 242 plant species, including herbaceous vegetation (U.S. Department of the Army, 1996).

Upland vegetation on RSA and MSFC is generally mowed, maintained in an early ecological succession stage, or retained as forest. Forested land composes about 40 percent of the acreage, with the remainder in pastures and scrub. The forest portion consists of hardwoods, pines, and mixtures of each type (U.S. Army Aviation and Missile Command, 1994).

Chestnut oak, blue beach, water oak, sweetgum, tulip poplar, sugarberry, and willow oak generally dominate mixed hardwood canopies. Middlestory species include the canopy species mentioned above and red bud, black gum, and eastern red cedar. Ground cover among the hardwoods is generally sparse. Species occurring in herbaceous and shrub layers include pepper-vine, poison ivy, Virginia creeper, potentilla, grape, greenbrier, blackberry, white snakeroot, Japanese honeysuckle, and ebony spleenwort (U.S. Army Aviation and Missile Command, 1994).

Loblolly pine, with some shortleaf pine, dominates the pine community. Most older pine stands are very dense with minimal ground cover. Where ample sunlight reaches the forest floor, a variety of species occurs in the lower vegetation layer. Middlestory and shrub layers are composed of pines, box elder, sweetgum, blackberry, mimosa, greenbrier, sassafras, staghorn, and winged sumacs, honey locust, grape, and young white oak. Japanese honeysuckle, poison ivy, broomsedge, grasses, asters, and components of upper layers dominate the herbaceous layer. Much of the open forested land is covered with kudzu, non-native vegetation that is seriously threatening natural vegetation survival and diversity on over 2,000 acres of RSA (U.S. Army Aviation and Missile Command, 1994).

Mountainous uplands on RSA support eastern red cedar and oak hickory woodlands on the drier, more exposed slopes, and beech, sugar maple, and yellow poplar on moist sites. In rocky soils at higher altitudes, disturbances, such as fires on Hatton and Bradford Mountains, have encouraged growth of mixed hardwood and Virginia pine forests (U.S. Army Aviation and Missile Command, 1994).

Large mowed fields, pasture, and hay fields, planted with varieties of fescue, lespedeza, and rye grass, can also be found on RSA. Fields not managed for agriculture are covered by broomsedge, a variety of grasses, and seedlings of tree and shrub species. Also, upland areas with deep soils, such as old agricultural land and areas around buildings, have been planted with loblolly pines (U.S. Army Aviation and Missile Command, 1994).

3.2.3.2 Wildlife

The diverse habitats represented at RSA and MSFC support a wide variety of wildlife. The presence of the 4,000-acre Wheeler National Wildlife Refuge (WNWR) adds to this diversity. Collectively, the wide range of upland, wetlands, and aquatic habitats and the large size of RSA and MSFC result in use of the area by a large number of wildlife species (U.S. Army Aviation and Missile Command, 1994).

RSA provides suitable habitat for carnivores such as the red and gray fox, bobcat, and mink. Opossum, cottontail, beaver, gray squirrel, woodchuck, coyote, raccoon, and skunk are also found on RSA. Several species of game birds such as the northern bobwhite, mourning dove, wild turkey, and several species of duck are common on RSA. Red-tailed and sharp-shinned hawks, great horned owls, American kestrels, and eastern screech owls are raptors present on RSA. Wetlands provide a large amount of waterfowl habitat (U.S. Army Aviation and Missile Command, 1994).

A wide variety of aquatic invertebrate species have been collected in dredge samples from Huntsville Spring Branch and Indian Creek (U.S. Department of the Army, 1996).

3.2.3.3 Threatened and Endangered Species

Table 3.2-2 shows the species with federal or state status located on or near RSA and MSFC.

Table 3.2–2 Species with Federal or State Status Potentially Occurring at RSA and MSFC

Scientific Name	Common Name	Status State	Status Federal
Plants			
Apios priceana	Price's potato-bean	—	T
Clematis morefieldii	Morefield's leather flower	—	E
Eriogonum longifolium var *harperi*	Harper's umbrella plant	—	SC
Marshallia mohrii	Mohr's Barbara's buttons	—	T
Panax quinquefolius	American ginseng	Regulated by permit	Candidate 3C
Trillium pusillum var. *alabamicum*	Dwarf trillium	—	SC
Xyris tennesseensis	Tennessee yellow-eyed grass	—	E
Crustaceans			
Palaemonias alabamae	Alabama cave shrimp	SP	E
Reptiles and Amphibians			
Aneides aeneus	Green salamander	SP	—
Alligator mississippiensis	American alligator	SSC	T (S/A)
Fish			
Etheostoma tuscumbia	Tuscumbia darter	SP	SC
Typhlichthys subterraneus	Southern cavefish	SP	—
Birds			
Falco peregrinus anatum	Peregrine falcon	SP	FE
Haliaeetus leucocephalus	Bald eagle	SP	T
Picoides borealis	Red-cockaded woodpecker	—	E
Mammals			
Felis concolor cougar	Eastern cougar	—	E
Myotis grisescens	Gray bat	SP	E
Myotis sodalis	Indiana bat	SP	E

Source: U.S. Army Aviation and Missile Command, 1994; Alabama Natural Heritage Program, 1995; National Aeronautics and Space Administration, 1997b; Redstone Arsenal, 1998b; 1999b.

– Not listed
SP State Protected
E Endangered
FE Formerly Endangered
T Threatened
(S/A) Listed by similarity of appearance to a listed species
SC Species of Concern
SSC State Species of Concern

Moderate habitat exists on RSA for the Price's potato-bean (Apios priceana), a federal threatened plant that grows in mixed hardwoods or clearings. Moderate habitat is also present in limestone outcroppings for the federally endangered Morefield's leatherflower (Clematis morefieldii), but it has not been identified on RSA (U.S. Army Aviation and Missile Command, 1994; Redstone Arsenal, 1998b).

Limited habitat exists on RSA for the federally and state endangered Mohr's Barbara's buttons (*Marshallia mohrii*). It occurs in moist to wet springs and natural clearings in mountainous areas. The federal endangered Tennessee yellow-eyed grass (*Xyris tennesseensis*) is found in calcareous soils of mountain seeps, wet meadows, and along spring fed streams (U.S. Army Aviation and Missile Command, 1994). Neither of these species has been identified at RSA.

The AMCOM Directorate of Environment and Public Works (DEPW) at RSA is currently funding monitoring of the Price's potato-bean, dwarf trillium (*Trillium pusillum* var. *alabamicum*) and Harper's umbrella plant (*Erigonum longifolium* var *harperi*), which are federal Species of Concern, and American ginseng (*Panax quinquefolius*), a state-regulated species (Redstone Arsenal, 1999b).

The federally endangered Alabama cave shrimp (*Palaemonias alabamae*) are known only to exist in Madison County, Alabama, and have been found in flooded caverns on RSA. These small shrimp have no eyes and no pigmentation except around the thorax region. On RSA, this species is known from lentic pools with muddy bottoms in Bobcat Cave. Three other caves in Madison County are known to contain cave shrimp (not in RSA). Bobcat Cave is located in the extreme northwestern corner of RSA. Little information is available about this species, but their preferred habitat is a subterranean pool lying over a silt substrate. They also seem to require an external carbon source to support their detrital-based food chain in the lightless cave environment (Weber, S., 2000). They may also be able to exist in hydrogeologically isolated areas that are essentially separated from the main underground aquifer system. This raises the possibility that they could occur in parts of RSA where they have not been previously reported (Weber, S., 2000). The AMCOM DEMP at RSA is currently funding habitat and life history investigations on the Alabama cave shrimp species (U.S. Army Aviation and Missile Command, 1994).

The American alligator occurs in rivers, swamps, small and large ponds, sloughs, and freshwater and brackish marshes. Over a decade ago, a number of alligators were released on Wheeler National Wildlife Refuge. An estimated 40-50 alligators are currently found on the refuge, and at least one active nest was located during the summer of 1998 (U.S. Fish and Wildlife Service, 1999a). Alligators have been sighted, and even captured, on RSA; however, these occurrences are infrequent (U.S. Army Aviation and Missile Command, 1994).

Although bald eagles are known to exist in Wheeler National Wildlife Refuge, they occur merely as transient migrants on RSA. No known nesting attempts have been made, and the birds are absent during the spring and summer months. No red-cockaded woodpeckers have been observed on RSA (Redstone Arsenal, 1998b). Moderate habitat is present for the federal and state endangered gray (*Myotis grisescens*) and Indiana (*Myotis sodalis*) bats. The bats use RSA for foraging habitat (Redstone Arsenal, 1998b; U.S. Army Aviation and Missile Command, 1994). The Indiana bat has not been trapped (mist netted) on RSA (Redstone Arsenal, 1999b).

The green salamander (*Aneides aeneus*), listed as a protected species by the State of Alabama, is known to occur in the hills east of the proposed PTF site. It does not occur within the PTF site construction area, but probably does exist within the area of the safety arc. The habitat for this species includes rock crevices on shaded sandstone cliff faces and mesic upland hardwood forests (Redmond, W.H., 1985). For optimal habitat, cliffs must have narrow cracks and holes, the cliff face must be moist but not wet, and openings must be at least partially sheltered from direct sun and rain (Barbour, R.W., 1971). This species also occurs under loose bark of dead trees and stumps, and may reach high density populations in logged-over areas where dead treetops have been left in place (Barbour, R.W., 1971). The species may also occur under stones (Cochran and Goin, 1970), rocks in crevices, or in arboreal habitats (Gordon, R.E. 1952). Outside of the region where the mixed mesophytic forest is typically developed, this species lives primarily in rock crevices in close association with small isolated stands of mixed mesophytic forest (Gordon, R.E., 1952).

The eastern cougar (*Felis concolor cougar*), a federal endangered species has not been identified on RSA. The peregrine falcon (*Falco peregrinus anatum*) is a transient species that is seldom seen at RSA.

A complete survey at RSA for threatened and endangered species performed in 1995 did not identify any endangered species in the proposed areas (Alabama Natural Heritage Program, 1995). The AMCOM DEPW has developed an Endangered Species Management Plan. The Endangered Species Management Plan describes the listed and proposed endangered and threatened species and ecologically sensitive areas found on the post, the conservation goals for these species and associated habitats, management prescriptions, monitoring and inventory programs, and funding requirements for plan implementation. The plan would serve as a guide for the conservation of biological diversity through the protection of listed, proposed, and candidate species and the associated critical habitats (U.S. Army Aviation and Missile Command, 1999).

Implementing the plan would improve sustainability of healthy, diverse, and productive plant resources, animal communities, and aquatic habitats to further support habitat and species biodiversity. Implementing the plan would specifically benefit threatened and endangered flora and fauna indigenous to RSA/MSFC and their habitats (U.S. Army Aviation and Missile Command, 1999).

3.2.3.4 Environmentally Sensitive Habitats

Environmentally sensitive habitats on RSA and MSFC include wetlands and Wheeler National Wildlife Refuge. Additional environmentally sensitive areas listed in the Natural Heritage Inventory and the Endangered Species Management Plan include William's Spring, Weeden and Madkin Mountains, Huntsville Spring Branch, Bell Bluff, Lehman's Bluff, sandstone outcroppings, caves, and Bradford Sinks (Swan Pond Wetlands Complex).

Wetlands

Over 20 percent of RSA land is considered wetlands. Wetlands communities at RSA include: (1) riparian areas associated with the major floodplains, such as Huntsville Spring Branch, Indian Creek, and McDonald Creek; (2) terrace wetlands such as oak flats where the water table is close to the surface during part of the year; and (3) spring-fed basins such as Swan Pond and the system near the Fishing Hole Cave. About half of these wetlands are found within the Wheeler National Wildlife Refuge. They are characterized by swampland and bottomland hardwood forest. Palustrine emergent wetlands (marshlands) are mainly found on the test ranges, although some are in pastures and along edges of ponds. More than one-quarter, or 4,047 hectares (10,000 acres), of RSA is affected by high stages of the Tennessee River and other tributary streams. The primary streams that traverse the installation are Huntsville Spring Branch, Indian Creek, and McDonald Creek (U.S. Department of the Army, 1996).

The sites proposed for use by the IFX ground-test program are not located within wetlands areas. Wetlands are located adjacent to the proposed PTF site.

There are no wetlands near Buildings 4718 and 4755 on MSFC that could be affected by the IFX ground-test program.

Wheeler National Wildlife Refuge

Wheeler National Wildlife Refuge lies west and south of RSA, and a small part extends onto MSFC. The refuge is located along the Tennessee River north of MSFC to just below Slaughter Landing on RSA. The refuge was established in 1938 and is composed of 34,500 acres. It is considered the easternmost national wildlife refuge of the lower Mississippi Flyway, and 115 species of fish, 74 species of reptiles and amphibians, 47 mammals, and 285 species of birds are listed as occurring there. Habitat types on Wheeler Refuge include bottomland hardwoods, wetlands, pine uplands, shoreline or riparian woodlands, agricultural fields, and backwater embayments. The refuge manages approximately 3,500 acres of cropland. Local farmers grow crops on a share arrangement and leave a portion in the field for wildlife as payment for use of the land (U.S. Fish and Wildlife Service, 1998).

3.2.4 Cultural Resources

For a discussion of cultural resources as well as a description of the types of laws and regulations that govern these resources, see Section 3.1.4.

3.2.4.1 Prehistoric and Historic Archaeological Resources

Archaeological investigations at RSA and MSFC indicate that human occupation of the Wheeler Basin first occurred approximately 13,000 years ago. Because of the diverse topography, fertile soils, abundant water, and varied plant and animal habitats, the area is among the earliest populated in the southeastern United States. Prehistoric occupation of the area is most simply divided into five successive periods—the Paleo-Indian Period (approximately 11,000 BC to 8000 BC), the Archaic Period (approximately 8000 BC to 1000 BC), the Gulf Formational Period (1000 BC to 300 BC), the Woodland Period (300 BC to AD 900), and the Mississippian Period (AD 900 to 1500). The last of the prehistoric periods ended with the arrival of Euro-American fur traders (U.S. Army Materiel Command, 1996).

Huntsville and the area of RSA remained under the control of indigenous populations until the beginning of the nineteenth century, when there was a westward movement of Euro-American settlers toward the Tennessee River. From this time, hostilities existed between the Indian tribes as well as between the tribes and Euro-American settlers; however, those tensions stopped when the Creek were defeated at Horseshoe Bend in

1814. After the Creek War, settlement of the area grew rapidly and was largely focused on farming of cotton—an industry that dominated the region around RSA and Huntsville for nearly 45 years (National Aeronautics and Space Administration, 1996). By 1850, the area had established itself as one of the most prosperous agricultural areas in the South, and that prosperity was reflected in the abundance of large houses on the farms and in the "planter" towns.

During the Civil War, raids and detached engagements kept the whole of north Alabama under constant tension. The federal garrison at Madison was attacked and the station destroyed in 1864, and numerous other encounters occurred in and around the Huntsville area throughout the war years. During the 15 years after the war, the Huntsville area struggled with a series of obstacles to the restoration of the pre-war economy—the abolition of slavery, the war destruction of the transportation network, a series of droughts in the late 1860s, and the volatility of the commodity markets (National Aeronautics and Space Administration, 1996). Construction of several large factories (the Dallas Manufacturing Company in 1891 and the Lincoln mills in 1918) helped to stabilize the economy somewhat, but when the cotton industry waned in the 1920s, the Huntsville economy became as depressed as many other communities in the United States.

During World War II, the Huntsville area was selected as the site for the nation's newest chemical warfare manufacturing plant (Huntsville Arsenal) and shell-loading plant (Redstone Ordnance Plant). Both were completed by 1942 and operated over a 4-year period. At the end of the war, the manufacturing from both plants essentially ceased and, until the Army relocated its rocket research and development program from White Sands, New Mexico, to Huntsville around 1950, there was little activity on the installation. The Ordnance Guided Missile Center (originally the Army Ballistic Missile Agency and renamed MSFC in 1960) was established under the direction of Dr. Wernher von Braun at the location of the two plants. The Huntsville economy finally stabilized through rocket research activities; these activities continue to the present (National Aeronautics and Space Administration, 1996).

Prehistoric and/or historic archaeological sites near the STF complex sites include one historic site (unnumbered but included as part of the National Register registration form for the Harris House); one site within the direct ground disturbance area for the PTF (Site 1Ma 630, which is potentially eligible for inclusion in the National Register); two sites within the 1,800-foot explosive safety quantity-distance (ESQD) zone for the PTF (sites 1Ma 629 [not currently recommended as potentially eligible] and 1Ma 269 [currently recommended as potentially eligible]); and several sites within the 0.75-mile safety zone, some of which are potentially eligible (Holland, 1998). There is also one cemetery near the PTF; an unnamed cemetery is located within the 1,800-foot ESQD zone for the PTF between Igloos 8308 and 8307. In addition, excavations for utilities would be conducted along the east side of McAlpine Road and along the south side of Buxton Road (extending from the intersection of Buxton Road and Patton Road). Of this particular area, running along the roadway, only one NRHP eligible archaeological site is present, Site 1Ma649 (Curry, personal communication). This site is located east of

McAlpine road and north and east of a channelized drainage, near Bunker 8062 (near the northern edge of the site). The site is 75 m by 70 m in extent. Last, the fiber optic corridor from Building 8876 to the PTF would traverse approximately 750 feet where previous archaeological surveys have not been performed.

3.2.4.2 Historic Buildings and Structures

Historic buildings and structures at RSA would be associated with historic activities such as farm and homestead sites, small communities, tenant slave and soldier quarters, remains of early manufacturing plants, and public and private cemeteries.

In 1984, an historic buildings and structures inventory was conducted by Building Technology Incorporated for RSA (which included the MSFC) and formally coordinated with the Alabama SHPO (National Aeronautics and Space Administration, 1996). Only four buildings and structures were determined to be historically significant—all are associated with MSFC. The four properties, all of which are now listed on the National Register and designated National Historic Landmarks include the Redstone Rocket Test Facility, the Neutral Buoyancy Space Simulator, the Propulsion and Structural Test Facility, and the Saturn V Dynamic Structural Test Facility (National Aeronautics and Space Administration, 1997b).

Since the survey is over 10 years old and many buildings have become 50 years old since 1984, the SHPO no longer accepts the findings. World War II and Cold War architectural historic surveys are underway (Redstone Arsenal, 2000a; Redstone Arsenal, 2000b). The RSA Environmental Quality Division has contracted for additional research to be conducted and reports prepared on World War II (WW II) Huntsville Arsenal chemical warfare buildings, the Huntsville Arsenal Administrative Area buildings, and Gulf Chemical Warfare buildings, additional assessments of Cold War buildings, and for the preparation of a Cold War historic context for RSA. This additional research is being conducted in response to SHPO questions concerning the determinations of eligibility in the architectural surveys.

Background research for a Cold War Context for RSA and an inventory of Cold War era buildings and structures were conducted in July 1999. The Cold War historic context and survey report and the WW II survey report are in final draft form. The Cold War Context and reconnaissance survey has recommended one Cold War district: the Guided Missile Center Historic District with nine buildings and a period of significance from 1950-1956. This potentially historic District consists of contributing Buildings 110, 111, 112, 114, 116, and 118 and non-contributing Buildings 109, 113, and 115.

All the buildings in the proposed Guided Missile Center Historic District were constructed during WW II and are at least 50 years old. The buildings in this District have been determined not eligible in the WWII context for RSA by the additional research on WWII buildings.

Buildings 4381, 4484, 4488, 4489, and 4505 are individual Army buildings located in Plant Area Number 1 of the former WWII Huntsville Arsenal. All of these buildings are considered eligible for the National Register of Historic Places (NRHP) in the Cold War context.

The additional research on WW II buildings recommended the WW II Huntsville Arsenal Administrative Area not eligible, but identified and recommended five historic districts and one individual building eligible in the WW II context. The five districts are: Huntsville Arsenal Carbonyl Iron Unit Historic District, the Huntsville Arsenal Mustard Gas Historic District, the Redstone Arsenal South Plant Line 3 Historic District, the Redstone Arsenal North Plant Line 2 Historic District, and the Gulf Chemical Warfare Depot, Igloo Area 2. The building recommended individually eligible is the Sam Harris House (Building 8012).

The reports resulting from the additional research will be coordinated with the Alabama SHPO for concurrence. (Redstone Arsenal, 1999a).

In addition, the Sam Harris House (Building 8012) is considered "locally unique" because of its association with homesteading in the RSA area. The original construction date of the house is not known, but it is believed to have been created by joining two houses (including a former slave quarters) around 1927; there is an associated cemetery (the Penland-Cooper cemetery). The house has been determined eligible for listing in the National Register (U.S. Army Materiel Command, 1996) and is situated near Building 8027 which would be used by the IFX ground-test program for offices and storage.

Four additional facilities, Buildings 3465, 3470, 4488, and 5681, were evaluated for listing in the National Register by the Mobile District Corps of Engineers in 1995 and determined to be ineligible (U.S. Army Materiel Command 1996). Although Building 4488 was determined not eligible in 1995, it has been determined exceptionally significant in the Cold War context for RSA Dr. Wernher von Braun's office was located in this building (Redstone Arsenal, 1999a). It was also the U.S. Ballistic Missile Agency (USBMA) Headquarters building. Beginning in 1950, RSA became the center for U.S. Army missile research and development. The ABMA designed, developed, produced, and launched America's first intermediate range ballistic missile and first earth satellite, EXPLORER I, into orbit. ABMA personnel and facilities comprised NASA's Marshall Space Flight Center when it was created at Redstone Arsenal in 1960.

Buildings and structures within or immediately adjacent to STF complex sites include 70 weapons storage igloos, seven of which are within the direct ground disturbance footprint of the PTF complex (Buildings 8330, 8331, 8338, 8339, 8348, 8347, and 8340—all constructed in 1942) and 63 of which are within the PTF ESQD, and Building 8027 (constructed in 1942). Building 8027 and the 70 weapons storage igloos are within the former WW II Gulf Chemical Warfare Depot. Building 8027 has been recommended not eligible in the report resulting from additional research on WW II buildings. The 70 weapons storage igloos are within the Igloo Area 2 Historic District proposed in this same report. This report will be sent to the Alabama SHPO for concurrence. (U.S. Army Aviation and Missile Command, 1997; Wu, 2000). However, since concurrence from the Alabama SHPO has not yet been received, they must be treated as potentially eligible.

Buildings 4718 and 4755 on MSFC were constructed in 1991 and 1964, respectively, and are not known to have any historical significance.

3.2.4.3 Native Populations/Traditional Resources

At the time of Euro-American contact, several tribes, among them the Cherokee, Chickasaw, Coushatta, Creek, and Shawnee, populated the area of Huntsville and RSA. Tribal boundaries were under constant dispute, and the area was hostile and unsettled. In 1786, the boundaries of two of the tribes were formalized under the Treaty of Hopewell, which placed a Cherokee/Chickasaw boundary line through Madison County. However, neither tribe appeared to have occupied the region after the treaty was ratified.

In 1830, the Indian Removal Act authorized relocation of many Native American tribes to the western United States. One of the most notable of the relocations involved the Five Civilized Tribes of the Choctaw, Chickasaw, Creek, Cherokee, and Seminole (Klegler, 1999). Most of the Native American peoples living in the area of RSA were relocated at that time. Very few remained; of those who chose to stay, ownership of all land in Alabama was relinquished to the U.S. Government. The Tunica-Biloxi tribe has contacted the AMCOM DEPW and requested to be included in their Native American consultation process (Redstone Arsenal, 1999a).

Important traditional resources sites are subject to the same regulations and are afforded the same protection as other types of historic properties. Traditional sites associated with the identified tribes could include archaeological and burial sites, mounds, ceremonial areas, caves, rockshelters, hillocks, water sources, plant habitat or gathering areas, or any other natural area important to this culture for religious or heritage reasons. By their nature, traditional resources sites often overlap with (or are components of) archaeological sites. As such, some of the National Register-listed or -eligible sites identified at RSA could also be considered traditional resources sites or contain traditional resources elements. Currently, no traditional cultural properties have been formally identified near STF sites.

3.2.5 Geology and Soils

This section provides an overview of the physiography, geology, soils, and geologic hazards in the vicinity of RSA and MSFC.

3.2.5.1 Physiography

The topography of RSA and MSFC is gently rolling, with elevations primarily in the range of 600 to 650 feet msl. The terrain generally slopes from north to south toward the Tennessee River. Peak elevations of approximately 1,240 feet msl occur in the north central portion of the installation in the Weeden and Madkin Mountains. Low areas are composed of valleys and floodplains along the Tennessee River and its tributaries to the north and are characterized by elevations of approximately 556 to 560 feet msl. Elevation at the proposed PTF area is approximately 600 feet msl (Geological Survey of Alabama, 1975).

3.2.5.2 Geology

The geologic units underlying RSA and MSFC are sedimentary in origin and are composed of Tuscumbia Limestone, Fort Payne Chert, Chattanooga Shale, and other geologic units. In mountain areas, Ste. Genevieve Limestone, Harselle Limestone, and

Bangor Limestone overlie the Tuscumbia Limestone. The surface geology consists of unconsolidated sedimentary material (regolith), primarily derived from weathering of bedrock. Regolith formed from the Tuscumbia Formation, consists of clay and rectangular to irregular blocks of chert. The Regolith thickness varies from approximately 20 to 40 feet in the northeast part of RSA to as much as 80 feet in the southern and western portions (U.S. Army Aviation and Missile Command, 1994).

3.2.5.3 Soils

The soil survey of Madison County identified six different soil associations within RSA and MSFC. The predominant soil type mapped for the installation consists of a deep, well drained to moderately drained, silt loam to silty clay loam. These soils typically possess a loamy surface horizon underlain by a loamy to clayey subsoil layer with lenses of silty and/or sandy clay. Rock fragments generally occur throughout the clayey material. Soil depths range from very shallow on the mountains to much deeper along the larger tributaries of the Tennessee River. Soils at the proposed PTF complex are of the Holston-Tupelo-Robertsville soil association and are considered poorly to moderately well drained with variable permeability (Geological Survey of Alabama, 1975).

Areas of prime farmland are located throughout the level to gently sloping portions of RSA, including uplands, foot slopes, stream terraces, and floodplains. However, the Natural Resources Conservation Service has determined that the prime farmland areas at the installation are excluded from consideration as prime farmland in accordance with the Farmland Protection Policy Act (U.S. Army Aviation and Missile Command, 1994).

3.2.5.4 Geologic Hazards

Unstable Soils

Soils within the vicinity of the STF complex sites exhibit a low to moderate shrink/swell susceptibility and moderate susceptibility to water and wind erosion (Iowa State University Statistical Laboratory, 1998). Consequently, unstable soils are not anticipated.

Seismicity

RSA and MSFC are located in seismic zone 1, according to the Uniform Building Code. There is a low probability of earthquakes within this seismic zone (U.S. Department of the Army, 1997). There are no known areas of volcanic activity within the State of Alabama.

3.2.6 Hazardous Materials And Hazardous Waste Management

For a general discussion of the regulations governing hazardous materials and hazardous waste management, see Section 3.1.6.

3.2.6.1 Hazardous Materials Management

Numerous types of hazardous materials are used annually to support the various missions and general maintenance operations at RSA. These materials include common building paints, industrial solvents, fuel oil, and gasoline. Onsite contractors supporting installation operations also use hazardous materials.

Hazardous materials management is the responsibility of each individual or organization. The DEPW oversees all hazardous materials activities and promulgated Hazardous Material/Waste Management System Operating Procedures. DEPW has established a tracking system that records and labels each hazardous material item and monitors its storage and use (U.S. Army Aviation and Missile Command, 1996).

Hazardous materials are turned over to the Defense Reutilization and Marketing Office (DRMO), which attempts to find another user for the material. If a new user cannot be located, the material is declared waste and is disposed of offsite in a permitted treatment, storage, and disposal facility by a RCRA-approved contractor. The AMCOM Disaster Control Plan for RSA and AMCOM Regulation 420-5 require an SPCC Plan and Installation Spill Contingency Plan for oil and hazardous substances. The DEPW also maintains Spill Plans for MSFC and the AMCOM Base Support Contractor (U.S. Army Aviation and Missile Command, 1996). RSA has a hazardous materials response team.

The proposed AI&TF would be located at MSFC, in Buildings 4718 and 4755. AI&TF operations would include support shops and laboratories consisting of machine shops, welding shops, paint shops, electrical shops, and instrument calibration and repair labs. Possible hazardous materials handled during AI&TF operations include petroleum products, lubricants, and solvents. Only small amounts of hazardous materials are anticipated, since hazardous materials would only be needed for testing. No laser firing would occur at the AI&TF complex.

3.2.6.2 Hazardous Waste Management

Hazardous waste management at RSA is regulated under 40 CFR 260-280 and Alabama Administrative Code 22-30, *Hazardous Waste Management*. These regulations are implemented through AMCOM Regulation 200-2, Chapter 5, “Hazardous and Solid Waste Management.” Storage, treatment, and disposal hazardous waste operations are conducted in accordance with RCRA Part B permit (AL7-210-020-742). The DEPW's Hazardous Material/Waste Management System Operating Guidelines define specific procedures for analyzing and turning in hazardous wastes (U.S. Army Aviation and Missile Command, 1996). Biennial reports of all hazardous waste material generated are sent to ADEM.

RSA is a large quantity generator of hazardous wastes. All hazardous waste generated is labeled with the appropriate USEPA identification number and is transported, treated, and disposed of under this number. All individuals or organizations at RSA are responsible for administering all applicable regulations and plans regarding hazardous waste, and for complying with applicable regulations regarding the temporary accumulation of waste at the process site. Wastes are stored at the point of generation in appropriate plastic or steel containers for up to 90 days. From the point of generation, wastes are stored onsite for up to 1 year in nine modified, watertight hazardous waste igloos before disposal offsite. These igloos are located on 51 acres on the southern part of the installation in a fenced restricted area, and are constructed of reinforced concrete with secondary containment. Each igloo has the capacity to store 240 drums, and each is designated for the storage of one type of waste (e.g., ignitable, corrosive, reactive, or toxic). Typically, the storage site operates at less than 50 percent capacity. RSA reported the generation of approximately 425,000 pounds of hazardous waste in 1997 (Hubbard, 1998).

MSFC is a less-than 90-day, large quantity, hazardous waste generator as defined in 40 CFR 262. Approximately 250 sources generate hazardous waste on MSFC. These waste include: cadmium, chromium, lead, and other metals; characteristic wastes that exhibit the characteristics of ignitability, corrosiveness, or reactivity, lab packs of small amounts of hazardous waste; spent solvents; and wastewater treatment sludge. Collection and management of hazardous waste is the responsibility of the Institutional Mission Services contractor and is an ongoing current contract (1997).

The DRMO is responsible for managing and marketing excess and recoverable products and waste materials in accordance with applicable regulations. Hazardous items that cannot be marketed by the DRMO are disposed of as hazardous wastes.

The proposed AI&TF would be located at MSFC, in Buildings 4718 and 4755. AI&TF operations would include support shops and laboratories consisting of machine shops, welding shops, paint shops, electrical shops, and instrument calibration and repair labs. Possible hazardous wastes generated include, waste solvents, waste petroleum products, and metals (from painting operations and welding). Only small amounts of hazardous wastes are anticipated, since hazardous wastes would only be generated during ITU and IFX testing. No laser firing would occur at the AI&TF complex. Hazardous waste generated at the AI&TF is expected to be consistent with hazardous wastes currently generated at MSFC. Therefore, operation of the AI&TF is not anticipated to affect hazardous waste management procedures at MSFC.

3.2.6.3 Pollution Prevention

U.S. Army Regulation (AR) 200-1, Chapter 10, “Pollution Prevention,” outlines the Army policy for pollution prevention. The Army’s primary pollution prevention goal is to reduce reliance on products or processes that generate environmentally degrading impacts to as near zero as feasible. Under this regulation all installations must prepare a pollution prevention plan. RSA has prepared a Pollution Prevention Plan that meets this policy. The Pollution Prevention Plan establishes the overall strategy and describes specific objectives for reducing pollution of the ground, air, surface water, and groundwater. The purpose of the Pollution Prevention Plan is to provide sufficient guidance to pollution prevention management and operations at RSA. Specific goals include implementation of management practices that eliminate or reduce the use of hazardous materials, increase efficiency in the use of raw materials, protect natural resources, and source reduction through recycling, treatment, and disposal practices.

The DEPW’s Hazardous Material/Waste Management System Operating Procedures describe pollution prevention as all actions necessary to include the use of processes, practices, products, or management actions that eliminate or reduce undesirable impacts on human health. These actions include source reduction, recycling, treatment, and disposal.

In accordance with EOs 12856,12843-12845, 12873, 12902, and 12898, federal facilities are required to initiate pollution prevention (P2) efforts. These pollution prevention efforts include reducing consumption, recycling and procuring recycled materials, meeting targets for reducing the release and offsite transfer of toxic chemicals, and reporting the release and offsite transfer of toxic chemicals above threshold levels. MSFC is on schedule to comply with P2 requirements. The MSFC P2 Plan sets goals for meeting or exceeding reduction of chemicals, energy, water and the generation of wastes requirements.

3.2.6.4 Remediation

In response to requirements outlined in the RSA RCRA Part B permit, a RCRA Facility Assessment (RFA) was performed for USEPA in 1989. The investigations were supplemented by a 1991 study. The two studies identified 289 Solid Waste Management Units (SWMU) and Areas of Concern (AOC) at RSA. Contaminants identified as being suspected at the SWMUs/AOCs include heavy metals, pesticides, volatile organic compounds, and chemical warfare materials. As a result of the findings from several RCRA Facility Investigations (RFI), RSA was placed on the USEPA National Priorities List on June 30, 1994.

Currently, 91 sites are being investigated under the RSA Installation Restoration Program. Of these sites, 42 are at the site investigation phase, and 49 are at the RI/FS phase. Eleven sites are undergoing Interim Remedial Action/Removal Alternatives, three are receiving earthen cap and cover, six are receiving groundwater treatment systems, and two are being excavated with contamination removal. Review of historical records, aerial photography, and other information has revealed no known contamination at the sites proposed for STF complex facilities (Redstone Arsenal, 1998a). There is one CERCLA site (RSA 110) in the laser safety zone. RSA is remediating groundwater in and adjacent to the laser safety zone. The studies have shown that contaminated groundwater in the PTF area moves slowly to the northeast, away from the proposed PTF site.

3.2.6.5 Storage Tanks

As of 1999, RSA had 61 active tanks, and eight ADEM registered USTs. The eight active tanks meet the 1999 RCRA standards. Nine other USTs, which were out of service, were removed in early 1998 (Davis, 1999). The regulated tanks store gasoline, aviation gasoline, diesel, and used oil, while the unregulated tanks store heating oil. RSA is in compliance with all USEPA and Alabama storage tank regulations. There are no reported storage tanks in the areas proposed for STF facilities (Redstone Arsenal, 1998a).

There are a total of 85 ASTs and 30 USTs at MSFC. Of the 30 USTs, 10 are either closed or inactive. The majority of the USTs at MSFC store either diesel fuel or water (George C. Marshall Space Flight Center, 1996).

3.2.6.6 Asbestos

Building construction at RSA began in the 1940s (U.S. Army Materiel Command, 1996). Therefore, many of the older buildings have been surveyed for ACM (Davis, 1999). Building 8027 is known to contain asbestos in floor tiles and in pipe and tank insulation. Building 8339 and the other igloos have not been tested but are not thought to contain asbestos as they were constructed out of concrete and dirt (Crutcher, 1999).

Asbestos in insulation, floor tiles, building side, etc., is ubiquitous on MSFC. Buildings 4718 and 4755 are assumed to have ACM.

3.2.6.7 Polychlorinated Biphenyls

A survey of all large transformers for PCBs was completed at RSA in 1975. All large transformers containing PCBs were disposed of according to regulations. The USEPA allowed RSA to test pole-mounted transformers for PCBs as they are taken out of service. When transformers are found to have less than 50 ppm PCB concentration, they are sold through DRMO. Those transformers found to contain more than 50 ppm PCBs are disposed of by a PCB disposal contractor at an approved disposal facility. PCB-contaminated equipment could occur at the existing facilities proposed for modification. PCB contamination in transformers and other equipment must be verified or tested before proceeding with facility modifications.

MSFC pays RSA for its electrical power use and all power distribution infrastructure on MSFC up to each building. RSA owns and is responsible for all outdoor transformers on MSFC.

3.2.6.8 Lead-Based Paint

Although lead-based paint surveys have been conducted in certain buildings at RSA, none of the structures proposed for use as part of the STF complex have been tested. Prior to any building demolition or modifications, the construction contractor would conduct a lead-based paint survey.

3.2.7 Health and Safety

Redstone Arsenal Support Activity has entered into a mutual aid agreement with cities within a 50-mile distance to provide assistance in the event of an on-station emergency. Each organization may request equipment and manpower in the event of a fire or other emergency. In an emergency that may affect off-station areas, Redstone Arsenal Support Activity contacts the appropriate county emergency management staff (Redstone Arsenal, 1998a).

Health and safety for construction and contractor-supported activities is regulated under USACE Engineer Manual 385-1-1, Safety and Health Requirements Manual. The provisions of this manual implement safety and health standards and requirements contained in 29 CFR 1926, 29 CFR 1960, 30 CFR 56, EO 12196, DoD Instruction 6055.1, AR 385-10, and AR 385-40. Where more stringent occupational health requirements are set forth in the AR 40 series, they will be applied to work by government forces. Army regulations provide for health and safety programs that are at least as effective as OSHA programs.

MSFC requires that a health and safety plan be prepared for all construction work prior to construction.

3.2.8 Land Use and Aesthetics

This section describes the existing environment in terms of land use and aesthetics for the areas on and surrounding RSA. Topics addressed are regional land use, RSA land use, and aesthetics.

3.2.8.1 Regional Land Use

The Top of Alabama Regional Council of Governments, Madison and Morgan Counties, and the Cities of Huntsville and Madison are the local planning authorities for incorporated and unincorporated areas around RSA. Morgan County, located to the south of RSA, has no zoning in that part of the county. Land use in that section of Morgan County is comprised of primarily open areas, agriculture, forested areas, and scattered residential areas, with the closest residence located approximately 1.5 miles from the RSA boundary. Currently, land to the east and west of RSA is developed in light to moderate residential with some recreational and open areas. Wheeler National Wildlife Refuge is located southwest of RSA. Dense residential areas are located to the northwest and northeast of RSA. Industrial development occurs along the northern boundary, along with the U.S. Space and Rocket Center and some commercial areas. A sewage treatment plant is in close proximity to the east. Zoning, which indicates the likely long-term development patterns around RSA, is consistent with existing land patterns, and provides room for future growth (Redstone Arsenal, 1989).

3.2.8.2 On-Base Land Use

RSA encompasses an area of 37,910 acres in the southwest section of Madison County (U.S. Army Aviation and Missile Command, 1994). Within this area, the Army uses about 4,075 acres under a permit agreement with the Wheeler National Wildlife Refuge. Wheeler National Wildlife Refuge is located southwest of RSA and its property extends onto the southwest portion of RSA. The Tennessee Valley Authority (TVA) also allows RSA to use approximately 2,095 acres along the Tennessee River under a land use permit (U.S. Army Aviation and Missile Command, 1983). The remainder of the land was purchased between 1941 and 1942.

Land uses on RSA are broken down into ammunition supply, test and operations, administration, research and development, training areas, troop housing, community recreation, and family housing. The MSFC, other administration areas, and the research and development facilities, are in the central section of RSA. Ammunition supply areas are located in the southern part of the installation, which primarily consists of vacant storage igloos. However, some of these igloos are still used for storage. Family and troop housing, and most community recreation are located in the northern part of RSA, with some recreation along the Tennessee River. Test and operations areas are on the western and central part of the base. Training areas are scattered throughout RSA.

3.2.8.3 Aesthetics

Aesthetics for RSA and MSFC includes the general visual environment surrounding RSA and the areas visible from off-base areas. The visual environment of RSA is characterized by the typical Tennessee Valley contrast between low mountains and agriculture. Much of the southern half of the installation is covered in forested wetlands (swampland). Topography is gently rolling, with elevations ranging from 556 feet at the Tennessee River up to 1,240 feet at Weeden and Madkin Mountains, with the primary range being 600 to 650 feet (U.S. Army Aviation and Missile Command, 1994).

RSA is fairly undeveloped. The most important aspect of the natural environment is the gentle rolling nature of the land and the densely forested areas and wetlands. The most important man-made features are test, administrative, and housing areas in the northern portion of RSA. These features are surrounded with open spaces containing grass and trees. The landscape is dominated by forested land, with the remaining land being in pasture, scrub shrub, and wetlands. The area has a relatively low visual sensitivity because the lack of relief and heavy vegetation limits any prominent vistas.

Since public access to RSA is restricted, viewpoints are limited to marine traffic on the Tennessee River, the Town of Triana to the southwest, Madison to the northwest, Huntsville to the northeast, and interstate traffic to the north.

3.2.9 Noise

For a general discussion of noise and the method of measurement used in this EA, see Section 3.1.9.

3.2.9.1 Background Noise Levels Off RSA

Several populated areas surround RSA: Huntsville borders on the east, north, and west; Madison on the west-northwest; Triana on the southwest; Mooresville on the west; Somerville on the southwest; Decatur on the west-southwest; Hartselle on the southwest; and Falkville on the south-southwest. The largest population densities adjacent to RSA are in Huntsville on the north and east boundaries and along the northwest portion of the installation boundary in Madison. The Huntsville International Airport and other commercial/industrial land uses, which are not considered to be noise sensitive, are located on the west side of RSA beyond developing residential areas. Isolated farm residences are in the area south of and across the Tennessee River from RSA. The Wheeler National Wildlife Refuge extends into large portions of RSA from the southwestern corner.

The City of Huntsville adopted a noise ordinance (88-663) that regulates noise production by various sources and defines levels of ambient noise for several types of land use. Daytime noise levels are limited to 55 dBA in residential areas, 62 dBA in commercial areas, and 70 dBA in industrial areas (National Aeronautics and Space Administration, 1996). Noise levels within the developed areas are typical of an urban environment ranging between 45 and 80 dBA.

3.2.9.2 Background Noise Levels on RSA

For undisturbed areas of MSFC, the background noise levels are reported to be 46 dBA. The major operational noise sources at RSA include rocket motor flight tests, static rocket motor firings, ordnance detonations, gun firing, airfield operations, and vehicle traffic. Most test areas are located on remote parts of RSA; therefore, noise generated by testing appears to have little impact on RSA and the surrounding community. Some weapons firings, small missile firings, and static missile firings can reach decibels at the test location of 150 dBA (National Aeronautics and Space Administration, 1996).

Noise complaints from activities at RSA are minimal because the noise producing activities at RSA are located so that a large buffer exists between noise-producing activities and the nearest population center. RSA has conducted an Installation Compatible Use Zone (ICUZ) study showing minimal noise concerns outside of RSA boundaries.

3.2.10 Socioeconomics

This section provides a socioeconomic overview of the region surrounding RSA and MSFC. Socioeconomic resources are described in terms of population and employment.

3.2.10.1 Region of Influence

For purposes of this analysis, the region of influence that surrounds RSA and MSFC is defined as an area that includes those communities within an approximate 1-hour drive from the proposed test site. The drive time is delineated using a computer program that assumes a journey carried out within the legal speed limits and in moderate traffic densities. While the drive time polygon covers all or part of nine counties, four counties constitute the majority of the defined region. These four counties are Limestone, Madison, Marshall, and Morgan, and they include the communities of Huntsville, Decatur, Athens, and Hartselle.

3.2.10.2 Population

Each of the four counties that comprise the major part of the 60-minute drive time rank within the top 20 most populated of 67 Alabama counties. Madison County, which contains Huntsville and RSA, had the third highest population in Alabama in 1995. In 1997, there was a population of 469,563 within a 60-minute drive of the RSA. This population is forecast to increase by 1.4 percent annually to 503,648 by 2002. A straight-line projection suggests that the population will grow to 525,276 by 2005. The fastest growing locations within this economic region are within a 30-minute drive of RSA. The growth in the Huntsville area has been largely attributed to the establishment and rapid growth of the high technology space and defense industries.

Those referred to as economically active (age 18 and above) constitute about 75 percent of the regional population. Despite a discernible trend in aging of the local population, this proportion remains constant through 2005. The median age of the region's population was 35.8 years in 1997 and is expected to rise to a little over 38 years of age by 2005.

3.2.10.3 Employment

Limestone, Madison, Marshall, and Morgan counties had 196,725 non-federal jobs in 1993. Employment rose 4.3 percent to 205,319 jobs in 1995. If the forecast growth rate in jobs for the State of Alabama, as a whole, were applied to the four-county area, there would be approximately 227,000 jobs in the region by 2005. Slightly over 13 percent of Alabama's total personal income, or $10.8 billion, was generated in the four counties in 1995; the majority of this personal income was earned in Madison County.

A major portion of Madison County's growth in science and technology industries centers on the Cummings Research Park. Located west of downtown Huntsville, the park encompasses 3,800 acres and contains 185 research and development companies employing over 26,000 people. Over 40 percent of the Madison County labor force work is in executive, managerial, professional, or technical support positions.

RSA employed a total of 23,681 civilian and military personnel in 1999, with a total payroll of $1.08 billion. Of that total, MSFC employed 2,492 personnel with a payroll of $222 million. It has been estimated that 50 percent of the Huntsville area's economy is directly or indirectly related to NASA or military spending.

3.2.11 Transportation

Transportation potentially affected by the IFX ground-test program at RSA and MSFC includes nearby federal, state, and local roads, as well as on-base roads. In addition, railroads, waterways, and airfields also serve RSA and MSFC, forming an interrelated system that provides two primary functions: the means by which people and goods move into RSA and the means for internal circulation (George C. Marshall Space Flight Center, 1996). The current AMCOM-MSFC support agreement, dated 8 January 1990, calls for AMCOM support of MSFC, including the use of the NASA Dock Area; security services, including traffic control and law enforcement within MSFC (Martin and Rideout Roads only); and transportation services and facilities, including roads, railroads, and airfields. In turn, MSFC agrees to support AMCOM through use of its roads and railroads (George C. Marshall Space Flight Center, 1996; Noles, 1999). Road, rail, waterway, and air transportation networks are described below.

3.2.11.1 Roadways

Off-Installation Network

The main transportation corridors are Memorial Parkway (SH-231), I-565, Governors Drive (SH-20/431), University Drive (US-72), Jordan Lane (SH-53), and Rideout Road (SH-255). A 4-mile extension of Rideout Road, linking US-72 West and SH-53, allows greater access between I-565 and northeast Madison County (Huntsville/Madison County Chamber of Commerce, 1997). Access to I-65, located approximately 16 miles west of RSA, is via US-72 (University Drive), US-72A, and I-565, a 21-mile spur linking downtown Huntsville (and RSA) to I-65. Urban roadways include Drake Avenue, entering RSA from the east; Governors Drive, which serves as a regional corridor through Huntsville; Green Cove, providing access to Gate 2 (currently closed); and Jordan Lane, providing direct access to Gate 8. Jordan Lane becomes Patton Road near RSA, and it becomes SH-53 to the north of Huntsville. Memorial Parkway, one of the city's major arterials, is a north-south divided highway that traverses Huntsville and is located east of RSA. Drake Avenue, Martin Road, Redstone Road, and Green Cove link RSA to Memorial Parkway.

The City of Huntsville conducted capacity analyses on the above roadways in 1995 using 1992 traffic counts (City of Huntsville, 1997); these figures are adequate for current analysis (Sanders, 1998). The ADT, capacities, and LOS for key roadways are shown in Table 3.2-3. Most of the roadways are operating at an adequate level of service with the exception of University Drive to the east of Enterprise. Alabama DoT has scheduled an expansion to seven lanes for this roadway in the near future. Alabama DoT has also scheduled the construction of overpasses in the near future on Memorial Parkway at Whitesburg Drive and Weatherly Road to increase the capacity of this roadway to the south of the existing limited access section. Figure 3.2-1 shows the regional transportation network for RSA and MSFC.

On-installation Network

The primary RSA roadways connecting RSA to the off-base network are Rideout Road (SH-255), Patton Road-Jordan Lane (SH-53), Drake Avenue, Martin Road, Redstone Road, and Green Cove Road. Currently, all traffic to and from RSA is routed through seven gates (George C. Marshall Space Flight Center, 1996). The Hansen Road gate, at the northeast boundary, is permanently closed. The Green Cove Road Gate (gate 2), at the southeast corner of the installation, has also been recently closed. Most of the gates are on the east and north sides of RSA, with only one gate (Gate 7) located on the west side. The Tennessee River forms the south boundary of the installation and has no access.

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Figure 3.2-1 Transportation Network, Redstone Arsenal/Marshall Space Flight Center, AL

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Martin Road is also an urban roadway providing access to RSA. During the morning peak hours, Martin Road, from Patton Road to Memorial Parkway, operates with both lanes inbound; during the afternoon peak hours, these same lanes are outbound. Patton Road connects RSA to Jordan Lane and I-565 to the north. Redstone Road provides access from South Memorial Parkway to RSA. Rideout Road is a limited-access highway that connects to Gate 9 on the west side of RSA and provides access to I-565 and SH-53. Gate 9 is the primary entrance to RSA for employees living in the Madison and Decatur areas as well as communities north of Huntsville. The on-base roads are operating at an adequate level of service.

3.2.11.2 Waterways

Off-installation Facilities

Huntsville's proximity to the Tennessee River and the Tennessee-Tombigbee (Tenn-Tom) Waterway allows direct shipment along 16,000 miles of inland waters via river barge (Huntsville/Madison County Chamber of Commerce, 1997). Nearby ports include the Port of Decatur and Mallard-Fox Creek Industrial Park. In 1996, Decatur handled 273.0 million tons of commodity traffic. Tennessee River and Decatur traffic can be estimated from vessels processed at the Wheeler and Guntersville locks. In 1997, 3,223 tows and 25,084 barges traveled those waterways (Riberich, 1998). Mallard-Fox Creek, a general commodity dock, can accommodate eight barges (Huntsville Foreign Trade Zone Corporation, 1998).

Table 3.2–3 Average Daily Traffic Volumes and Level of Service, Huntsville, Alabama

Roadway	From	*Daily Capacity	1999 ADT	LOS
OFF BASE ROADS				
1-565	East of Rideout Rd.	136,000	72,000	B
	West of Rideout Rd.	102,000	70,500	
Drake Avenue	East of Jordan Lane	28,500	18,500	B
Jordan Lane	South of Bob Wallace	31,900	25,500	C
Memorial Parkway	South of Airport Rd.	75,000	67,700	C
	South of Martin Road	75,000	61,600	C
	South of Hobbs Rd.	33,900	30,000	C
University Drive	West of Jordan Lane	50,000	48,000	C
	East of Enterprise	33,900	58,000	F
Martin Road	West of Memorial Parkway	13,700	11,000	C
Redstone Road	West of Memorial Parkway	11,500	5,600	A
Rideout Road	North of I-565	50,000	36,200	B

*Capacity based on LOS C service volume
Source: City of Huntsville Planning Department

On-installation Facilities

Water transportation on RSA (located adjacent to the Tennessee River) was developed since distances between manufacturing, static testing, and launch sites, as well as cargo size, weight, and sensitivity, might preclude alternate transport (George C. Marshall Space Flight Center, 1996). There are two slips on Shields Road: the Army dock, unused since around World War II, and the MSFC dock, which has a recess for roll-on and roll-off loading and unloading. MSFC has overall responsibility for all special water transportation of shuttle components and related cargo between ports and as such, must monitor cargo loading, unloading, and in-transit care of the barges (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). MSFC's Marine Operations (Transportation Management Division) allows transport of large items via the "Orion," a 265-foot river/ocean covered barge with a 1,000-ton cargo capacity and available electric power for specialized cargo (National Aeronautics and Space Administration/Marshall Space Flight Center Transportation Management Services, 1997). Another covered river-ocean barge, the "Poseidon," is also available, as is an open-shuttle barge, the "Pearl River," both of comparable size to the Orion. The home port is New Orleans' Michoud Assembly facility (George C. Marshall Space Flight Center, 1996; Welch, 1998).

The distance from the PTF site to the dock is 4.8 miles. The RSA barge-loading dock, as well as a supporting road system capable of handling heavy cargo, allows direct access to deep water via the Tenn-Tom and the Tennessee/Ohio/Mississippi River System (National Aeronautics and Space Administration, 1997b). If barge transport on the Tenn-Tom (the suggested route for IFX ground-test activities) is disrupted in late winter/early spring, it can be compensated for by re-routing traffic up the latter system and south to the Gulf of Mexico, thus avoiding flood conditions entirely. Vessel height restrictions of 50 feet or less (due to bridge clearances) may also mandate the alternate route.

3.2.11.3 Railways

Off-installation Facilities

Huntsville is served by Norfolk Southern and by the Huntsville and Madison County Railroad Authority, a shortline railroad. Norfolk Southern provides rail coverage on an east to west route through Huntsville connecting in the downtown area with the Huntsville and Madison County Railroad Authority, which provides service into the southern area of Huntsville and Madison County. Both railroads have the ability to work with new or existing industries needing to establish new rail service or to modify existing rail service. Huntsville has no passenger rail service (Huntsville OnLine, undated).

On-installation Facilities

By 1973, RSA railway use diminished as alternate shipping methods increased (George C. Marshall Space Flight Center, 1996). Most of the track was removed, leaving only two small sections. A railhead with a seven-track spur less than 1 mile in length, located on Overlook Road near the north boundary, was retained to serve MSFC as needed (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). Another section, 1.4 miles in length, lies northeast of the intersection of Patton and Redstone roads and is utilized as the Redstone Rail Impact Test Facility. The former is the Norfolk Southern Railway Classification Yard and joins the main line just north of Gate 9. The latter is isolated, with no access to off-post railways (U.S. Army Aviation and Missile Command, 1983), and terminates at Sheffield Road. AMCOM retains right of access to all railroad tracks for operation, maintenance, and modification purposes (George C. Marshall Space Flight Center, 1996; Noles, 1999).

3.2.11.4 Airways

Off-installation Facilities

Huntsville International Airport and Huntsville-Madison County Jetplex are located approximately 8 miles west of RSA, allowing simultaneous operations via two parallel runways (National Aeronautics and Space Administration, 1997b) and five major and commuter airlines (Table 3.2-4). Assisting in Huntsville International Airport's efficiency are state-of-the-art facilities and the International Intermodal Air Cargo Center, a large terminal assisting the transport of shipments from truck to air and vice-versa (Huntsville/Madison County Chamber of Commerce, 1997). Other features include Foreign Trade Zone No. 83 and a U.S. Customs Port of Entry. Several small, private airports are also located in the Huntsville metro area (Huntsville OnLine, undated).

On-installation Facilities

As needed, AMCOM–controlled Redstone Army Airfield is used for bringing components into RSA for test and integration. This runway can accommodate 747s and C-5 transports (Fine, 1998) and is used by both military and civilian aircraft, although NASA and civilian aircraft require special advance permission. In emergencies, RSA and Huntsville International Airport facilities can be used on an interim, reciprocal basis (George C. Marshall Space Flight Center, 1996).

Table 3.2–4 Redstone Arsenal Available Airway Facilities

Airport/Airfield	Runways in feet	Commercial Operations	General Aviation Operations	Flights
Off-installation				
Huntsville International	West -8,000); East - 10,000)	26,816/annually	30,107/annually	80/day
On-installation				
Redstone Army Airfield	7,300 length; 150 width	Civil aircraft >600 arrivals-departures/month	N/A	600/month (1)

Source: Fine, 1998; National Aeronautics and Space Administration, 1997b; National Resources Defense Council, Inc., 1996; U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993.
(1) Approximately 35 percent of RSA traffic is NASA or NASA-related flights. With added personnel and shifts, RSA has the capability to double operations (U.S. Department of the Army, 1996).

3.2.12 Utilities

3.2.12.1 Water Supply

RSA operates separate potable and industrial water supply systems, with potable water acquired from the Tennessee River (EDAW, Inc., 1998c) and treated at one of three active water treatment plants (WTP). The primary WTP, No. 1, produces both domestic and industrial water; No. 2 is a generally inactive auxiliary industrial water source; and No. 3 treats industrial water to produce higher quality domestic water (George C. Marshall Space Flight Center 1996; U.S. Army Aviation and Missile Command, 1994). The WTPs have a combined capacity to deliver 9 million gallons per day (mgd) of potable water, with average consumption of 5 mgd and peak demand of 8 mgd (Redstone Arsenal, 1998a). Assuming a per capita water demand of 50 gallons per day, 1.2 mgd of base water supply would be for drinking water consumption.

The industrial water, obtained also from the Tennessee River, supplies restrooms and maintenance activities. The system can deliver over 34 mgd, with demand averaging between 12 mgd in the summer and 8 mgd in the winter; peak demands are 15 mgd and 13 mgd, respectively (Redstone Arsenal, 1998a). RSA stores 1.7 million gallons of potable water and 9 million gallons of industrial water. During emergencies, RSA can acquire 1 mgd of potable water from the City of Huntsville.

3.2.12.2 Wastewater

Domestic RSA and MSFC wastewater is treated at the Centralized WWTP, Domestic Treatment and Collection System 3, with a designed average capacity of 3.6 mgd. The peak 2-hour capacity is 9.0 mgd (Eubank, O., 1998b), and the peak 24-hour capacity is 6 mgd (RSA, 1998a). The average flow rate of the plant is 2.4 mgd, with a peak demand of 9.0 mgd. A potential increase in capacity of 0.3 mgd, average, and 1.0 mgd, peak, could result from a tie-in with the City of Huntsville system (Redstone Arsenal, 1998a). For 1997, during periods of wet weather, the average flow was 4.5 mgd (Eubank, O., 1998b). Effluent discharges to the Tennessee River under RSA's current NPDES permit. The plant accepts domestic municipal wastewater.

The WWTP at the Buxton-Shields intersection has a 6.0 mgd capacity and a current daily load of 2.80 mgd.

An assumed per capita wastewater generation rate of 30 gallons per day equates to approximately 710,000 gallons per day or 14 percent of the total daily flow for both WWTPs.

3.2.12.3 Solid Waste

RSA operates a 76.0-acre landfill for disposal of inert waste (rocks, construction materials, asphalt, and asbestos). The Army has applied to ADEM for a permit modification to increase the allowable disposal area from 41.8 to 43.3 acres. This modification would not affect the types of waste allowed, its service area, or its maximum daily volume. The landfill would still be allowed to accept only construction/demolition debris or similar wastes from within the RSA reservation at 600 cubic yards per day. ADEM's preliminary determination indicates the proposed modification would satisfy all applicable regulations. At current rates of use, it is expected to reach capacity in 15 to 25 years (Alabama Department of Environmental Management, 1997).

Most RSA/MSFC-generated solid waste is disposed of daily. RSA and MSFC dispose of roughly 31.5 tons of waste at Huntsville's Waste-to-Energy facility daily

(Eubank, O., 1998b). In 1997, RSA disposed of 9,600 tons of solid waste offsite, of which only a small portion was construction debris (Harrison, S., 1998).

3.2.12.4 Energy

Electrical

Electrical services to RSA are provided by the TVA, with a system composed of three subsystems—a transmission, a subtransmission, and a distribution system. The primary supply is obtained from the TVA 161-kV, 3-phase transmission systems; the part to which RSA is connected is supplied by three separate 161-kV generating stations: the Wheeler Dam (including the Browns Ferry Nuclear Plant); Guntersville Dam stations, which normally supply power to RSA; and the Widow's Creek Steam Generating Plant. The 161-kV transmission lines are transformed to a 44-kV, 3-phase subtransmission level by three government-owned primary substations (George C. Marshall Space Flight Center, 1996). Plans are underway for as many as 13 future substation units (Redstone Arsenal, 1998a).

RSA has access to a 182,108-kilovolt-ampere (kVA) electrical supply, with an average daily use of about 52,900 to 75,500 kVA and peak demand of approximately 80,000 kVA (Redstone Arsenal, 1998a), or less than 44 percent of available capacity. MSFC also has approximately 1,800-kVA total capacity through several emergency generators for critical or special electrical circuits (George C. Marshall Space Flight Center, 1996). The RSA electricity demand for FY98 averaged approximately 34.4 million kWh per month or 3,913 MMBtu per day (Lusk, R., 1999b).

Natural Gas

Natural gas for RSA is obtained through Huntsville Utilities at two locations: Goss Road, for firm consumption, and Patton Road, for interruptible (Eubank, O., 1998a; b). Natural gas is routed through MSFC at 45 pounds per square inch, but its primary purpose is to serve the Army-operated boiler plant (George C. Marshall Space Flight Center, 1996). RSA's average usage has been approximately 244.88 million cubic feet, or 2,448,823 therms (Lusk, R., 1999a). This energy usage equates to 2,448,000 MMBtu per day.

3.2.13 Water Resources

This section provides an overview of the surface and groundwater features, water quality, and flood hazard areas in the vicinity of RSA and MSFC, Alabama. ADEM is responsible for the management of the NPDES permit process.

3.2.13.1 Groundwater

The hydrology at RSA and MSFC can be characterized by three units: the regolith, the Tuscumbia Limestone and Fort Payne Chert, and the Chattanooga Shale. The Tuscumbia limestone and Fort Payne Chert compose the limestone aquifer. The upper regolith and the Chattanooga Shale, because they are relatively impermeable, act as the confining units for the limestone aquifer. Water in the lower layers of the regolith, by contrast, occurs under water table conditions. Groundwater movement reflects the topography and is generally from north to south toward the Tennessee River. In the vicinity of the PTF the water movement is to the north and then west toward the Tennessee River. Groundwater in both the limestone aquifer and the water table aquifer moves to lowland areas in the stream basin where it provides a base flow to the streams. The aquifers beneath RSA and MSFC are some of the most productive in Madison County. None of the aquifers in Madison County have been designated as sole principal drinking water sources under Section 1424(2)g of the Safe Drinking Water Act of 1974 (U.S. Army Aviation and Missile Command, 1994).

3.2.13.2 Surface Water

The Tennessee River, flowing west, forms the southern boundary of RSA. Other major watercourses that flow through RSA include Indian Creek, Huntsville Spring Branch, and McDonald Creek. Each of these tributaries generally flows south and empties into the Tennessee River.

The western portion of RSA drains into Indian Creek, and the eastern half drains into Huntsville Spring Branch. Indian Creek originates in the northwestern portion of Madison County, flows southward across RSA, and forms an arm of Wheeler Lake. Indian Creek drains the Wheeler Lake and joins the Tennessee River at Wheeler Reservoir near the southwestern boundary of RSA. McDonald Creek runs along the eastern boundary of RSA and drains the northeastern corner of the installation before joining Huntsville Spring Branch. Huntsville Spring Branch originates at a spring in the City of Huntsville, flows in a southwesterly direction across RSA, and empties into Wheeler Lake (U.S. Army Aviation and Missile Command, 1994; George C. Marshall Space Flight Center 1996).

Storm water is discharged (under separate NPDES permits for RSA and MSFC) to McDonald Creek, Huntsville Spring Branch, and Indian Creek as they cross RSA and MSFC to the Tennessee River. South RSA drains directly into the river. Since 1992, only two non-complying discharges have been reported, both short-term events resulting from unusually heavy rainfall.

3.2.13.3 Special Flood Hazard Areas

Special Flood Hazard Areas are defined as areas with a 1 percent or greater chance of equaling or exceeding an established flood level (100-year flood) in any given year. Such areas are typically referred to as floodplains.

Approximately one-third of RSA lies within the 100-year floodplain of the Tennessee River. These areas include most of the Wheeler National Wildlife Refuge, several creeks and ponds, and the Tennessee River Banks. The 100-year floodplain lies at elevations ranging from approximately 570 to 575 feet msl on RSA. For planning purposes, the 100-year flood level of the Tennessee River is established at approximately 572.5 feet msl. Much of the southern part of RSA is topographically below this elevation and within a 100-year floodplain (Redstone Arsenal, 1998a; Redstone Arsenal, 1999c).

Portions of MSFC in the west and southwest are within the 100-year floodplain. Buildings 4718 and 4755 are not situated within the 100-year floodplain (Redstone Arsenal, 1999c).

3.2.13.4 Water Quality

There is the potential for groundwater contamination at RSA as a result of past waste handling and generation activities, including the manufacture of chemical weapons and testing of rocket motors. Numerous groundwater investigations are planned or are in progress to aid in the identification and remediation of contaminated waste sites under RSA. Where identified, groundwater contamination is being monitored at test wells located across the installation as part of the IRP. The Army has initiated groundwater remediation on several sites and expects complete cleanup to take 10 to 20 years (U.S. Army Aviation and Missile Command, 1994).

Installation staff periodically sample and test water quality at several RSA locations on the Indian Creek and Huntsville Spring branches. Surface water quality is generally characterized as "moderately hard" to "hard," moderately high in dissolved solids, and high in manganese. Area surface waters, including Indian Creek, Huntsville Spring Branch, and McDonald Creek, are generally suitable for most uses and are classified by ADEM as suitable for fish and wildlife use. The Tennessee River adjacent to RSA has been classified for use as a public water supply and for fish and wildlife uses (U.S. Army Aviation and Missile Command, 1994).

Groundwater quality at MSFC has been affected in localized areas by MSFC operations, as has surface water quality. Site cleanup is ongoing as discussed in detail in the remediation section of this EA. Generally, local groundwater and surface water quality is similar to RSA (George C. Marshall Space Flight Center 1996).

3.2.14 Environmental Justice

For a description of EO 12898 and the methodology used for this analysis, see Section 3.1.14. Pursuant to this EO, in 1996 MSFC prepared an Environmental Justice Plan for the installation.

Most of the environmental effects from the IFX ground-test program at CCAFS are anticipated to occur in Morgan and Madison Counties. In developing statistics for the 1990 Census of Population and Housing, the U.S. Department of Commerce, Bureau of Census, identified small subdivisions used to group statistical census data. In metropolitan areas, these subdivisions are known as census tracts.

Tables for the 1990 Census of Population and Housing were used to extract data on low-income and minority populations in census tracts in Morgan and Madison counties. The census reports both on minority and poverty status. Minority populations included in the census are identified as Black; American Indian, Eskimo, or Aleut; Asian or Pacific Islander; Hispanic; or Other. Poverty status (used in this EA to define low-income status) is reported as the number of families with income below poverty level ($12,764 for a family of four in 1989, as reported in the 1990 Census of Population and Housing).

A census tract is considered disproportionate under either of these two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in the region of comparison, or (2) the percentage of low-income or minority populations in the census tracts exceeds 50 percent. Data for each census tract were compared to data for the regional political jurisdiction surrounding the tract. For this analysis, the region of comparison for RSA was defined as Madison and Morgan counties. Based on the 1990 Census of Population and Housing, Madison County had a population of 238,912. Of that total, 25,289 persons, or 10.85 percent, were low-income, and 56,002 persons, or 23.44 percent, were minority. Morgan County had a population of 100,043. Of that total, 11,285 persons, or 12.03 percent, were low-income, and 11,101 persons, or 11.10 percent, were minority.

Madison County is subdivided into 63 census tracts, of which 34 have a disproportionate percentage of low-income or minority populations (or both). Morgan County is subdivided into 24 census tracts, of which 11 have a disproportionate percentage of low-income or minority populations (or both). These census tracts have been determined to have disproportionate low-income and/or minority populations, and therefore may be subject to environmental justice impacts.

3.3 CAPE CANAVERAL AFS

The following sections discuss the affected environment or baseline conditions at CCAFS. This discussion includes the locations proposed for use by the IFX ground-test program as well as adjacent areas that have the potential to be impacted by program activities.

3.3.1 Air Quality

A general description of air quality and regulations is presented in Section 3.1.1.

3.3.1.1 Meteorology

At CCAFS, the climate is characterized by long, relatively hot summers and mild winters. The average temperature is 71°F with a minimum monthly average of 60°F in January and a maximum of 81°F in July. During the summer months, relative humidity ranges from 70 to 90 percent. Winter humidity levels are lower, ranging from 55 to 65 percent. Fog is generally a winter phenomenon limited to an average of 54 days annually. It is often associated with the passage of a weather front (Ballistic Missile Defense Organization, 1999).

The prevailing winds during the winter months are most often from the north and west. The winds generally shift to a southerly origin in the spring and originate predominantly from the south and east in the summer and fall. Midday mixing heights range from an average low of 2,300 feet in the winter to an average high of 4,600 feet in the summer. Strong temperature inversions are rare occurrences in this coastal location due to land-sea breeze phenomena and jet stream activity. On average, hurricane-force winds reach Brevard County approximately once in 20 years (Ballistic Missile Defense Organization, 1999).

Rainfall is seasonal with a wet season occurring from May to October and the remainder of the year being relatively dry. Average annual rainfall for CCAFS is approximately 48 inches, approximately 70 percent of which occurs during the wet season. The CCAFS area has the highest average annual number of thunderstorms in the

United States. On average, thunderstorms occur 76 days per year at CCAFS. During thunderstorms, wind gusts in excess of 60 miles per hour and rainfall greater than 1.0 inch per hour are not uncommon (Ballistic Missile Defense Organization, 1999).

3.3.1.2 Regional Air Quality

Federal actions must comply with the USEPA Final General Conformity Rule published in 40 CFR 93, subpart B (for Federal agencies) and 40 CFR 51, subpart W (for state requirements). The Final Conformity Rule, which took effect on January 31, 1994, requires all Federal agencies to ensure that proposed agency activities conform with an approved or promulgated SIP or Federal implementation plan (FIP). Conformity means compliance with a SIP or FIP for the purpose of attaining or maintaining the NAAQS. Specifically, this means ensuring the Federal activity does *not*: 1) cause a new violation of the NAAQS; 2) contribute to an increase in the frequency or severity of violations of existing NAAQS; 3) delay the timely attainment of any NAAQS; or 4) delay interim or other milestones contained in the SIP for achieving attainment.

The Final General Conformity Rule *only* applies to Federal actions in designated nonattainment or maintenance areas, and the rule requires that total direct and indirect emissions of nonattainment criteria pollutants, including ozone precursors, be considered in determining conformity. The rule does not apply to actions that are *not* considered regionally significant and where the total direct and indirect emissions of nonattainment criteria pollutants do not equal or exceed *de minimis* threshold levels for criteria pollutants established in 40 CFR 93.153(b). A Federal action would be considered regionally significant when the total emissions from the proposed action equal or exceed 10 percent of the nonattainment area's emissions inventory for any criteria air pollutant. If a Federal action meets *de minimis* requirements and is *not* considered a regionally significant action, then it does not have to go through a full conformity determination. Ongoing activities currently being conducted are exempt from the rule so long as there is no increase in emissions above the *de minimis* levels as the result of the Federal action.

CCAFS is located in Brevard County within the Central Florida Intrastate AQCR 48. AQCR 48 includes the Florida Counties of Brevard, Lake, Orange, Osceola, Seminole, and Volusia. The USEPA has designated the air quality within Brevard County as better than NAAQS for TSP and SO_2, and unclassified for CO, Pb, NO_2, O_3, and PM_{10}. The area is classified as Prevention of Significant Deterioration (PSD) Class II.

3.3.1.3 Air Emissions Sources

The CCAFS Title V Air Permit regulates the operation of stationary sources of air pollution emissions at CCAFS. Potential sources of air pollution on CCAFS include rocket preparation, assembly, and fueling activities; mobile sources such as support equipment, commercial transport (including aircraft), personal vehicles, and launch emissions; and point sources such as heating units, power plants, generators, incinerators, and storage tanks. Nearby air pollution sources include two regional power plants located within 12 miles of the station. The operational release of hydrogen fluoride during laser testing and the potential accidental release of nitrogen trifluoride or fluorine is addressed in Appendix A.

Exhaust from rocket motor ignition during launches is episodic in nature and does not directly contribute to the long-term air quality at CCAFS. The permitted stationary point and area emission source inventory for the AQCR 48 is presented in Table 3.3-1 for comparative purposes.

Table 3.3-1 Stationary Emissions Inventory for the Central Florida Intrastate AQCR

Air Pollutant Emission Source[a]	CO (tpy)	VOC (tpy)	NO_x (tpy)	SO_x (tpy)	PM_{10} (tpy)	Pb (tpy)
AQCR 48 Emissions Inventory[a]	3,470	1,908	29,055	51,402	2,715	5.3

[a] Source: U.S. Environmental Protection Agency, 2000

3.3.2 Airspace

A general description of the airspace designations, flight rules, and the criteria used to determine if a structure would be an obstruction to navigable airspace is provided in Sections 3.1.2.1 through 3.1.2.3.

Regional Airspace

The nearest airport is the CCAFS Skid Strip, located approximately 2.4 miles south-southeast of the nearest proposed siting location. The elevation of the Skid Strip is 10 feet msl, and the runway is approximately 11,000 feet in length. There are two existing obstructions identified on CCAFS. One just north of the proposed siting locations is 513 feet agl, and the second is 280 feet agl located at the southern end of CCAFS (National Oceanic and Atmospheric Administration, 2000b).

The airspace above CCAFS is Class D airspace and restricted airspace R-2932. The Class D airspace has a ceiling of 2,500 feet agl. Restricted airspace R-2932 is continuously controlled by the FAA’s Miami Air Route Traffic Control Center with altitude restrictions from the surface up to, but not including, 5,000 feet msl. R-2932 is included in the KSC Federal Aviation Regulation 91.143 Space Operations Area that operates on an intermittent basis by NOTAM. Altitude for the Space Operations Area is surface to an unlimited altitude (National Oceanic and Atmospheric Administration, 2000b).

3.3.3 Biological Resources

A definition of biological resources is presented in Section 3.1.3. A description of biological resources at CCAFS is presented in this section.

3.3.3.1 Vegetation

CCAFS has a series of ridges and swales located parallel to the coastline that supports several ecologically important natural communities that are highly fragmented by mission-related construction and clearings. At least 10 high-quality natural communities exist on CCAFS. Vegetation consists mainly of indigenous Florida coastal scrub that includes oak and rosemary scrub, and xeric (extremely dry) and maritime hammocks. Coastal strand, coastal dune, and grasslands occur along the 13 miles of

Atlantic Ocean shoreline. Seagrasses are located in the nearby rivers. Wetlands will be discussed under Environmentally Sensitive Habitats. The remaining areas are associated with the cleared launch complexes and support facilities (U.S. Air Force, 1998).

Mixed oak scrub consists of densely growing shrubs such as myrtle oak, sand live oak, saw palmetto, and Chapman oak. Before modern development, these oak scrub communities would have burned frequently from lightning-set fires. However, fire suppression has caused the scrub to become so densely vegetated that burning could result in a catastrophic fire completely removing vegetation from the area. CCAFS has a burn plan to manage oak scrub (U.S. Air Force, 1998).

Xeric hammock is prevalent in the southern half of the station between the industrial area and the launch complexes. The xeric hammock is dominated by live oak and saw palmetto. Scrub oaks are seldom present, distinguishing xeric hammock from oak scrub; red bay and twinberry are rarely present, distinguishing xeric hammock from maritime hammock (U.S. Air Force, 1998).

Maritime hammock is found on CCAFS in two locations: Atlantic maritime hammock on the east side, just landward of coastal strand, and Banana River maritime hammock on the west side of the peninsula, bordering the Banana River. The largest stand of Atlantic maritime hammock occurs on the southern end of the station. Red bay and live oak canopies often have a subcanopy of twinberry, Hercules' club, buckthorn, and cabbage palm. Saw palmetto is dominant in the understory, with vines such as muscadine grape, catbrier, Virginia creeper, and poison ivy (a prominent feature). The ground surface has a thick layer of leaf litter that limits the growth of small herbs. The Banana River maritime hammock is classified as shell mound in the Florida Natural Areas Inventory classification system. Cabbage palm, Carolina laurelcherry, and red mulberry occur in the canopy as well as red bay and live oak. Shell mound species include red cedar and hackberry. Fern species are abundant in this maritime hammock (U.S. Air Force, 1998).

Coastal strand typically contains dense thickets of woody shrubs such as cabbage palm, saw palmetto, sea grapes, and tough buckthorn. Some of this habitat has been disturbed by previous construction of launch complexes, but can reestablish itself in a relatively short period of time (U.S. Air Force, 1998).

Coastal dunes contain sea oats (a State Species of Special Concern) and are inhospitable to many plants because of the constantly shifting substrate, salt deposition, abrasion from wind-blown sand, and effects of storm waves. The beaches north of CCAFS have been eroding, while beaches to the south are increasing. CCAFS beaches are also increasing, and supports several parallel dune lines and conspicuous offshore sandbars. Sea oats, beach elder, railroad vine, beach croton, bitter panic grass, saltgrass, camphorweed, and beach cordgrass can often be found in coastal dune communities. Florida Statute 370.41 prohibits the disturbance or removal of sea oats (Cape Canaveral Air Force Station 45th Space Wing, 1996; U.S. Air Force, 1998).

Grasslands often are landward from coastal dune communities, in areas that are of newly deposited sand, or receive frequent disturbances that keep out the woody species.

Grasslands are densely vegetated with grasses and other herbaceous species, although woody species such as varnish leaf, wax myrtle, and saw palmetto are scattered throughout. Muhly grass, sea oats, beach cordgrass, camphorweed, prickly pear, beach croton, and other coastal dunes species can also be found. Cape Canaveral is one of the few broad barrier islands on the East Coast. Grasses uniquely dominate its backdune zone. (Myers and Ewell, 1992)

Seagrasses including Cuban shoal, manatee, and turtle grasses are present in the northern Indian River system (including the Banana River).

Mixed urban grasses and disturbed groundcover is the predominant land cover on the areas proposed for the STF complex. The vegetation is primarily mixed urban grasses and sedges. The grass areas are maintained (mowed) and provide little habitat.

3.3.3.2 Wildlife

The coastal scrub and associated woodlands provide habitat for mammals including the white-tailed deer, armadillo, bobcat, feral hog, and raccoon.

Numerous bird species are found at CCAFS. Maritime hammock provides habitat for mourning dove, gray catbird, black-throated warbler, and northern cardinal. Oak-hickory scrub is habitat for the blue and scrub jays, doves, and red-bellied woodpecker, as well as many maritime hammock species. Birds that utilize the shore line include the black-necked stilt, willet, ruddy turnstone, spotted sandpiper, gulls, Caspian tern, brown pelican, and great blue heron. Turkey vultures, hawks, barn swallows, fish crows, common grackles, warblers, and sparrows are also located on CCAFS (U.S. Air Force, 1998).

Neotropical migrants observed on CCAFS include warblers, such as the blue-winged and black-and-white warblers, yellow-throated and red-eyed vireos, eastern kingbird, ovenbird, American redstart, merlin, Cooper’s hawk, and peregrine falcon. These species mainly use the maritime hammock (U.S. Air Force, 1998).

Numerous amphibians, reptiles, and fish have been observed at CCAFS. Amphibians observed include the spade-foot and eastern narrow-mouth toads, squirrel and southern leopard frogs, and green treefrogs. Reptiles observed include the American alligator, Florida box turtle, gopher tortoise, Florida softshell, green anole, six-lined racerunner, broadhead skink, southern ringneck snake, everglades racer, eastern coachwhip, and mangrove salt marsh snake. Bluegill, garfish, largemouth bass, killifishes, sailfin molly, and topminnow can be found in the small freshwater habitats on CCAFS (U.S. Air Force, 1998).

Marine mammals, including the bottlenose dolphin, spotted dolphin, and manatee, can be found along the coast of Florida. The seagrass beds in the northern Indian River system provide important nursery areas, shelter, and foraging habitat for a wide variety of fishes, invertebrates, manatees, and other aquatic organisms. The Banana and Indian rivers, and Mosquito Lagoon, provide habitat for marine worms, mollusks, and crustaceans.

3.3.3.3 Threatened and Endangered Species

The USFWS lists species that are endangered or threatened and those that are proposed for endangered or threatened status. An endangered species is defined as any species in danger of extinction throughout all or a large portion of its range. A threatened species is one that is likely to become endangered in the foreseeable future. CCAFS contains habitat utilized by a large number of federally and state-listed species. Those listed species that are known to occur within or near its boundaries are listed in Table 3.3-2.

No federally listed plant species have been identified on CCAFS. The Florida Natural Areas Inventory documented six species of state-listed plants on CCAFS. Additional species may be located in the vicinity of the proposed STF sites, but these areas have not been surveyed (Patrick Air Force Base, 1999; U.S. Air Force, 1998).

Listed animals in the vicinity of the launch complexes include the bald eagle (*Haliaeetus leucocephalus*), an occasional visitor, and American alligator (*Alligator mississippiensis*). Atlantic loggerhead (*Caretta caretta*), leatherback (*Dermochelys coriaacea*), and green sea (*Chelonia mydas*) turtles are located along the Atlantic coastline. The southeastern beach mouse (*Peromyscus polionotus niveiventris*) occurs along the vegetation zones paralleling the beach and dune lines. The eastern indigo snake (*Drymarchon corais couperi*) occurs in most habitat on CCAFS including gopher tortoise (*Gopherus polyphemus*) burrows. Gopher tortoises are most often found in xeric and scrub habitats. The Florida scrub jay (*Aphelocoma coerulescens*) is found in Florida coastal scrub and slash pine stands, and the West Indian manatee (*Trichechus manatus*) is found along the Banana River and occasionally observed in the ocean (Patrick Air Force Base, 1999; U.S. Air Force, 1998).

The gopher tortoise is still common in some parts of its range, although rare in others. Although this species is not formally listed as a threatened or endangered species by the federal or state government, it is listed as a state Species of Special Concern. In addition, gopher tortoise burrows provide important habitat to numerous other protected species. This valuable habitat warrants special note in this subsection and is found in moderate densities on CCAFS, in areas of sandy, well-drained soils, primarily in coastal strand and dry clearings. It prefers open habitats that have herbaceous plants for forage including disturbed areas such as recent burn areas, road shoulders, fence lines, and launch complexes. Gopher tortoises are tolerant of human presence (U.S. Air Force, 1998).

American alligators live in fresh to brackish waters found in marshes, ponds, lakes, rivers, swamps, bayous, and large spring runs. They bask on land next to the water and dig dens and build nests in riverbanks, lake margins, or marshes. They use the dens to escape from cold or drought.

The threatened eastern indigo snake has been identified on CCAFS and probably occurs throughout the station. It occurs in most types of hammocks, often near wetlands, and is often associated with gopher tortoise burrows (U.S. Air Force, 1998).

Table 3.3-2 Threatened, Endangered, and Species of Special Concern Occurring or Potentially Occurring at Cape Canaveral AFS

Scientific Name	Common Name	State Status	Federal Status
Plants			
Asclepias curtissii	Curtiss' milkweed	E	--
Chrysophyllum oliviforme	Satin-leaf	E	--
Glandulareia maritima	Coastal vervain	E	--
Lechea cernua	Nodding pinweed	E	--
Ophioglossum palmatum	Hand fern	E	--
Remirea maritima	Beach-star	E	--
Fish			
Centropomus undecimalis	Common Snook	SSC	--
Fundulus jenkinski	Salt marsh topminnow	SSC	--
Reptiles and Amphibians			
Alligator mississippiensis	American alligator	SC	T(S/A)
Caretta caretta	Loggerhead sea turtle	T	T
Chelonia mydas	Green sea turtle	E	E
Dermochelys coriacea	Leatherback sea turtle	E	E
Drymarchon corais couperi	Eastern indigo snake	T	T
Eretmochelys imbricata	Hawksbill sea turtle	E	E
Gopherus polyphemus	Gopher turtle	SSC	--
Lepidochelys kempi	Atlantic (Kemp's) Ridley sea turtle	E	E
Nerodia clarkii	Atlantic salt marsh snake	T	T
Pituophis melanoleucus mugitus	Florida pine snake	SSN	--
Birds			
Ajaia ajaja	Roseate spoonbill	SSC	--
Aphelocoma coerulescens	Florida scrub jay	T	T
Charadrius melodus	Piping plover	T	T
Egretta caerulea	Little blue heron	SSC	--
Egretta rufescens	Reddish egret	SSN	--
Egretta thula	Snowy egret	SSC	--
Egretta tricolor	Tri-colored heron	SSC	--
Eudocimus albus	White ibis	SSC	--
Falco peregrinus(1)	Peregrine falcon	E	--
Falco sparverius paulus	Southeastern American kestrel	T	--
Haliaeetus leucocephalus	Bald eagle	T	T
Haematopus palliates	American oystercatcher	SSC	--
Mycteria americana	Wood stork	E	E
Pelecanus occidentalis	Brown pelican	SSC	--
Rynchops niger	Black skimmer	SSC	--
Sterna antillarum	Least tern	T	--
Mammals			
Balaenoptera borealis	Sei whale	E	E
Balaenoptera physalus	Finback whale	E	E
Eubalaena glacialis	Northern right whale	E	E
Megaptera novaeangliae	Humpback whale	E	E
Peromyscus polionotus niveiventris	Southeastern beach mouse	T	T
Physeter macrocephalus	Sperm whale	E	E
Podomys floridanus	Florida mouse	SSC	--
Trichechus manatus	Manatee	E	E

Source: U.S. Air Force, 1998; Cape Canaveral Air Station 45th Space Wing, 1996; U.S. Department of the Interior, 1998.
(1) Recently delisted, but will be monitored for the next decade
E Endangered
SC Special concern (state designation)
(S/A) Listed by similarity of appearance to a listed species
T Threatened

Green sea turtle breeding populations along the Florida and Pacific coasts and Mexico are federally listed as endangered. Pollution and development are degrading the nesting and feeding habitats for the green sea turtle. The Air Force has adopted strict light management policies to minimize the impact of artificial lighting on sea turtle hatchlings and adults (Cape Canaveral Air Force Station, 2000b).

Development on the beaches sometimes forces nesting to occur too close to the tidal zone, and tidal inundation and erosion destroy many nests. Green sea turtles are present on the Florida coast from May to September and are known to nest on CCAFS beaches (U.S. Air Force, 1998).

The loggerhead sea turtle is relatively abundant and occupies most of the Florida coastline. When nesting, they are present on the beaches of Florida from May to September. It is possible that only the females are migratory; others are known to occupy Florida waters year-round. They are known to nest on CCAFS beaches. The leatherback sea turtle (*Dermochelys coriacea*) population in Florida is small and threatened by development due to lighting problems, erosion, nest predation by animals and humans, and pollution along the beaches. The leatherback sea turtles mainly occur in the open sea, but a few females can be found on the Florida beaches and coastal waters from April to July.

The leatherback sea turtle has been reported to nest on CCAFS beaches (thirteen occasions) (Patrick Air Force Base, 1999). Although the Atlantic (Kemp's) Ridley (*Lepidochelys kempi*) and the hawksbill sea turtles (*Eretmochelys imbricata*) are not known to nest on CCAFS beaches, they have been known to occur in the waters off the Florida coast and near shore areas (U.S. Air Force, 1998).

Wood storks (*Mycteria americana*) forage in marshes, ponds, and lagoons, and are year-round residents in the CCAFS area. The wood stork is a specialized federal and state endangered wading bird that catches fish by groping in water 6 to 10 inches deep and snapping up prey that touch its bill. Wood storks are more susceptible to water level fluctuations than other wading birds. Wood storks are colonial wading birds that rarely breed before 4 years of age. They nest in the treetops of mangrove swamps or by man-made impoundments (Kennedy Space Center, 1997; 1999; U.S. Air Force, 1998).

The bald eagle was down-listed to threatened throughout the conterminous United States in 1995, although the Florida population has been listed as threatened for years. They can be found year-round near the coast, rivers, and large lakes of Florida, but do not breed on CCAFS, although numerous active nests have been reported at KSC. Bald eagles can be tolerant of human activity if the activity is not directed toward them (U.S. Air Force, 1998; National Aeronautics and Space Administration, 1997a).

All free-flying peregrine falcons (*Falco peregrinus*) were federally listed as endangered, because of the similarity of appearance to the Eurasian subspecies *F. p. peregrinus,* which is listed as endangered. The subspecies *F. p. anatum* was removed from federal listing in October 1994 as a recovered subspecies. The American peregrine falcon, which was recently delisted, migrates through the Florida area and can be found most of the year, except from mid-June to mid-August. The bird is basically tolerant of human presence (U.S. Air Force, 1998).

The Florida scrub jay is a year-round resident that is very sedentary and territorial. Its habitat is open oak scrub without a dense canopy, as well as palmetto, sand pine, and rosemary. Successful scrub jay nesting has occurred between Samuel C. Phillips Parkway along the coast and LC-41. Drier, more sparsely vegetated habitats are better for scrub jay management activities than wetter areas that are valuable for other species. The species can become habituated to human presence over time.

Piping plovers (*Charadrius melodus*) nest in or near least tern colonies along the Atlantic coast from approximately March to August. They may also winter in the area (U.S. Air Force, 1998).

The Florida manatee is endemic to this region of Florida. They occupy shallow coastal waters, estuaries, bays, and intercoastal rivers and lakes. Sheltered bays, coves, and canals are important for reproductive activities. Manatees are semipermanent residents in the area, but may migrate southward for the winter. USFWS designated manatee critical habitat is located adjacent to CCAFS at the Hangar AF Solid Rocket Booster Recovery access channel. Manatees are sensitive to human disturbance, which can result in low population densities, low reproductive rates, limited range, and high mortalities. Die-offs associated with red tides and unusually cold weather have occurred in Florida; however, the primary threat to the manatee is injury inflicted by motor boats (U.S. Air Force, 1998).

Southeastern beach mouse populations on CCAFS have been found at the launch complexes where the area is artificially open grassland. The coastal grasslands and strand communities provide the highest population densities at CCAFS. Other habitat is the coastal dune which includes sea oats (*Uniola paniculata*) , slender cordgrass (*Spartina patens*), and beach grass (*Panicum amarum*) (U.S. Air Force, 1998).

Finback (*Balaenoptera physalus*), humpback (*Megaptera novaeangliae*), northern right (*Eubalaena glacialis*), sei (*Balaenoptera borealis*), and sperm (*Physeter macrocephalus*) whales are pelagic mammals generally found from the shelf edge seaward. Large baleen whales tend to move to northern temperate waters in the spring and toward the equator in the fall. Their migration takes them past CCAFS and around the tip of Florida north of Cuba (U.S. Air Force, 1998).

3.3.3.4 Sensitive Habitats

Environmentally sensitive habitats on CCAFS include wetlands, rookeries, listed species critical habitats, and Essential Fish Habitats (EFH).

Wetlands

Wetlands are defined by the USACE as “those areas that are inundated or saturated by surface or ground water 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.”

CCAFS contains many wetlands and associated vegetation communities including estuarine tidal (mangrove) swamps and marshes, hydric hammock, coastal interdunal swales, and man-made borrow pits and canals. A USFWS National Wetlands Inventory conducted in 1994 identified a total of 2,235 acres of wetlands on CCAFS.

Bird Rookeries

The nearest rookery is located west of the proposed complexes on the Banana River Spoil Islands (National Aeronautics and Space Administration, 1997a).

Critical Habitat

Manatee critical habitat is located in the Banana River system. It includes the entire inland section of the Indian River, the entire inland section of the Banana River, and all waterways between the Indian and Banana rivers, with the exception of some man-made structures or impoundments not necessary to the normal needs of the manatee. The National Marine Fisheries Service (NMFS) designated the water adjacent to the coast of Florida as critical habitat for the northern right whale (National Aeronautics and Space Administration, 1997a).

Essential Fish Habitats

The 1996 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) set forth a new mandate for NMFS, regional Fishery Management Councils, and other federal agencies to identify and protect important marine and anadromous fish habitat. The EFH provisions of the MSFCMA support one of the nation's overall marine resource management goals - maintaining sustainable fisheries.

The MSFCMA requires that EFH be identified for all fisheries which are Federally managed. This includes species managed by the regional fishery management councils (FMC) under Federal fishery management plans (FMP), as well as those managed by the NMFS under FMPs developed by the Secretary of Commerce. EFH is defined in the MSFCMA as "...those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The rules promulgated by the NMFS in 1997 further clarify EFH with the following definitions: waters - aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate - sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary - the habitat required to support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and spawning, breeding, feeding, or growth to maturity - stages representing a species' full life cycle. EFH may be a subset of all areas occupied by a species. At CCAFS, EFHs are identified as the area waterward of the Atlantic coastline and all estuarine and intercoastal areas west of CCAFS (i.e. Banana River and Mosquito Lagoon).

3.3.4 Cultural Resources

For a discussion of cultural resources as well as a description of the types of laws and regulations that govern these resources, see Section 3.1.4.

3.3.4.1 Prehistoric and Historic Archaeological Resources

Archaeological investigations at CCAFS indicate that human occupation of the area first occurred approximately 4,000 years ago. Early settlement was focused within the Banana River salt marsh environment; however, over time, site distribution and size fluctuated, and there is archaeological evidence that the entire peninsula was exploited for a wide variety of marine, estuarine, and terrestrial resources. Occupation of the area is divided into seven periods: the Archaic Period; the Orange Period; the Transitional Period; the Malabar I, IIA, and IIB Periods; and the Protohistoric or Seminole Period.

Numerous archaeological surveys have been conducted at CCAFS (University of West Florida, 1990; U.S. Army Corps of Engineers and 45th Space Wing, 1994; Le Baron, 1884; National Park Service, 1984; Kennedy Space Center, 1967; Moore, 1922; Rouse, 1951; Stirling, 1935; U.S. Army Corps of Engineers, 1988a, 1989, 1990, 1991; Wiley, 1954). In addition, in 1992, the USACE synthesized data from several of these studies and developed a cultural resources sensitivity map for CCAFS (New South Associates, 1996). Fifty-six prehistoric and historic archaeological sites have been recorded; 19 of these sites have been recommended as eligible for listing in the National Register.

3.3.4.2 Historic Buildings and Structures

In 1949, the CCAFS Long-Range Proving Ground was formally established under the direction of the Air Force. Construction of the first missile launch pads, support facilities, and down-range tracking stations began in 1950, and throughout that decade, military facilities and activities developed at a rapid pace. Various cruise-type missiles were tested during these years, and the installation began to support the Intermediate Range and Intercontinental Ballistic Missile programs, as well as manned flight space exploration. Activity at the installation peaked in 1966 with construction of more than 30 operational launch complexes; however, over the next 10 years, programs and operations began to decline. Launch complexes and support buildings that had served their purposes were adapted to other uses, deactivated, or put on standby status. Current Air Force launch programs include ballistic missile operations and commercial launch operations (New South Associates, 1996).

Historic building and structure surveys at CCAFS include those conducted by the National Park Service in association with the Man in Space theme (1980); Resource Analysts, Inc., of Bloomington, Indiana (National Park Service, 1983); and the U.S. Army Construction Engineering Research Laboratories (U.S. Department of the Air Force, 1994; U.S. Air Force, 1994). Of these surveys, 14 National Register-listed or -eligible historic buildings and structures have been identified (New South Associates, 1996). Seven of the fourteen properties (six launch complexes [5/6, 13 MST, 14, 19, 26, 34] and the original Mission Control Building) compose a National Historic Landmark district associated with the Man in Space Program. The remaining seven properties are LC-1/2, -3/4, -17, -21/22, -25, -31/32, and the Cape Canaveral Lighthouse, all of which are considered eligible for inclusion in the National Register.

3.3.4.3 Native Populations/Traditional Resources

At the time of European contact, the CCAFS and Banana River areas were populated by tribal groups of the Ais Indian tribe. Settlements were described by early explorers as sparse and isolated, and historical accounts indicate that they remained well into the eighteenth century (New South Associates, 1993). The Ais settlements closest to CCAFS were the Ulumay villages along the Banana River. These settlements were numerous, changed with the seasons, and reflected a fishing and gathering subsistence; agriculture was not practiced. Dwellings were impermanent, and tools and utensils were typically fashioned of conch shell or gourds.

After European contact, the Ais had easy access to trade items and precious metals from the Spanish and French. Because of their proximity to the Straits of Florida, they also took advantage of the numerous shipwrecks along the Florida coast. Wrecks were looted for their treasure, and survivors were typically taken in as slaves and then later bartered back to the Europeans. By 1760, few Ais remained, their disappearance attributable to European diseases, encroachment of their land, and enslavement. A few are believed to have moved into southern Florida, where they may have banded together with other tribes to ultimately form the Seminole culture. Today, there are no known direct descendants of the Ais tribe remaining; the Seminole and Miccosukee tribes are recognized as the appropriate Native American cultures for consultation during the treatment of Ais remains.

Important traditional resources sites are subject to the same regulations and are afforded the same protection as other types of historic properties. Traditional sites associated with the Ais could include archaeological and burial sites, mounds, ceremonial areas, hillocks, water sources, plant habitat or gathering areas, or any other natural area important to this culture for religious or heritage reasons. By their nature, traditional resources sites often overlap with (or are components of) archaeological sites. As such, some of the National Register-listed or -eligible sites identified at CCAFS could also be considered traditional resources sites or contain traditional resources elements.

3.3.5 Geology and Soils

This section provides an overview of the physiography, geology, soils, and geologic hazards in the vicinity of CCAFS.

3.3.5.1 Physiography

CCAFS lies on a barrier island composed of relict beach ridges formed by wind and wave action. This island is approximately 55 miles in length and 4.5 miles wide. Land surface on the island ranges from sea level to 20 feet msl at the harbor dredge disposal site near Port Canaveral. The higher elevations occur along the eastern portion of CCAFS, with a gentle slope to lower elevations toward the marshlands along the Banana River (U.S. Air Force, 1998). Land surface at the proposed STF sites is relatively flat, with surface elevations averaging approximately 10 feet msl (National Aeronautics and Space Administration, 1992).

3.3.5.2 Geology

Four stratigraphic units generally define the geology underlying CCAFS; youngest to oldest, these units are: the surficial sands, the Caloosahatchee Marl, the Hawthorn Formation, and the limestone formations of the Floridan Aquifer (U.S. Air Force, 1998).

The surficial sands immediately underlying the surface are sandy marine deposits. These undifferentiated sandy units typically extend to depths of approximately 10 to 30 feet below the surface.

The Caloosahatchee Marl underlies the surficial sands and consists of fine-grained, semi-confining zones. The Caloosahatchee consists of green to gray sandy shell marl with varying silt, clay, and shell content. This formation generally extends to a depth of approximately 70 feet below the surface.

The Hawthorn Formation underlies the Caloosahatchee Marl. The Hawthorn Formation is the regional confining unit for the Floridan Aquifer, and consists of green to gray clays, silty clays, and sands with phosphatic zones and beds of sandy limestone. This formation is generally 80 to 120 feet thick, typically extending to a depth of approximately 180 feet below the surface (U.S. Air Force, 1998).

Beneath the Hawthorn Formation lie the limestone formations of the Floridan Aquifer. The upper limestone units from the youngest to oldest are Williston, Inglis, Avon Park, and Ocala Formations. The Floridan Aquifer and other limestone formations extend several thousand feet below the surface at CCAFS (U.S. Air Force, 1998).

3.3.5.3 Soils

The soil survey of Brevard County identified 11 different soil types within CCAFS. The three most prominent soils compose the Canaveral-Palm Beach–Welaka association. These associations are nearly level to gently sloping with moderately well-drained to excessively drained soils and are sandy throughout. The soils are highly permeable with low water retention capability. There are no prime or unique farmland soils on CCAFS (U.S. Air Force, 1998).

3.3.5.4 Geologic Hazards

Unstable Soils

The presence of unstable or plastic geologic materials in the near surface can create foundation problems in construction projects. Soils containing high levels of organic materials (e.g., peat or mulch deposits) may not have the strength to support developed structures, and some clay soils shrink and swell upon drying or wetting, which can stress building foundations. Structural integrity can also be affected by susceptibility of the soil to wind and water erosion (Florida Geological Survey, 1994).

Soils within the vicinity of the STF complex sites are predominantly sandy throughout and, as such, are well drained and exhibit low shrink/swell susceptibility. Although these soils exhibit a low susceptibility to sheet and rill erosion by water, they are considered highly susceptible to wind erosion (Iowa State University Statistical

Laboratory, 1998). No problems associated with previous construction activities at Cape Canaveral have been identified (U.S. Air Force, 1998).

Sinkholes

The principal geologic hazard in central Florida is sinkholes that develop when overlying soils collapse into existing cavities. CCAFS is not located in an active sinkhole area, and review of topographic maps did not reveal the presence of any sinkholes. The Canaveral Peninsula is not prone to sinkholes, because the limestone formations are over 100 feet below the ground surface, and confining units minimize groundwater recharge to the limestone (U.S. Air Force, 1998).

Seismicity

A seismological investigation conducted by the Seismological Branch of the U.S. Coast and Geodetic Survey showed that the Cape Canaveral underground structure is generally free of anomalies, voids, and faults (National Aeronautics and Space Administration, 1997a). CCAFS is located in a seismic zone 0, meaning that seismic disturbances are rare and associated risks are considered low (Florida Department of Natural Resources, 1991). There are no known areas of volcanic activity within the State of Florida.

3.3.6 Hazardous Materials and Hazardous Waste Management

For a general discussion of the regulations governing hazardous materials and hazardous waste management, see Section 3.1.6.

3.3.6.1 Hazardous Materials Management

Numerous types of hazardous materials are used annually to support the various missions and general maintenance operations at CCAFS. These materials range from volatile organic compounds and non-volatile organic compound primers, paints, industrial solvents, and cleaners to hazardous fuels. Hazardous materials are also used by on-station contractors to support station construction and operations.

Although hazardous materials management is the responsibility of each individual or organization, there is a central reporting requirement for all hazardous materials that come on the base. All hazardous material brought on the installation (operation or construction) must be reported to the hazardous materials pharmacy at Patrick Air Force Base (AFB), tracked through the Air Force Environmental Management Information System (AF-EMIS) and otherwise managed in accordance with AFI 32-7086, Hazardous Material Management. The operator and construction contractor will report all chemicals, locations, etc. as required by EPCRA to 45 CES/CEV at Patrick AFB on a quarterly report, as well as tracking them in the AF-EMIS tracking system.

All hazardous materials must be totaled by base personnel to meet federal reporting requirements regarding threshold quantities of waste. A separate materials pharmacy system for procurement, storage, and distribution of hazardous materials has not yet been established at CCAFS. Individual contractors at CCAFS may obtain hazardous materials through their own organizations, local purchases, or other outside channels, although contractors are required to enroll in the HAZMART Pharmacy at Patrick AFB and encouraged to obtain hazardous materials through the pharmacy whenever possible.

The Joint Propellants Contractor (JPC) controls hazardous fuels for the 45th Space Wing (45 SW). The JPC provides for the purchase, transport, temporary storage, and loading of hazardous fuels and oxidizers. Because of the limited storage capacity on station, only limited quantities of hypergolic fuels are stored onsite at any time. Spills of hazardous materials are covered under 45th Space Wing Operations Plan 32-3, Vol. I, *Hazardous Materials Response Plan*. CCAFS has a hazardous materials response team.

3.3.6.2 Hazardous Waste Management

Hazardous waste management at CCAFS is regulated under 40 CFR 260-280 and Florida Administrative Code (FAC) 62-730. These regulations are implemented through 45 SW Operational Plan 19-14, *Petroleum Products and Hazardous Waste Management Plan*.

The Air Force, as owner of the facilities at CCAFS, is considered the generator of a majority of the hazardous wastes. There are some commercial operations that manage waste under the contractor's own USEPA identification number. All hazardous waste generated is labeled with the USEPA identification number for CCAFS and is transported, treated, and disposed of under this number. All individuals or organizations at CCAFS are responsible for administering all applicable regulations and plans regarding hazardous waste, and for complying with applicable regulations regarding the temporary accumulation of waste at the process site. The JPC collects and transports hazardous waste (including propellant waste) from the process site to a 90-day hazardous waste accumulation area, to the permitted 1-year hazardous waste storage facility, or to a licensed disposal facility off station..

The Environmental Support Contractor (ESC) provides environmental management and technical support for CCAFS. The ESC ensures that contractors have hazardous waste management programs in place, and reviews and inspects contractors to verify compliance with the 45 SW Operational Plan 19-14 and all applicable regulations. The ESC also operates the permitted hazardous waste storage facility on CCAFS. The 45th Civil Engineer Squadron/Environmental Flight at Patrick AFB is the environmental support organization that provides oversight of the ESC at CCAFS (U.S. Air Force, 1998).

The DRMO is responsible for managing and marketing excess and recoverable products and waste materials in accordance with applicable regulations. Hazardous items that cannot be marketed by the DRMO are disposed of as hazardous wastes (U.S. Air Force, 1998). The DRMO is also responsible for obtaining offsite hazardous and non-hazardous disposal contracts at all downrange sites. CCAFS rarely uses DRMO, as they have their own contracts and hazardous waste disposal procedures.

CCAFS currently operates a single main hazardous waste storage facility at Buildings 44200/44205 that is permitted (RCRA Part B Permit, Number HO01-255040) to store hazardous wastes for up to 1 year. The site is permitted under the current Florida Department of Environmental Protection (FDEP) permit, and is operated by the ESC.

This facility was constructed to replace Buildings 44632, 54810, and 55123 that were previously used to store hazardous waste and are now closed. The new waste storage site is not permitted to store hydrazine, monomethyl hydrazine, or nitrogen tetroxide hazardous wastes. These wastes are stored at Fuel Storage Area 1 for less than 90 days and are taken off station for disposal. CCAFS currently operates one hazardous waste treatment facility (Building 15305), the Explosive Ordnance Disposal Facility, which provides thermal treatment of waste explosive ordnance. The Explosive Ordnance Disposal Facility operates under the current FDEP permit and the associated Subpart X permit application.

Individual contractors and organizations maintain hazardous waste satellite accumulation points and 90-day hazardous waste accumulation areas in accordance with 45 SW Operational Plan 19-14. CCAFS operates approximately 65 satellite accumulation points. A maximum of 55 gallons per waste stream of hazardous waste can be accumulated at a satellite accumulation point. There are currently approximately 17 90-day accumulation areas on station. There is no limit to the volume of waste that can be stored, but wastes must be taken to the permitted 1-year facility or disposed of offsite within 90 days. The number and location of accumulation sites is dynamic and changes as operations dictate. CCAFS reported the generation of 302 tons of hazardous waste in 1995. Spent caustic and other liquid wastes make up the majority of CCAFS hazardous waste generation (Albury, 1998).

3.3.6.3 Pollution Prevention

Air Force Policy Directive 32-70, *Environmental Quality*, outlines the Air Force policy for pollution prevention. This directive references Air Force Instruction 32-7080, *Pollution Prevention Program*, which defines the Air Force's Pollution Prevention Program requirements.

A Pollution Prevention Management Plan has been prepared for CCAFS. The Pollution Prevention Management Plan establishes the overall strategy, delineates responsibilities, and sets forth specific objectives for reducing pollution of the ground, air, surface water, and groundwater. The operator/constructor will recycle and follow affirmative procurement requirements as stated in EOs 12856 and 13101. All recycling and affirmative procurement will be reported to 45 CES/CEV at Patrick AFB in a monthly report.

3.3.6.4 Remediation

The Installation Restoration Program (IRP) was established by the Air Force to identify, characterize, and remediate past environmental contamination on DoD installations. The program established a process to evaluate past disposal sites, control the migration of contaminants, and control potential hazards to human health and the environment.

There are 147 SWMUs at CCAFS. These SWMUs were identified based on historic practices and the results of a RFA completed by the USEPA in 1989. Some of the SWMUs were studied under the IRP, and some of the SWMUs did not require further action since a release was not suspected.

Currently, 105 IRP sites have been identified at CCAFS. Of these, 67 sites are classified as No Further Action and have regulatory closure, 31 sites are in the RFI process or are undergoing interim cleanup activities, and eight sites are either in long-term monitoring or are managed under the Florida Petroleum Contamination Site Clean-up program (U.S. Air Force, 1999).

The PTF proposed location is at the ESA-60 complex, which was formerly operated by NASA. Within the ESA-60 complex are Facilities 54445 and 54446, which are identified as the sterilization building and dynamic balance laboratory, respectively (U.S. Air Force, 1997a). Although the facility is not identified as an IRP site nor is it identified as a SWMU in CCAFS records, two USTs for containment of spilled hydrazine and oxidizer are documented as associated with Facility 54445, and are considered unmaintained. Evidence of these tanks was found during the site visit in June 2000. Discussions with CCAFS IRP personnel indicate that soil and groundwater sampling may be warranted at ESA-60 to confirm the presence or absence of contamination. A PCB-contaminated oil spill from an old electric transformer was recently documented at the ESA-60 complex, and may also warrant additional investigation.

Approximately 1,500 feet south of ESA-60 is Fire Training Area #2 (IRP site FT-17, SWMU 33). According to CCAFS records, this site was used for fire training exercises from 1965 to 1985, and a variety of fuels, solvents, and PCB-containing lubricating fluids were burned as this location. Several interim measures have been conducted to date to remediate soil and groundwater at the site. Contaminated soils and free product were removed in 1998. A horizontal air sparging system is in operation to intercept and treat groundwater with elevated concentrations of volatile organic compounds. A RCRA Facility Investigation and Corrective Measures Study was submitted to the USEPA in August 1999 indicating that volatile organic compound concentrations had been effectively reduced by the air sparging system, and long-tem groundwater monitoring with institutional controls are proposed for the site.

The RCF is proposed to be located in Building 1777. Adjacent to this facility is SWMU 109, which is identified in CCAFS records as a cleared area south of Paint Storage Facility 1778. There is no waste history regarding this SWMU, however no further action was approved by the USEPA in 1995 based on site investigation findings (U.S. Air Force, 1997a).

The AI&TF is to be located in the SMAB (Facility 70000). There are no IRP sites associated with the SMAB. The local sewage treatment plant at the SMAB is identified in CCAFS records as SWMU 121, but no further action is required for this facility. The nearest IRP site to the SMAB is Facility 70500, which is located approximately 2,000 feet south of the SMAB. This IRP site has been classified as No Further Action.

3.3.6.5 Storage Tanks

Storage tanks are subject to federal regulations and Florida Administrative Code Chapters 62-761, which are more stringent than federal regulations. Aboveground petroleum storage tanks must be registered if over 550 gallons in size, and underground petroleum storage tanks are registered if over 110 gallons in size, except those used to store heating fuels. All of the non-petroleum storage tanks are unregulated.

There are no reported petroleum storage tanks in the areas proposed for STF facilities at CCAFS. As noted in the previous section on Remediation, there are existing USTs (not petroleum) at the ESA-60 site that are considered unmaintained.

3.3.6.6 Asbestos

The current Air Force policy is to manage or abate ACM in active facilities, and remove ACM, following regulatory requirements, before facility demolition. ACM is abated when there is a potential for asbestos fiber release that would affect the environment or human health. The Launch Base Support (LBS) contractor revised the CCAFS Asbestos Management and Operations Plan in October 1994. Several asbestos surveys were conducted at CCAFS between 1992 and 1995. The ESA-60 complex buildings have been tested and have ACM (National Aeronautics and Space Administration, 1994).

3.3.6.7 Polychlorinated Biphenyls

A testing program was implemented by the LBS contractor to identify PCB transformers. While all transformers containing PCBs, as defined by the Air Force, have been removed from CCAFS, several small transformers still used in communication equipment are in operation, and several mission critical spares are in storage. These transformers have been registered with the USEPA by serial number (Patrick Air Force Base, 1999). Additionally since there is no testing program for other electrical devices, it is possible that there are PCB-containing capacitors on CCAFS. Since capacitors come in many sizes and are plentiful within electronic equipment, it is improbable that all of the capacitors containing PCBs have been removed and/or replaced. The 45 Space Wing Operations Plan (OPlan) 17-16, *PCB Items Control Plan*, was updated by the Environmental Support Contractor in July 2000. PCB-contaminated equipment could occur at the existing facilities proposed for modification for the STF, RCF, and AI&TF complexes. All equipment in these facilities must be verified or tested for PCBs before proceeding with the modifications.

As noted in Section 3.3.6.4 for Remediation, a spill of PCB-contaminated oil from a former transformer was recently documented at ESA-60.

3.3.6.8 Lead-based Paint

A comprehensive lead-based paint survey has not been conducted at CCAFS. Air Force Policy (1993) ensures that lead-based paint hazards are avoided or abated during building modifications. The existing buildings and structures proposed for complexes may contain lead-based paint. Before any building demolition or modifications, the construction contractor will be required to conduct a lead-based paint survey.

3.3.7 Health and Safety

The City of Cape Canaveral, KSC, and the range contractor at CCAFS have entered into a mutual aid agreement in the event of an on-station emergency. Each organization may request equipment and manpower in the event of a fire or other emergency. In the event of an emergency involving a launch accident that may affect off-station areas CCAFS contacts the Brevard County Emergency Management Staff (U.S. Air Force, 1998).

At CCAFS, Range Safety monitors launch surveillance areas to ensure the risk to people, aircraft, and surface vessels are within acceptable limits. Control areas and airspace are closed to the public as required. A Notice to Mariners and a NOTAM are published and circulated in accordance with established procedures to provide warning to personnel (U.S. Air Force, 1998).

Health and safety for construction and support activities is regulated under Air Force Occupational Safety and Health standards. These standards provide for health and safety programs that are at least as effective as OSHA programs.

CCAFS is part of the Eastern Range. Eastern and Western Range 127-1, *Range Safety Requirements,* (1997) is divided into seven chapters that address all aspects of range safety. Range safety is managed by the 45 SW Range Safety Office and is the responsibility of all 45 SW organizations, tenants, contractors, subcontractors, range users, and visitors to the ranges. The Air Force has developed the "Concept to Launch" process for missile programs. This process includes an introduction to range safety, tailoring of Eastern and Western Range 127-1 for specific program requirements, noncompliance resolution, flight analysis review, launch vehicle elements and GSE design review, airborne range safety system review, facility design review, operation test review, final range safety approval for launch operations, safety critical launch operations, and final range safety clear to launch. The safety review procedure provides a means of substantiating compliance with program safety requirements, and encompasses all systems analyses and testing as required by DoD (U.S. Air Force, 1998).

Launches and hazardous operations are not allowed at CCAFS if an undue hazard to persons and property exists due to potential dispersion of hazardous materials or propagation of blast or other acoustic effects. The 45 SW has prepared a Toxic Hazard Control Plan that details the procedures to be used to control heated toxic gas hazards. Before a launch, an air dispersion computer model, the Rocket Exhaust Effluent Diffusion Model, is run. Inputs to this model include predicted meteorological conditions, probable failure modes, and solid/liquid propellant emission estimates from the launch vehicle and/or facility. Model scenarios encompass numerous normal and failure modes. The Rocket Exhaust Effluent Diffusion Model produces a Potential Hazard Corridor and plots it in relation to the surrounding community. If the Potential Hazard Corridor encompasses any public area at an unacceptable level, as determined by population density and Brevard Emergency Management Center readiness, the launch is put on hold until more favorable meteorological conditions exist (U.S. Air Force, 1998).

Emergency responses to major peacetime accidents and natural disasters are covered by the 45 SW Operational Plan 32-1, Volume II. Emergency responses involving hazardous materials are covered by 45 SW Operational Plan 32-3, Volume I. The Disaster Control Group is an emergency response team that is activated for non-launch related disasters at CCAFS. The mission of the Disaster Control Group is to minimize loss of personnel and operational capability caused by wartime contingencies, peacetime disasters, and major accidents, including those involving hazardous materials. (U.S. Air Force, 1998)

3.3.8 Land Use and Aesthetics

This section describes the existing environment in terms of land use and aesthetics for the areas on and surrounding CCAFS. Topics addressed are regional land use, on-installation land use, coastal zone management, and aesthetics. These resources at CCAFS encompass the station boundaries and potentially affected adjacent lands.

3.3.8.1 Regional Land Use

CCAFS is located on a barrier island midway down the east coast of Florida. It is located in northeastern Brevard County. CCAFS is bordered on the east by the Atlantic Ocean, on the west by the Banana River, on the north by KSC, and on the south by Port Canaveral and the City of Cape Canaveral. Brevard County and the City of Cape Canaveral are the local planning authorities for the incorporated and unincorporated areas near CCAFS. The unincorporated community of Merritt Island is located west of CCAFS across the Banana River on Merritt Island. Land uses designated by Brevard County for Merritt Island include residential, industrial, public facilities, agricultural, recreation, and conservation. The City of Cape Canaveral is located just south of CCAFS on the same barrier island, and Patrick AFB is located further south on the barrier island. *The City of Cape Canaveral Comprehensive Plan* (U.S. Air Force, 1998) designates residential, commercial, industrial, public facilities and recreation, and open space land use areas, with continued commercial and industrial use of Port Canaveral. Port Canaveral is also used by the Navy, NASA, and the Air Force to support launch and shipping activities. Neither the county nor the City of Cape Canaveral has land use authority over CCAFS because it is federally owned. CCAFS designates its own land use and zoning regulations. The general plans of the county and City of Cape Canaveral designate compatible land uses around CCAFS.

Several communities on the Florida mainland act as gateway communities to CCAFS. The City of Cocoa is located west of the community of Merritt Island and is linked to the southern portion of CCAFS by SR 528. The City of Titusville is located approximately 12 miles north of Cocoa and is linked to the northern portion of CCAFS by the NASA Parkway. The NASA Parkway also provides access to the KSC, which is a major tourist attraction in central Florida. KSC land uses include primarily industrial uses associated with NASA launch programs, along with open space associated with the Merritt Island National Wildlife Refuge, located to the north of KSC. Another federal property, the Canaveral National Seashore, is located directly north of CCAFS on the same barrier island. The National Park Service manages this property.

3.3.8.2 On-base Land Use

CCAFS encompasses an area of 15,800 acres. Land uses at CCAFS include launch operations, launch and range support, airfield, port operations, station support area, and open space.

The launch operations land use category is located along the Atlantic Ocean shoreline and includes active and inactive launch sites and support facilities. The launch and range support area is west of the launch operations area and is divided into two sections by the airfield. The airfield is in the central part of the station and includes a single runway, taxiways, and apron. Port operations take place in the southern part of the station and include facilities for commercial and industrial activities. The major industrial area is located in the center of the western portion of the station, and is included in the station support area category. Although many of the activities are industrial in nature, the land use area also includes administrative, recreational, and range support functions. Open space is dispersed throughout the station. There are no public beaches located on CCAFS. However, there are recreational activities, such as boating, water skiing, surfing, and fishing, which occur in the ocean areas and rivers surrounding the station (U.S. Air Force, 1998).

3.3.8.3 Coastal Zone Management

The entire State of Florida is defined as being within the coastal zone; thus, any federal activity in or affecting a coastal zone in Florida requires preparation of a Coastal Zone Consistency Determination in accordance with the federal Coastal Zone Management Act of 1972. This act was passed to preserve, protect, develop and where possible, restore or enhance the nation's natural coastal zone resources.

In Brevard County, a "no development" zone has been established by the Florida Coastal Management Act (FCMA) requiring a setback of 75 feet from the mean high water level. CCAFS has an additional standard for construction near the coast which requires that facilities have a setback at least 150 feet from the coast. The Florida Department of Community Affairs (FDCA) is the state's lead coastal management agency. The Air Force is responsible for making the final coastal zone consistency determinations for its activities within the state, and FDCA reviews the coastal zone consistency determination (U.S. Air Force, 1998).

3.3.8.4 Aesthetics

Aesthetics at CCAFS include the general visual environment surrounding the station and the areas visible from off-station areas.

The barrier island on which it is located characterizes the visual environment in the vicinity of CCAFS. Topography of the island is generally flat, with elevations ranging from sea level to approximately 20 feet above sea level (U.S. Air Force, 1998). CCAFS is fairly undeveloped with large areas of open space dispersed throughout the installation. The most visually important aspect of the natural environment is the gentle coastline and flat island terrain. The landscape is dominated by Florida coastal stand, coastal scrub, and coastal dune vegetation. The area has a low visual sensitivity because the flatness of the area limits any prominent vistas. The most important man-made features are the launch complexes and various support facilities.

Since public access to the station is prohibited, viewpoints are primarily limited to marine traffic on the east and west, and to Port Canaveral, Cape Canaveral, and Cocoa

Beach to the south. Additionally, views from the north at KSC are available to a limited population.

3.3.9 Noise

For a general discussion of noise and the method of measurement used in this EA, see Section 3.1.9.

3.3.9.1 Background Noise Levels off Cape Canaveral AFS

Most of the region surrounding CCAFS is open water, with the Atlantic Ocean to the east and the Banana River to the west. Immediately north of CCAFS is KSC, and to the south is Port Canaveral. This relative isolation of the station reduces the potential for noise to affect adjacent communities. The closest residential areas to CCAFS are to the south, in the Cities of Cape Canaveral and Cocoa Beach. Expected sound levels in these areas are normally low, with higher levels occurring in industrial areas (Port Canaveral) and along transportation corridors. Residential areas and resorts along the beach would be expected to have low overall noise levels, normally about 45 to 55 dBA. Infrequent aircraft flyovers from Patrick AFB and missile launches from CCAFS would be expected to increase noise levels for short periods of time. The launch of space vehicles from CCAFS and KSC does generate intense, but relatively short-duration, noise levels of low frequencies. The highest recorded levels are those associated with the Titan IV and Space Shuttle, which can exceed 160 dBA in the launch vicinity. Noise levels at Port Canaveral would be expected to be typical of an industrial facility reaching levels of 60 to 80 dBA (U.S. Air Force, 1998).

3.3.9.2 Background Noise Levels on Cape Canaveral AFS

An additional source of noise in the area is the CCAFS airfield. Because of the infrequent use of this airfield, noise generally does not affect public areas. Other less frequent but more intense sources of noise in the region are space launches from CCAFS. Current launches include Delta, Atlas, Titan, and Trident. The A-weighted noise levels from launch vehicles can be as high as 120 dBA at approximately 3,000 feet from the launch site, depending on the launch vehicle (U.S. Air Force, 1998).

Following liftoff, launch vehicles gain altitude, pitch over, and accelerate quickly. When flight speed exceeds the speed of sound, sonic shock waves develop. When these shock waves intersect with the ground, they produce a sonic boom. Sonic booms produced during vehicle ascent occur over the Atlantic Ocean, and are directed upward and in front of the space vehicle. Sonic booms generated from launches at CCAFS are not known to have affected developed areas (U.S. Air Force, 1998).

3.3.10 Socioeconomics

Socioeconomic resources describe the social and economic characteristics of a community or region by analyzing variables and indicators that include population and employment. This section provides a socioeconomic overview of the region surrounding CCAFS.

3.3.10.1 Region of Influence

For the purposes of this analysis, the region surrounding CCAFS is defined as an area that includes those communities within an approximate 1-hour drive from the proposed test site. The drive time is delineated using a computer program that assumes a journey carried out within the legal speed limits and in moderate traffic densities. While the drive time polygon covers all or part of five counties, four counties constitute the majority of the defined region. These four counties are Brevard, Orange, Seminole, and Volusia, and they include the communities of Titusville and parts of Orlando and Melbourne.

3.3.10.2 Population

Each of the four counties that comprise the major part of the 60-minute drive time rank within the top 12 most populated of 67 Florida counties. Orange County, which contains Orlando, had the sixth highest population in Florida in 1995. In 1997, there was a population of 624,000 in the portion of the four counties within a 60-minute drive of CCAFS. This population is forecast to increase by 1.8 percent annually, to 682,280 by 2002. A straight-line projection suggests that the population will grow to 719,830 by 2005.

The portion of the population referred to as economically active (18 years and older) constitute 77 percent of the regional population. Despite a discernible trend in aging of the local population, this proportion is expected to remain constant through 2005. The median age of the region's population was 37.4 years in 1997 and is expected to rise to about 40.9 years of age by 2005.

3.3.10.3 Employment

The four counties of Brevard, Orange, Seminole, and Volusia had a total of over 760,000 non-federal jobs in 1993. If the forecast 1993–2005 growth rate in jobs for the State of Florida is applied to the four-county area, there would be approximately 990,000 jobs in the region by 2005, or an increase of 30 percent over a 12-year period.

In Brevard County, federal, state and local government jobs constituted approximately 14 percent of the jobs in 1994.

Recent information for the 45th Space Wing, the primary tenant of the CCAFS as well as nearby Patrick AFB, cites total employment of 7,800 personnel with a payroll of $400 million. In 1997, it was estimated that the 45th Space Wing contributed nearly $1.4 billion into the Brevard County economy.

3.3.11 Transportation

Transportation resources potentially affected by the IFX ground-test program at CCAFS include key federal, state, and local roads within north and central Brevard County, and any waterways that provide access to CCAFS. Local rail networks and airway facilities are also described.

3.3.11.1 Roadways

Off-installation Network

As CCAFS is located on an Atlantic Ocean barrier island to the east of another island where KSC is located, there are only a few roads that access the installation. Northern access is provided by NASA Parkway (State Road (SR) 405), which also traverses the KSC. Southern access is provided by SR 528, which passes to the south of the KSC. On the Florida mainland, a number of other roadways provide access to these two primary links. Both US-1 and I-95 provide access to the area from points north and south of CCAFS. These roadways parallel the entire eastern seaboard of the United States. Orlando lies approximately 50 miles to the west on SR-528 (the Beeline Expressway). The Beeline Expressway was constructed to provide a direct, high-speed link for CCAFS/KSC employees who chose to live in the Orlando urban area.

In addition, SR-A1A, SR-401 and SR-3 also provide important access functions in the area. SR-A1A is a divided highway located immediately adjacent to the Atlantic Coast. SR A1A approaches SR-528 from the south and is a major transportation corridor for both CCAFS and Patrick AFB employees. SR-401, a primary access route to CCAFS from other areas on the barrier island to the south of CCAFS, becomes General Samuel C. Phillips Parkway as it approaches Gate 1. Persons traveling SR-A1A from the City of Cape Canaveral or points south, as well as those from the Orlando area on SR-528, generally access the base via SR-401 (Cape Canaveral Air Station 45th Space Wing, 1996). SR-3 provides access from the south through its connection with SR-405, an arterial that becomes the NASA Causeway upon entering KSC (Cape Canaveral Air Station 45th Space Wing, 1996). Table 3.3-3 describes the traffic conditions for the major roadways in the area. Generally, most of the roadways in the area are operating at an adequate level of service. However, US 1, to the south of SR 528, and sections of I-95 are approaching congestion levels determined to be unacceptable for those particular roadways in accordance with the level of service standards set in the Brevard County Comprehensive Plan. Each of these facilities is programmed for major improvements in the near future. Figure 3.3-1 shows the regional transportation network for CCAFS.

On-installation Network

CCAFS roadways provide access to launch complexes, support facilities, and industrial areas. During peak hours, traffic flow remains steady, and significant delays seldom occur. Central Control Road, a primary arterial, adjoins Phillips Parkway, connecting it with Lighthouse Road. Industry Road, another primary arterial, proceeds westward from the parkway, becoming the NASA Causeway at the KSC boundary (Cape Canaveral Air Station 45th Space Wing, 1996). Samuel C. Phillips Parkway is the principal onsite arterial, a divided highway accommodating most of the north-south traffic. At its intersection with Skid Strip Road, it becomes a one-way, northbound arterial, whereas the southbound lanes are an extension of Hangar Road from the north (Cape Canaveral Air Station 45th Space Wing, 1996). ICBM Road is the primary access road to many of the launch complexes (Cape Canaveral Air Station 45th Space Wing, 1996).

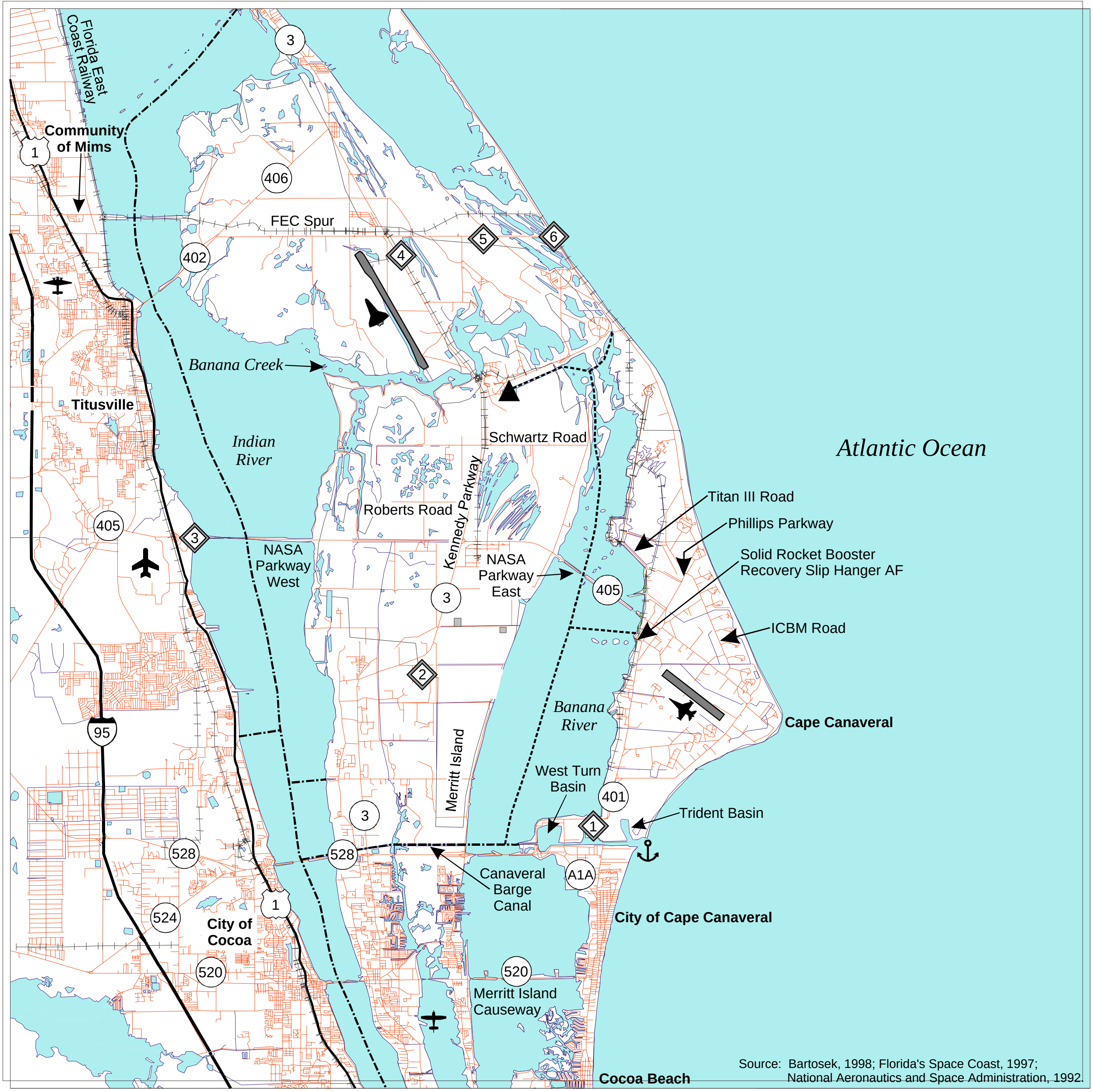
3.3.11.2 Waterways

Waterways—Off-installation

Abutting the southern boundary of the installation is Port Canaveral, the nearest anchorage with docking facilities (Patterson, 1998). Small boat facilities include five marinas, several cargo piers with drafts ranging from 35 to 39 feet, and numerous cruise ship terminals (Canaveral Port Authority, 1997). Sea buoy to berth travel time is 45 minutes. Total ship calls for FY 1997 were 337 cargo, 45 layberth, and 1,113 cruise (DeClaire, 1998). Cruise passengers for FY 1997 totaled 1,429,554 (Canaveral Port Authority, 1997). Cargo for FY 1996 totaled 3.57 million tons (U.S. Army Corps of Engineers, Water Resources Support Center, 1996) and, for FY 1997, 3.5 million tons (DeClaire, 1998).

Waterways—On-installation

The CCAFS Port Operations Zone occupies 184 acres on north Port Canaveral, where locks connect the harbor to the Banana River. NASA vessels use this access, as berthing for NASA recovery vessels is located on the Banana River, west of Hanger AF in the CCAFS Industrial Area. Two of the port’s turning basins are utilized by both military and civilian vessels, whereas the third (eastern) basin, constructed for the Navy Trident program, is reserved for military vessels exclusively (Cape Canaveral Air Force Station, 1992). Military activities have increased considerably in support of Fleet Ballistic Missile operations; in addition, commercial/industrial activities have expanded into the port’s west side, adjacent to the south boundary of CCAFS. The port also contains the Air Force berthing facility, and two deep-draft Navy wharves.



EXPLANATION

Roads
Interstate Roads
U.S. Highways
State Highways
Railways
Arthur Dunn Airpark
Merritt Island Airport
Space Center Executive Airport
Shuttle Landing Facility
Skid Strip
Port Canaveral
Primary Gates
Vehicle Assembly Building Barge Terminal Facility
Turning Basin Access Channel
Intracoastal Waterway

Scale 1:250,000
0 3.2 6.3 Kilometers
0 2 3.9 Miles
NORTH

0025ltf

Figure 3.3-1

Transportation Network

Cape Canaveral AFS, FL

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Table 3.3-3 Cape Canaveral AFS Area Roadways

Roadway	From	To	*Daily Capacity	1999 ADT	LOS
OFF BASE ROADS					
I-95	SR 520	SR 524	46,900	44,000	C
I-95	SR 524	SR 528	38,500	38,500	C
I-95	SR 528	SR 407	31,500	31,500	B
I-95	SR 407	SR 50	33,000	33,000	C
I-95	SR 50	SR 406	26,500	26,500	B
US 1	Forrest	SR 528	35,000	34,222	E
US 1	SR 528	Fay Blvd.	42,800	31,049	C
US 1	Fay Blvd.	SR 405	42,800	25,824	B
US 1	SR 405	SR 50	42,800	25,536	B
SR A1A	North Atlantic	SR 401	35,000	30,772	C
SR 3	SR 520	SR 528	40,000	35,052	D
SR 3	SR 528	KSC	32,800	15,765	B
SR 401	SR 528	CCAFS	35,000	13,463	B
NASA Causeway	US 1	KSC	42,800	15,101	A
SR 528	SR 407	I-95	32,300	23,759	B
SR 528	I-95	Clearlake Rd.,	46,900	18,807	A
SR 528	Clearlake Rd.	US 1	49,200	28,540	B
SR 528	US 1	N. Courtenay	49,200	45,800	C
SR 528	N. Courtenay	SR 401	49,200	31,507	B
ON BASE ROADS					
Central Control Rd.					
ICBM Road					
NASA Causeway					
Titan III Road					

*Maximum acceptable volume that the road can carry at its adopted LOS
Source: Brevard County MPO

Docks at the Hangar AF Wharf are primarily employed in Solid Rocket Booster retrieval. The Turning Basin Wharf/External Tank Barge Dock is used to unload Space Shuttle external fuel tanks and other heavy equipment suited to waterway transport (National Aeronautics and Space Administration, 1997a).

3.3.11.3 Railways

Railways—Off-base Facilities

Railways include the Florida East Coast Railway, servicing Brevard County via a main line through Titusville, Cocoa, and Melbourne (U.S. Air Force, 1998). The line parallels US 1, carrying from 10 to 20 million tons of cargo annually (East Central Florida Regional Planning Council, 1995b) and connecting with the CSX and Norfolk Southern railways (East Central Florida Regional Planning Council, 1995b). Spur rail lines serve other parts of Brevard County (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). CSX offers rail freight service with a main line running through Orlando. Amtrak passenger terminals are located at Orlando and Winter Park; the “Autotrain,” transporting both automobiles and passengers, is available 10 miles northeast of Orlando in Sanford (Cape Canaveral Air Station 45th Space Wing, 1996).

Railways—On-base Facilities

Florida East Coast operates a restricted spur-line, by permit only, extending from KSC and Titusville via the main line north of CCAFS and terminating within the north part of the installation.

3.3.11.4 Airways

Airways—Off-base Facilities

The major airport serving Brevard County is Melbourne International Airport, a 2,800-acre airport located approximately 30 miles south of CCAFS. In order to accommodate long-range, international, non-stop flights, an approved project is pending to strengthen and lengthen the runway to 11,600 feet (Melbourne International Airport, 1997). Local commercial and executive airports are Titusville’s Space Coast Regional (formerly Space Center Executive) Airport and Merritt Island Airport. Both offer asphalt-surfaced, lighted runways with aircraft tiedowns (Patterson, 1998) and are within 1 hour’s drive of CCAFS. In addition, there are two local C5A-compatible, fixed-base operators with asphalt runways, Rockledge (formerly Greens) Air Park and the Arthur Dunn Airport (Cape Canaveral Air Station 45th Space Wing, 1996). However, Rockledge is currently a private airport and unavailable for commercial flights (Sung, 1998). Regional air services are more than adequate, and are described in Table 3.3-4.

Airways—On-base Facilities

The CCAFS Airfield Operation Zone comprises 1,193 acres on an isolated peninsula with a single runway referred to as the Skid Strip. All other military traffic is directed to Patrick AFB, which also controls the Skid Strip. Civilian traffic is directed to the aforementioned non-military airfields (Cape Canaveral Air Station 45th Space Wing, 1996). The Skid Strip accommodates aircraft in direct support of missile launches, missile component delivery, or transportation of government personnel. Land on the runway’s east end allows the option of extending the runway 5,000 feet; however, there are currently no plans for expansion (Cape Canaveral Air Force Station, 1992; Cape Canaveral Air Station 45th Space Wing, 1996).

Table 3.3-4 Cape Canaveral AFS Available Airway Facilities

Airport/Airfield	Runway length (feet)	Runway width (feet)	Passengers	Flights	Load Capacity (pounds)
Off-installation					
Melbourne International	9,481	150	Enplanements - 321,188 [(1)]; Deplanements - 313,556 [(1)]	42/day	n/a
Space Coast Regional					
18-36:	6,001	150	n/a	130,000/ year[(2)]	Single-wheeled: 160,000; dual- wheel, single-axle: 220,000; dual-wheel, tandem-axle: 380,000
9-27:	5,001	100	n/a		
Merritt Island	3,600	75	250,000	100,000	n/a
Arthur Dunn					
15-33:	3,000	70	125,000[(2)]	50,000 [(2)]	n/a
4-22:	1,790	100			n/a
On-installation					
Skid Strip (Class B)	10,000	300	n/a	28,000 [(3)]	Rated for C-5 aircraft
Shoulders		75			
Stabilized overruns	1,000	450			
Shuttle Landing Facility (15-33)	15,000	300	No commercial	15,000 [(5)]	Unlimited
Overruns (each end)	1,000 [(4)]	300			

Source: Cape Canaveral Air Force Station, 1992; Cooksey, 1999; Hutto, 1998; Kennedy Space Center, 1998b; Mason, 1998; Melbourne International Airport, 1997; National Aeronautics and Space Administration, 1992; Patterson, 1998; Taff, 1999; Titusville-Cocoa Airport Authority, 1998; 1999.
(1) Figures for 1997.
(2) Totals for all runways.
(3) Estimated annual operations, per Cooksey. This includes overflights and "touch and go" operations, and amounts to 14,000 aircraft.
(4) Giving a total length of 3.2 miles.
(5) Figures for 1998. For the Shuttle Landing Facility, approximately 50 percent are "flyovers." Total aircraft would be about 7,500.

3.3.12 Utilities

3.3.12.1 Water Supply

CCAFS receives its potable water from the City of Cocoa. When necessary, Melbourne water can be supplied through Patrick AFB (Cape Canaveral Air Force Station 45th Space Wing, 1996) and KSC. CCAFS, KSC, and Patrick AFB are contracted to receive up to 6.5 mgd, but usage averages about 2.5 mgd (Crouch, M., 1998; Larrabee, C., 1998). Of the 49 on-base wells, none are used as potable water sources; however, six are on standby to support the St. Johns River Water Management District.

In 1995, CCAFS used an average 0.75 mgd and has a system capacity of 3 mgd (U.S. Air Force, 1998).

Peak usage of 1.1 mgd occurs on launch days (Cape Canaveral Air Force Station 45th Space Wing, 1996). Total water storage capacity is 0.65 million gallons in two elevated tanks and 5.9 million gallons in ten ground-level tanks (Cape Canaveral Air Force Station 45th Space Wing, 1996).

3.3.12.2 Wastewater

CCAFS treats both domestic and industrial wastewater onsite at a WWTP with a permitted capacity of 0.8 mgd and a peak daily flow of 0.3 mgd; design capacity is 2 mgd. An industrial wastewater permit allows CCAFS to discharge deluge water to grade or to pump to the WWTP for treatment as an alternative (U.S. Air Force, 1998). Deluge water flows into deluge containment ponds where it is contained until the water meets the permit requirements (pH adjustment) for discharge to permitted percolation areas. Discharge to the WWTP is only considered on an emergency basis and only when launch time-frame constraints would not allow discharge of treated deluge water that meets FDEP standards.

Current peak wastewater generation at CCAFS is 0.63 mgd. Future plans include connecting the KSC sewage system with that of CCAFS.

3.3.12.3 Solid Waste

The on-station Class III landfill near the Skid Strip only accepts construction and demolition debris, ACM, and WWTP sludge. Of 182 acres available, only 55 acres are currently in use. The remaining acres are either closed or remain natural scrub habitat available for future expansion. General solid waste and construction debris is typically disposed at the Central Disposal Facility (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). In 1995, CCAFS disposed of 2,085 tons of construction and demolition debris, 25,546 tons of concrete, and 748 tons of ACM (U.S. Air Force, 1998) for a total of 28,379 tons.

3.3.12.4 Energy

Electricity

Florida Power and Light supplies electricity to CCAFS through a 240/138-kV switching station (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). Transmission lines enter at three locations: the southwestern boundary (South Cape Substation); the NASA Causeway (North Cape Substation); and Merritt Island (to the Titan Substation). Transformers convert the transmission voltage to a distribution voltage of 13.2 kV. The north and south substations have a capacity of 20 megavolt-amperes and the Titan Substation has a capacity of 15 megavolt-amperes. In addition to these, there are 170 other substations converting distribution voltage to user voltages (Cape Canaveral Air Force Station 45th Space Wing, 1996). Figures for 1995 indicate CCAFS consumed 864,000 kWh per day of the total 220,000,000 kWh per day delivered to Brevard County (U.S. Air Force, 1998).

Natural Gas

In 1999, CCAFS completed installation of a natural gas system; City Gas distribution lines run along the existing right-of-way, beginning at the eastern limits of KSC's General

Support Zone and terminating at the south CCAFS gate (Kennedy Space Center, 1997). Currently, certain facilities utilize liquid petroleum as an alternative fuel.

3.3.13 Water Resources

This section provides an overview of the surface and groundwater features, water quality, and flood hazard areas in the vicinity of CCAFS. The Florida Environmental Resource Permit (ERP) program also governs storm water management activities within the State of Florida. The ERP program applies to alterations of the landscape, including the creation or alteration of wetlands and other surface waters, and alterations of uplands that affect flooding and all storm water management activities. Under the ERP program, the permit application serves as a joint application to initiate review by the FDEP, the St. Johns River Water Management District (SJRWMD), and USACE. FDEP utilizes the ERP application for the concurrent review of State of Florida storm water management requirements, as an application for use of state-owned submerged lands, and for ensuring compliance with state water quality standards. The SJRWMD and FDEP enforce State of Florida storm water management requirements at CCAFS.

3.3.13.1 Groundwater

Two aquifer systems underlie CCAFS: the surface aquifer and the Floridan Aquifer. The surface aquifer system, which is composed of sand and marl, is under unconfined conditions (capable of being recharged due to the lack of an impermeable layer) and is approximately 70 feet thick. The seasonal water table below CCAFS is generally located approximately 10 feet below the ground surface. Recharge to the surface aquifer is principally by precipitation. Groundwater in the surface aquifer at CCAFS generally flows to the west (U.S. Air Force, 1998)

A confining unit composed of clays, sands, and limestone separates the surface aquifer from the underlying Floridan Aquifer. The confining unit is generally 80 to 120 feet thick. The relatively low hydraulic conductivity of the confining unit restricts the vertical exchange of water between the surface aquifer and the underlying confined Floridan Aquifer (U.S. Air Force, 1998).

The Floridan Aquifer is the primary source of potable water in central Florida and is composed of several carbonate units with highly permeable zones. The top of the units occurs at a depth of approximately 180 feet below ground surface, and the carbonate units extend to a depth of several hundred feet. The permeability of the Floridan Aquifer is generally very high, yielding large quantities of water (U.S. Air Force, 1998).

3.3.13.2 Surface Water

CCAFS is located on a barrier island that separates the Banana River from the Atlantic Ocean. CCAFS is within the Florida Middle East Coast Basin. This basin contains three major bodies of water in proximity to the station: the Banana River to the immediate west, Mosquito Lagoon to the north, and the Indian River to the west. All three water bodies are estuarine lagoons, with circulation provided mainly by wind-induced currents (U.S. Air Force, 1998).

Several water bodies in the Middle East Coast Basin have been designated Outstanding Florida Waters in Florida Administrative Code (FAC) 17-3, including most of Mosquito Lagoon and the Banana River, Indian River Aquatic Preserve, Banana River State Aquatic Preserve, Pelican Island National Wildlife Refuge, and Canaveral National Seashore. The Outstanding Florida Waters designation affords the highest level of protection to these waters, and any compromise of ambient water quality is prohibited. Additionally, the Indian River Lagoon System has been designated an Estuary of National Significance by USEPA (U.S. Air Force, 1998).

Surface drainage at CCAFS generally flows to the west into the Banana River. The Banana River has been designated a Class III surface water, as described by the CWA of 1977. Class III standards are intended to maintain a level of water quality suitable for recreation and the production of fish and wildlife communities. There are no wild and scenic rivers located on or near CCAFS (U.S. Air Force, 1998).

Storm drainage is separated from the sewer system and is “open” in part and “closed” in part. The former conveys runoff overland via cross-connecting canals, gutters, channels, and swales, to outfalls at the Banana River; the latter consists of catch basins, pipes, and connections beneath the drainage area, discharging into either drainage canals or the Banana River. Runoff is reduced by percolation into the sandy soil (Cape Canaveral Air Station 45th Space Wing, 1996).

3.3.13.3 Special Flood Hazard Areas

Special Flood Hazard Areas are defined as areas with a 1 percent or greater chance of equaling or exceeding an established flood level in any given year, or 100-year flood. On CCAFS, the 100-year floodplain extends approximately 7 feet msl on the ocean side, and approximately 4 feet msl in the vicinity of the Banana River (U.S. Air Force, 1998). EO 11988, *Floodplain Management*, directs federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains. In addition, the Air Force requires a Finding of No Practicable Alternative before taking any action in a floodplain. Areas proposed for IFX ground-test activities are not located within designated 100-year floodplains (U.S. Air Force, 1997b). However, because average surface elevations are low (approximately 10 feet msl), the STF complex areas may be subject to flooding from storm surge tides.

3.3.13.4 Water Quality

Groundwater in the Floridan Aquifer, beneath CCAFS, is highly mineralized due to saline intrusion from the surrounding saltwater bodies (U.S. Air Force, 1998).

Surface water quality near CCAFS and KSC is monitored at 11 long-term monitoring stations maintained by NASA. The FDEP classified water quality in the Middle East Coast Basin as “poor to good” based on the physical and chemical characteristics of the water, as well as whether they meet their designated use under FAC 17-3. The upper reaches of the Banana River adjacent to CCAFS and the lower reaches of Mosquito Lagoon have generally good water quality due to lack of urban and industrial development in the area. However, recent studies by NASA indicate certain parameters (i.e., primarily phenols and silver) consistently exceed state water quality criteria, with hydrogen ion concentration (pH), iron, and aluminum occasionally exceeding criteria. Nutrients and metals, when detected, have generally been below the Class II standards. Areas of poor water quality exist along the western portions of the Indian River, near the City of Titusville, and in Newfound Harbor in southern Merritt Island. Water quality impacts to surface waters in these areas are influenced primarily by effluent discharges from WWTPs and urban runoff and discharge of wastewater effluent. Discharge to the nearby Banana and Indian Rivers is not permitted (U.S. Air Force, 1998).

3.3.14 Environmental Justice

3.3.14.1 Background

For a description of EO 12898 and the methodology used for this analysis, see Section 3.1.14.

3.3.14.2 Methodology

Most of the environmental effects from the IFX ground-test program at CCAFS are anticipated to occur in Brevard County. In developing statistics for the 1990 Census of Population and Housing, the U.S. Department of Commerce, Bureau of Census, identified small subdivisions used to group statistical census data. In metropolitan areas, these subdivisions are known as census tracts.

Tables for the 1990 Census of Population and Housing were used to extract data on low-income and minority populations in census tracts in Brevard County. The census reports both on minority and poverty status. Minority populations included in the census are identified as Black; American Indian, Eskimo, or Aleut; Asian or Pacific Islander; Hispanic; or Other. Poverty status (used in this EA to define low-income status) is reported as the number of families with income below poverty level ($12,764 for a family of four in 1989, as reported in the 1990 Census of Population and Housing).

A census tract is considered disproportionate under either of these two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in Brevard County, the region of comparison, or (2) the percentage of low-income or minority populations in the census tracts exceeds 50 percent. Data for each census tract were compared to data for the regional political jurisdiction surrounding the tract. For this analysis, the region of comparison was defined as Brevard County. Based upon the 1990 Census of Population and Housing, Brevard County had a population of 398,978. Of that total, 35,815 persons, or 9.13 percent, were low-income, and 49,861 persons, or 12.45 percent, were minority.

Brevard County is subdivided into 89 census tracts, of which 40 have a disproportionate percentage of low-income or minority populations (or both). These census tracts have been determined to have disproportionate low-income and/or minority populations, and therefore may be subject to environmental justice impacts.

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CHAPTER 4

ENVIRONMENTAL CONSEQUENCES

This section describes potential environmental consequences of the Proposed Action and compares these consequences with the current status of potentially affected environmental resources. Sections 4.1 through 4.4 provide discussions of the potential environmental consequences of these activities and the No Action Alternative. The amount of detail presented in each section is proportional to the potential for impacts.

To assess the potential for and degree of environmental impacts from the proposed IFX ground-test activities, a list of activities necessary to accomplish the Proposed Action and alternatives was first developed (Section 2.0). Next, the Affected Environment was described, with emphasis on any special environmental sensitivity (Section 3.0). The anticipated environmental impacts of the IFX ground-test program on the existing status of the potentially affected environment resources at each location determined the environmental impacts of the Proposed Action. Table 2-10 is a summary of the potential environmental impacts.

Environmental impacts from the proposed IFX ground-test activities as well as other currently planned and reasonably anticipated future activities were added to determine the potential for cumulative impacts.

4.1 STENNIS SPACE CENTER

4.1.1 Air Quality

4.1.1.1 Environmental Effects

As indicated in Section 3, the region is in attainment and the General Conformity Rule under the Clean Air Act is not applicable.

Construction

Fugitive dust from ground disturbing activities, combustive emissions from construction equipment, and emissions from asphalt paving operations would be generated during construction of the proposed projects. Fugitive dust would be generated from activities associated with site clearing, grading, cut and fill operations, and from vehicular traffic moving over the disturbed site. These emissions would be greatest during the initial site preparation activities and would vary from day to day depending on the construction phase, level of activity, and prevailing weather conditions.

The quantity of uncontrolled fugitive dust emissions from a construction site is proportional to the area of land being worked and the level of construction activity. The USEPA has estimated that uncontrolled fugitive dust emissions from ground-disturbing activities would be emitted at a rate of 80 pounds (lbs) of total suspended particulates (TSP) per acre per day of disturbance (U.S. Environmental Protection Agency, 1995). In a USEPA study of air sampling data at a distance of 50 meters downwind from construction activities, PM_{10} emissions from various open dust sources were determined based on the ratio of PM_{10} to TSP sampling data. The average PM_{10} to TSP ratios for top soil removal, aggregate hauling, and cut and fill operations are reported as 0.27, 0.23, and 0.22, respectively (U.S. Environmental Protection Agency, 1988). Using 0.24 as the average ratio for purposes of analysis, the emission factor for PM_{10} dust emissions becomes 19.2 lbs per acre per day of disturbance. Fugitive dust emissions from demolition activities would be generated primarily from building demolition, debris loading, and debris hauling. The USEPA has established a recommended emission factor of 0.011 lbs of PM_{10} per square foot of demolished floor area. This emission factor is based on air sampling data taken from the demolition of a mix of commercial brick, concrete, and steel buildings (U.S. Environmental Protection Agency, 1988).

The USEPA also assumes that 230 working days are available per year for construction (accounting for weekends, weather, and holidays), and that only half of these working days would result in uncontrolled fugitive dust emissions at the emitted rate described above (U.S. Environmental Protection Agency, 1995). These emissions would produce slightly elevated short-term PM_{10} ambient air concentrations. However, the effects would be temporary and would fall off rapidly with distance from the proposed construction site. The USEPA estimates that the effects of fugitive dust from construction activities would be largely reduced with an effective watering program. Watering the disturbed area of the construction site twice per day with approximately 3,500 gallons per acre per day would reduce TSP emissions as much as 50 percent (U.S. Environmental Protection Agency, 1995).

Specific information describing the types of construction equipment required for a specific task, the hours the equipment is operated, and the operating conditions, vary widely from project to project. For purposes of analysis, these parameters were estimated using established cost estimating methodologies for construction and experience with similar types of construction projects (Means, 1999). Combustive emissions from construction equipment exhausts were estimated from USEPA approved emissions factors for heavy-duty diesel-powered construction equipment (U.S. Environmental Protection Agency, 1998). Annual construction emissions resulting from the construction of the proposed STF facilities at SSC are presented in Table 4.1-1. Estimated pollutant emissions are based on the proposed site areas, the duration of each project, and the specified building square footage for new construction, renovations, and demolition.

Analysis of the data presented in Table 4.1-1 indicates that the overall ambient air quality within the Mobile-Pensacola-Panama City-Southern Mississippi Interstate AQCR 5 would be slightly affected by the construction of the proposed STF facilities at SSC. Increased emissions from construction activities would produce slightly elevated air pollutant concentrations. However, the increases would be minimal (not exceeding a 0.11 percent increase for any criteria pollutant) when compared to baseline AQCR 5 emissions. The effects would be temporary, fall off rapidly with distance from the proposed construction site, and would not result in any long-term impacts.

Table 4.1-1 Proposed Construction Emissions Within AQCR 5 at SSC

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	NO_X (tpy)	SO_X (tpy)	PM_{10} (tpy)	Pb (tpy)
AQCR 5 Emission Totals[a]	74,603	28,078	110,835	208,375	7,231	7.4
Proposed Annual Emissions[b]						
Performance Test Facility	0.56	0.09	1.21	0.13	3.39	0.00
Remote Control Facility	0.01	0.00	0.03	0.00	0.00	0.00
Reactant Storage Facility	0.02	0.00	0.05	0.01	0.00	0.00
Assembly, Integration & Test Facility	0.58	0.09	1.26	0.13	3.84	0.00
Engineering & Administration Facility	0.05	0.01	0.12	0.01	0.01	0.00
Utility Improvements	0.00	0.00	0.00	0.00	0.03	0.00
Road Improvements	3.22	0.17	0.51	0.06	0.38	0.00
Total Construction Emissions (tpy)	4.45	0.36	3.18	0.35	7.65	0.00
Percent Change in AQCR 5 (%)	**0.01**	**0.00**	**0.00**	**0.00**	**0.11**	**0.00**

a Summarized from the USEPA's AIRSData Source Count Inventory Report (USEPA, 2000).
b Estimated emissions based on building square footage, site areas, and project durations.
tpy tons per year.

Operation

Combustive emissions from increased vehicle and emergency generator operations and the release of hydrogen fluoride during laser testing would be generated during the proposed operation of the STF facilities at SSC. Emissions from vehicle operations are based on 260 permanent personnel, 200 long-term personnel, and the following assumptions:

- Daily round trip to and from work = 20 miles;
- Average vehicle speed = 35 miles per hour;
- Average vehicle occupancy = 1.2 persons per vehicle;
- Annual number of workday = 230 days;
- Year model of each vehicle = 1995 (80 percent automobiles, 20 percent pickups);
- Operations mode = Federal Test Procedure (FTP) conditions; and
- Average ambient temperature = 70°F.

Combustive emissions from personal vehicle exhausts are estimated from USEPA approved emissions factors for light-duty gasoline vehicles (automobiles) and light-duty gasoline trucks (pickups) assuming the conditions described above (U.S. Environmental Protection Agency, 1998). Combustive emissions from emergency generator operations are estimated from USEPA approved emissions factors (U.S. Environmental Protection Agency, 1995) and are based on the following assumptions:

- Generator capacity = 2,000 kilowatts;
- Emissions control = none;

- Fuel type = diesel fuel No. 2;
- Sulfur content of fuel = 2 percent;
- Operational usage = 100 hours per year; and
- Monthly operational testing = 1 hour per month.

The PRS generates superheated steam that in turn generates the vacuum used to draw reactants through the laser generator. Each test could result in the operational emission of up to 0.0096 pounds of hydrogen fluoride as described in Appendix A. This would be ejected as a gas along with approximately 9,774 gallons of water as steam. For purposes of analysis, it is assumed that 22 laser tests will be conducted annually. Annual pollutant emissions resulting from the operation of the proposed STF facilities at SSC are presented in Table 4.1-2.

Table 4.1-2 Proposed Operational Emissions Within AQCR 5 at SSC

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	NO_x (tpy)	SO_x (tpy)	PM_{10} (tpy)	Pb (tpy)	HF (tpy)
AQCR 5 Emission Totals[a]	74,603	28,078	110,835	208,375	7,231	7.4	NA
Proposed Annual Emissions							
Emergency Generators	0.06	0.02	0.84	0.02	0.05	0.00	0.00
Personal Vehicle Emissions	27.05	2.20	3.57	0.00	0.00	0.00	0.00
Laser Testing	0.00	0.00	0.00	0.00	0.00	0.00	<0.1
Total Operational Emissions (tpy)	27.11	2.22	4.41	0.02	0.05	0.00	<0.1
Percent Change in AQCR 5 (%)	**0.04**	**0.01**	**0.04**	**0.00**	**0.00**	**0.00**	**0.00**

a Summarized from the USEPA's AIRSData Source Count Inventory Report (USEPA, 2000).
tpy tons per year.
NA Not available

Analysis of the data presented in Table 4.1-2 indicates that the overall ambient air quality within the Mobile-Pensacola-Panama City-Southern Mississippi Interstate AQCR 5 would only be slightly affected by the operation of the proposed STF facilities at SSC. Increased emissions from increased vehicle and emergency generator operations would produce slightly elevated air pollutant concentrations. However, the increases would be minimal (not exceeding a 0.04 percent increase for any criteria pollutant) when compared to baseline AQCR 5 emissions. The AQCR is in attainment, and a conformity determination under the Clean Air Act is not required.

Operational releases of hydrogen fluoride would not be expected to cause exceedances of health-based standards beyond the laser safety zone. Operational releases of hydrogen fluoride would be subject to the employment of meteorological and/or procedural operational constraints to assure the protection of personnel. Management of such constraints for operations involving hazardous materials is a common practice to assure the protection of personnel.

Hydrogen fluoride would tend to remain in a gaseous state unless subjected to meteorological conditions of humidity greater than 90 percent and temperatures less than

50° F. As such, it is not expected to deposit out of the cloud as liquid droplets, but would generally remain within the cloud as a gas as it expanded. Once the cloud expanded to the point where it was contacting the ground, the hydrogen fluoride would likely be absorbed into any wet surfaces or surface water with which it came into contact. Once absorbed in water, it would be effectively removed from the exhaust cloud. Under normal circumstances, the cloud would be highly dispersed before coming into contact with the ground or surface water and deposition of hydrogen fluoride in any given area would be extremely low, and would have minimal impact on surface water pH levels.

As an example, assuming the maximum anticipated concentration from the modeling analysis in Appendix A (0.0015 parts per million [ppm] or 0.0012 milligrams per liter) is deposited on a 1-meter square area of water with a pH of 7 and an alkalinity of 25 milligrams per liter (calcium oxide equivalent). Further assuming the deposited hydrogen fluoride reacted with only the first 3 inches of water, the total volume of water in the reaction would be 20 gallons. The total available alkalinity would be approximately 1,890 milligrams calcium oxide, only 0.11 milligrams of which would be required to neutralize the 0.12 milligrams of hydrogen fluoride deposited in this example. Therefore, there would be negligible loss of alkalinity. The overall pH of the system would also not be subject to change.

Mishap Impacts

In addition to the operational exhaust of hydrogen fluoride, it is also possible that one or more of the reactants to be stored at the STF complex could leak or be accidentally released into the atmosphere. The two chemicals of concern due to potential toxicity would be nitrogen trifluoride and fluorine. Up to approximately 1,102 pounds of nitrogen trifluoride and 231 pounds of fluorine would be stored. The primary hazards of an accidental release involve the transfer of the reactants from the loading truck to the ground storage tanks, transfer from the storage tank to the test apparatus, a catastrophic storage container failure, and a massive release of hydrogen fluoride resulting either from the slow combustion or the detonation of compounds while reactants are stored in the Performance Test Chamber.

Reactant transfer operations (refilling storage tanks or transferring the reactants into the test equipment) are activities that would result in the highest probability of accidental release. Transfer operations would be remotely controlled where possible, and personnel directly involved (such as those conducting the transfer from delivery vessels to storage vessels) would follow established operating procedures and wear appropriate personal protection equipment. Accidental releases due to transfer operations would probably be limited to a few ounces of reactant, which would be dispersed before reaching the edge of the safety area. However, the potential does exist for a serious mishap involving the release of a larger portion of a stored reactant. As such, meteorological monitoring and dispersion modeling would be carried out prior to initiating any transfer operations. If the modeling indicated the potential for hazardous conditions beyond the laser 0.75-mile safety zone, transfer of the reactant would be delayed until conditions changed sufficiently that modeling indicated a release would not result in hazardous conditions beyond the laser safety zone.

Two remote possibilities of a catastrophic release have been identified and are being analyzed. The first of which involves a massive and instantaneous release of gaseous fluorine or nitrogen trifluoride gases while reactants are in ground storage. The second possibility involves a massive release of hydrogen fluoride resulting either from the slow combustion or the detonation of F2/NF3 with H2/D2 while reactants are stored in the Performance Test Chamber. Toxic endpoints for each of these toxic species have been determined for various atmospheric conditions. The results of such analyses are included in the Offsite Consequence Analysis report. Appropriate steps would be determined and included in the Risk Management Plan in the event that such accident occurs in order to minimize the impact such an accident could have on human health and the environment.

In addition to the chance of an accidental release occurring during reactant transfer operations, there is the remote possibility of an accidental release occurring at other times. Analysis indicates that it is possible that a release of sufficient quantity of reactant could occur that under proper meteorological conditions could present a serious health hazard beyond the laser safety zone. The duration of the health hazard would be limited to the amount of time required for the reactant plume cloud to disperse. Specific times and distances would depend upon meteorological conditions, the type of chemical and amount released, and the rate of release. Appendix A describes the offsite consequence analysis for the SBL IFX project and the potential impacts to human health and the environment. As with other industrial facilities that utilize hazardous chemicals, the appropriate steps to be carried out in the event of a chemical release will be included in the facility Risk Management Plan. It will include steps to be taken in order to minimize the impact such an accidental release could have on people and on the environment. The Risk Management Plan will be developed in coordination with the proper agencies.

Required Actions. Permitting under the Clean Air Act and preparation of a Risk Management would be required.

4.1.1.2 Cumulative Impacts

At SSC, no new programs or extensive construction projects are foreseeable that would create cumulative impacts with the IFX ground-test program. Personnel levels are forecast to remain constant. The emissions constituents from laser tests and ongoing engine tests are different with the exception of water vapor. Water vapor does not cause adverse effects on air quality. Therefore, there would be no cumulative adverse effects on regional air quality.

4.1.2 Airspace

4.1.2.1 Environmental Effects

Analysis of airspace impacts from the proposed construction and alteration of facilities at SSC are based on the criteria established in Section 3.1.2.3, the proposed maximum height of the facilities, and the location of the proposed facilities in relation to the nearest runway. It is assumed that the maximum height of any proposed facility would not exceed 160 feet above ground level (agl), which is less than the 200 feet maximum not requiring notification to the FAA.

The distance from the proposed siting locations at SSC to the nearest point on each of the nearest runways at both Stennis International Airport and Picayune Pearl River County Airport exceeds the 20,000 feet horizontal distance criteria established for notification to the FAA. Therefore, notification to the FAA Administrator *is not* required prior to construction of the proposed facilities at SSC, and proposed activities *would not* adversely affect airspace.

4.1.2.2 Cumulative Impacts

No additional activities that would impact airspace have been identified at SSC. Therefore, cumulative activities would not result in adverse impacts to airspace.

4.1.3 Biological Resources

4.1.3.1 Environmental Effects

Criteria for assessing potential impacts to biological resources are based on the number or amount of resources that could be impacted relative to its occurrence at the project sites, the sensitivity of the resource to proposed activities, and the duration of the impact. Impacts are considered significant if they have the potential to result in reduction of the population size of federally listed threatened or endangered species, degradation of biologically important or unique habitats, substantial long-term loss of vegetation, or the capacity of a habitat to support wildlife.

The following sections discuss the environmental effects of the IFX ground-test program on biological resources found at SSC.

Construction

Construction activities would result in clearing of vegetation associated with road widening, expansions of buildings, utility corridors/trenches, and igloo ramps.

The STF complex would impact land within the SSC Fee Area only, and would not affect the buffer area. Open areas within the Fee Area are managed for commercial tree harvest, and timber is harvested on a regular basis in accordance with the SSC Natural Resources Management Plan. The project would not have adverse impacts on these activities or resources.

Although the ranges of numerous transient threatened or endangered species overlap with the SSC Fee Area and Buffer Zone, it is unlikely that any of the listed threatened or endangered plants or animals would be impacted by the proposed IFX ground-test program. The majority of the project would be constructed in previously disturbed areas. Construction of the maintenance road could impact alligator habitat in the wetlands area within the safety arc, but direct impacts on alligators are not likely. All the other listed species observed within the SSC occur either in the larger buffer area surrounding the Fee Area, or at other locations at the edge of the Fee Area, away from the proposed construction activities.

Up to 8 acres of freshwater wetlands would be affected by the proposed activities. These impacts are broken out below.

- Approximately 4 acres of wetlands would be filled and/or disturbed for construction on the north side of Building 8201 (AI&TF).
- An additional 3.5 acres of wetlands would also be filled and/or disturbed in conjunction with the other buildings and road widening within the SSC as itemized below.
  - Widening of portions of the existing road between Building 8201 and the PTF would be required. This would affect wetlands associated with drainage ditches adjacent to the road. The total distance is approximately 3,500 feet (this would equal approximately 3,500 feet x 5 feet widening = 17,500 square feet = 0.4 acres of wetlands). Figure 4.1-1 shows the location of the proposed road widening.
  - Extension of a natural gas line to the PTF along existing roads would be required. This would affect wetlands along the corridor for the gas line. The total distance is approximately 13,200 feet (this would equal approximately 13,200 feet x 10 feet corridor disturbance = 132,200 square feet = 3.0 acres of wetlands). No other utility lines (wastewater, water, electrical) would be required. Figure 4.1-2 shows the location of the proposed natural gas line.
  - Widening of driveways for three igloos at the MSAAP site, and construction of new ramps between the igloos and the road (estimate 0.1 acres affected).

The exact number of acres of wetlands affected at each of these construction sites has not been calculated because a detailed design is not available at present. An estimate of the total number of acres of wetlands impacted has therefore been made based on existing information and approximate lengths and widths of construction footprints.

The existing dock area would be used for this project to transport the IFX system. New construction at the dock area would not be required. Dredging of the river at the dock would not be required for this project, and a Section 404 permit would not be necessary for any dock activities.

Where wetlands would be impacted, specific mitigation measures to offset impacts on these habitats would be developed during permitting in coordination with the Vicksburg District USACE. The permitting process would still be conducted in accordance with the USEPA's guidelines for evaluating Section 404 permitting applications found in Section 404 (b)(1) of the Clean Water Act. These regulations require that a sequence of avoidance, minimization, and compensation be followed for projects involving filling of waters of the United States, including wetlands. For this project, the Section 404(b)(1) guidelines require that the applicant demonstrate that the

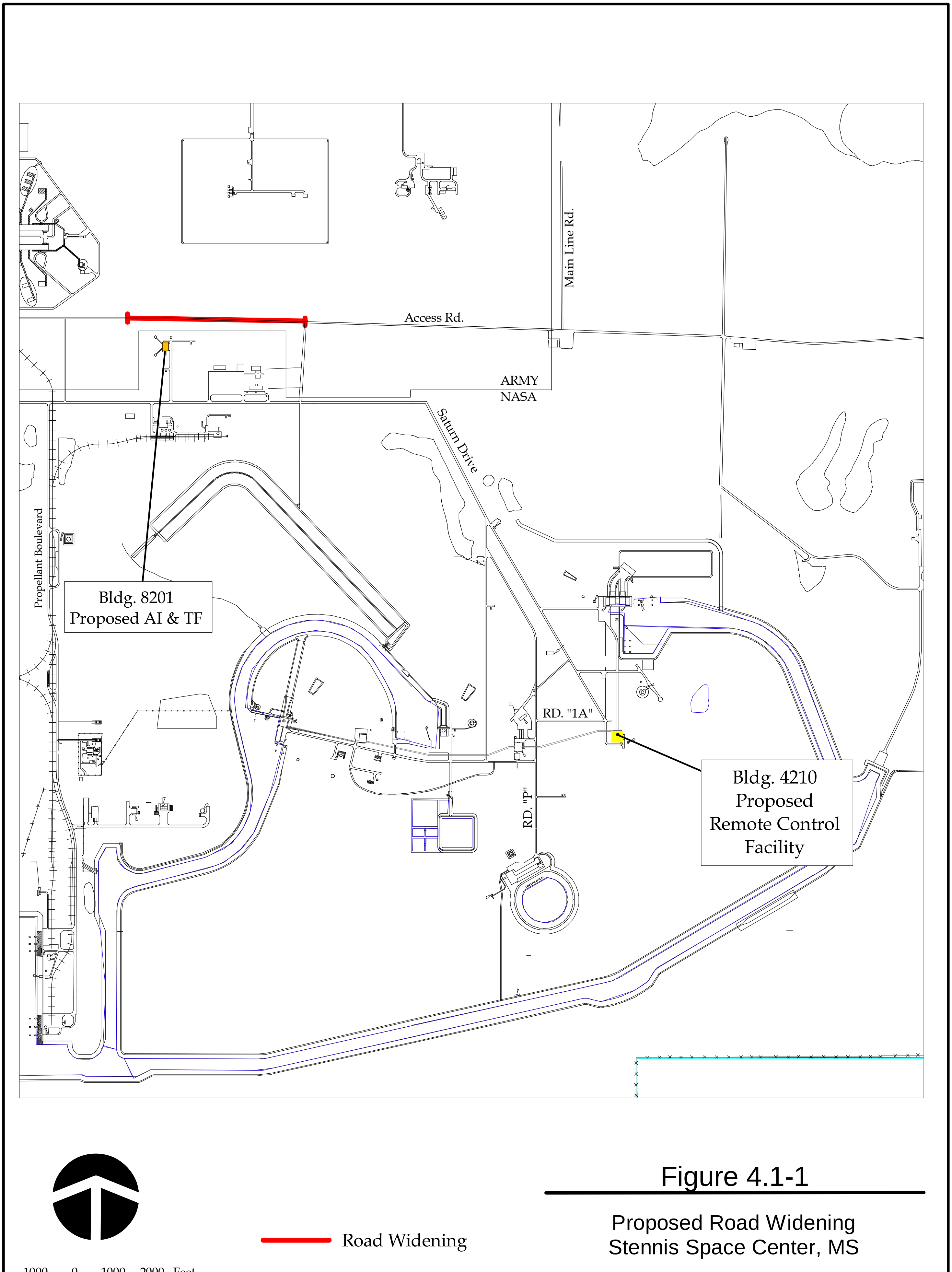

Figure 4.1-1

Proposed Road Widening
Stennis Space Center, MS

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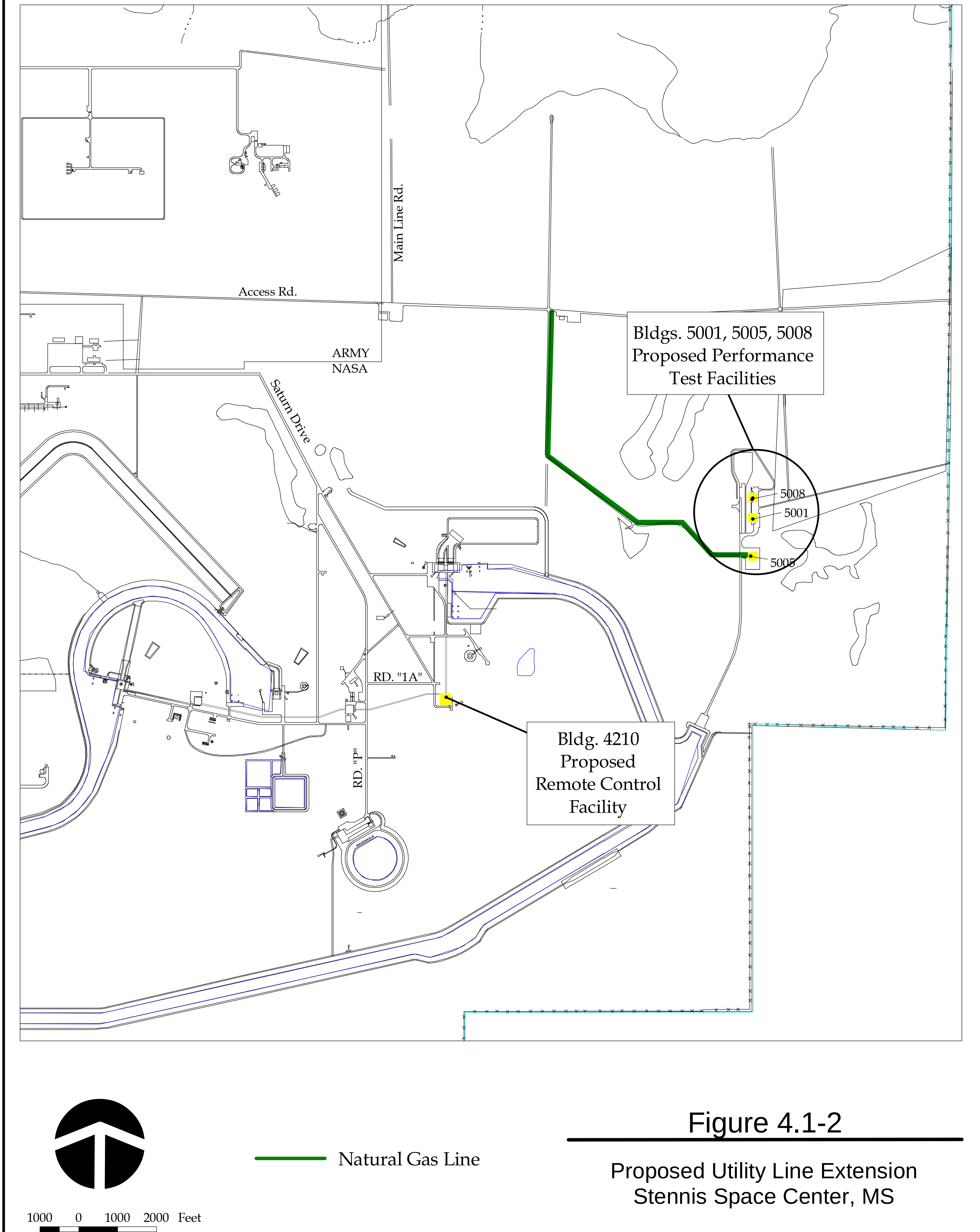

Figure 4.1-2

Proposed Utility Line Extension
Stennis Space Center, MS

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SSC represents the "least environmentally damaging practicable alternative." Once this "avoidance" test has been passed to the USACE's satisfaction, the applicant is allowed to proceed to the minimization stage. In this stage, steps are taken at the engineering level to reduce impacts of the preferred alternative. For this project, the conditions and procedures of avoidance, minimization, and compensation have largely been established in the general permit. Facility design would attempt to avoid and minimize direct and indirect disturbance of wetlands to the extent practicable, as required by the guidelines. Mitigation measures would be developed during the permitting process once a detailed design has been developed. Agency-recommended mitigation would take into account the size and quality of the wetlands involved. Mitigation for wetlands could include: (1) use of the previously established mitigation bank to offset wetlands losses at a ratio determined through consultation with the USACE; and (2) monitoring of the wetlands bank areas as required under the general permit to determine the effectiveness of replacement and any remedial measures.

As discussed in the previous paragraph, the project's wetland impact would be evaluated under Section 404(b)(1) guidelines of the Clean Water Act. These regulations require a review sequence of avoidance, minimization, and compensation for unavoidable impacts to wetlands. The MDEQ Office of Pollution Control (OPC) regulations require the same considerations before a Section 401 Water Quality Certification can be issued. The OPC sequential review is typically conducted during the U. S. Army Corps of Engineers Section 404 Public Notice period. It is during this time that OPC will need to review detailed facility designs and site layouts in order to determine if wetlands impacts have been avoided and minimized to the maximum extent practicable. Wetland mitigation requirements will vary depending on specific wetlands types to be impacted. In regards to mitigation, OPC has indicated through agency comments that the wetland impacts can likely be mitigated on-site through utilization of SSC's existing mitigation bank.

Although removal of upland and wetlands vegetation could displace wildlife, it would not result in a substantial reduction in habitat available for wildlife in the area. The SSC acoustic Buffer Zone alone contains over 125,000 acres where development is not permitted. All of the affected habitat would be adjacent to existing infrastructure and facilities.

The effects of construction noise on biological resources is discussed in the noise section of this EA, Section 4.1.9.

Operation

The effects of operational noise on biological resources is discussed in the noise section of this EA, Section 4.1.9.

The component of the exhaust that is of concern to biological resources is hydrogen fluoride. Using the rated scrubbing rate and the maximum reactant supply time, each test could result in the operational release of up to 0.0096 pounds of hydrogen fluoride along with the 9,774 gallons of water exhausted as superheated steam. Using the methodology in Appendix A, it was calculated that the highest concentration of hydrogen fluoride would be 0.0015 ppm or 0.0012 milligrams per liter. Actual concentrations are anticipated to be significantly lower than those predicted through modeling (due to variations in weather and the initial buoyancy of the exhaust cloud).

Hydrogen fluoride would tend to remain in a gaseous state unless subjected to meteorological conditions of humidity greater than 90 percent and temperatures less than 50° F. As such, it is not expected to deposit out of the cloud as liquid droplets, but would generally remain within the cloud as a gas as it expanded. Once the cloud expanded to the point where it was contacting the ground, the hydrogen fluoride would likely be absorbed into any wet surfaces or surface water with which it came into contact. Once absorbed in water, it would be effectively removed from the exhaust cloud. Under normal circumstances, the cloud would be highly dispersed before coming into contact with the ground or surface water and deposition of hydrogen fluoride in any given area would be extremely low, and would have minimal impact on surface water pH levels.

As an example, assuming the maximum anticipated concentration from the modeling analysis in Appendix A (0.0015 parts per million [ppm] or 0.0012 milligrams per liter) is deposited on a 1-meter square area of water with a pH of 7 and an alkalinity of 25 milligrams per liter (calcium oxide equivalent). Further assuming the deposited hydrogen fluoride reacted with only the first 3 inches of water, the total volume of water in the reaction would be 20 gallons. The total available alkalinity would be approximately 1,890 milligrams calcium oxide, only 0.11 milligrams of which would be required to neutralize the 0.12 milligrams of hydrogen fluoride deposited in this example. Therefore, there would be negligible loss of alkalinity. The overall pH of the system would also not be subject to change.

In systems with low mixing dynamics (slow current or no flow) it is possible that a thin acid layer would temporarily form over a more basic layer. If this occurred, the layering effect would be transitory and would be lessened by water flow or animal movements in the water.

Under rainy conditions, it is possible that the exhaust could be deposited in a smaller area, resulting in a greater amount of hydrogen fluoride in any given area. However, rain levels sufficient to wash the hydrogen fluoride from the exhaust cloud would also serve to dilute the acid and minimize its impact on surface waters. Wind levels during such rain events would also serve to disperse the hydrogen fluoride even as the rain serves to concentrate it. The base pH of the rain would further serve to buffer any system to which the hydrogen fluoride is introduced. Rain has a pH range of approximately 4-8 under normal circumstances, and the addition of a small amount of hydrogen fluoride would not be likely to cause a measurable change in the pH of the rainfall. As such, hydrogen fluoride that is absorbed into rain would not be likely to have a measurable impact.

In a 1996 study on the effects of hydrogen fluoride, an absence of serious pulmonary or other adverse effects was noted in rats during direct delivery of 950 ppm (760 milligrams per cubic meter) to the trachea for an exposure period of 10 minutes (Dalbey, 1996). Concentrations below 120 ppm (96 milligrams per cubic meter) were tolerated for 5 hours with no deaths by rabbits and guinea pigs (American Industrial Hygiene Association, 1988). The estimated maximum ground level concentration of hydrogen fluoride is predicted to be 0.0015 ppm. The length of exposure to the hydrogen fluoride cloud is anticipated to be less than 5 minutes, which further reduces actual impacts. No adverse effects to wildlife species, such as birds flying through the steam and hydrogen fluoride cloud, are expected as a result of this level of hydrogen fluoride emission.

During operation, IFX elements would be transported to and from SSC. The exact method of IFX elements transport has not been determined. The IFX elements would be transported to and from SSC via rail, air (commercial or military), truck and/or barge. All of these transportation methods are available for SSC. For barge transport, no modifications to the existing barge system would be required. No adverse impacts on any aquatic systems would result from use of the existing barge system, and no dredging would be required to use the barges.

The USFWS has reviewed the IFX ground-test program and concluded that there would be no adverse effects to threatened or endangered species.

Required Actions. Mitigation of wetland impacts through the existing SSC mitigation bank is required.

4.1.3.2 Cumulative Impacts

No other cumulative actions at SSC have been identified that would cause cumulative effects with the IFX ground-test program. The mitigation bank at SSC has mitigated all past activities.

4.1.4 Cultural Resources

4.1.4.1 Environmental Effects

Prehistoric and Historic Archaeological Resources

Prehistoric and historic archaeological surveys of the SSC Fee Area are considered complete by the Mississippi SHPO (National Aeronautics and Space Administration, 1995b; Mississippi Department of Archives and History, 1990) and no further studies are required. Except for archaeological sites and artifacts located in the areas of the Gainesville and Logtown townsites (not near STF construction sites), there are no sites within the Fee Area. Because archaeological sites and artifacts are known to occur within the boundary of the installation, there is some potential for cultural materials to be unexpectedly discovered during the course of project activities. In the event this should occur, all activities would halt in the immediate area and the Mississippi SHPO consulted through the SSC Environmental Office. Subsequent actions would follow guidance provided in 36 CFR 800.11 and/or in NAGPRA.

To ensure that historic resources are appropriately considered during construction planning, a Preliminary Environmental Study form has been developed that must be completed by any proponent of an activity at SSC. The form must be submitted to the Environmental Office for consideration before any construction. In addition, all construction contracts shall contain language requiring notification to the Contracting Officer of any archaeological finds discovered during construction. Therefore, there would be no effect on archaeological resources from activities associated with construction of the STF facilities.

Historic Buildings and Structures

There are no historic properties that would be affected by the IFX ground-test program.

Native Populations/Traditional Resources

There are no traditional cultural properties at SSC; therefore, no effects are expected.

4.1.4.2 Cumulative Impacts

There are no past, present, or reasonably foreseeable future programs identified for SSC that would overlap the IFX ground-test program; therefore, no cultural resources cumulative impacts would be expected to occur.

4.1.5 Geology and Soils

4.1.5.1 Environmental Effects

Construction

Construction activities typically involve the removal of vegetation, cut-and-fill operations, and grading for site preparation and access. Site preparation activities at SSC would be subject to Phase I and II NPDES construction permit requirements. These requirements call for implementation of an SWPPP, which would identify the Best Management Practices to be implemented both during and following construction activities for the purpose of preventing soil erosion and controlling pollutant discharges into waterways during storm events. Best Management Practices often include the construction of berms, swales, and runoff diversion ditches, hydroseeding, and the use of silt fences or separators. With implementation of the SWPPP and Best Management Practices, the erosion of soil resulting from project construction would be minor and short-term in nature. Additionally, pollutant discharge would not be expected.

Operation

Soils in the area of the PTF are moderately to strongly acidic (average pH levels range from approximately 4.5 to 5.5) (Iowa State University Statistical Laboratory, 1998). Due to the low buffering capacity of the soils, the deposition of small amounts of hydrogen fluoride may result in a slight and temporary increase in soil acidity. However, because hydrogen fluoride deposition on soil surfaces would occur only during periods of high humidity and because hydrogen fluoride is highly soluble in water, small amounts of hydrogen fluoride residuals would be quickly diluted and buffered by rainfall. PTF operations are not expected to result in long-term changes in the chemical composition or physical characteristics of soils located near the PTF. However, temporary increases in soil acidity may result in short-term impacts to vegetation and soil-dwelling microorganisms.

Because SSC is located in a low seismic risk area, the potential occurrence of liquefaction, seismic settlement, or ground rupture at the project sites are considered minimal. In addition, soils at the STF sites exhibit low shrink/swell susceptibility.

4.1.5.2 Cumulative Impacts

Temporary, minor impacts to geology and soils, when combined with other current and foreseeable future activities, would not result in adverse cumulative impacts.

4.1.6 Hazardous Materials and Hazardous Waste Management

The primary hazardous materials and the hazardous wastes associated with STF operation and maintenance are listed in Table 2-5.

4.1.6.1 Environmental Effects

Construction

Construction and internal renovation of proposed STF buildings would utilize small amounts of hazardous materials and generate hazardous wastes. Hazardous materials used during construction may include paints, oils, and solvents. Usage of materials is anticipated to be minimal and consistent with typical construction activity. These materials would be handled and stored in accordance with SSC and applicable federal regulations. This is not expected to adversely affect SSC hazardous material practices or handling procedures.

Asbestos-Containing Material (ACM), Lead-Based Paint, and PCBs. Internal building renovation activities proposed for Buildings 5001, 5005, and 8201 and MSAAP munitions bunkers may generate wastes, including ACM and lead-based paints, and PCBs. According to the SSC Asbestos Hazard Control Plan, asbestos levels in installation buildings are less than 0.01 fibers per cubic centimeter, well below the OSHA recommended 0.10 fibers per cubic centimeter recommended for asbestos workers (John C. Stennis Space Center, 1998). However, ACM does exist in Building 8201. All renovation work in this facility would be performed by a licensed asbestos abatement contractor, in accordance with state and federal regulations. All removed asbestos would be disposed of in an on-site solid waste landfill cell designed to receive ACM.

Although lead-based paint has not been used at SSC, it is possible that lead-based paint from installed equipment and PCBs would be encountered during building renovation. Paints that exceed the limits for lead must be removed in accordance with the applicable health and safety standards and disposed of as hazardous waste. PCB contamination may be encountered during construction/renovation activities, as contaminated pad mounted transformers are located in various sites at SSC. However, SSC conducts an annual PCB status report to monitor the remaining contaminated transformers. Therefore, release or exposure to PCBs during construction and renovation is not anticipated.

Operation

Hazardous Materials. During the operational phase of the IFX ground-test program, hazardous reactants\chemicals would be stored in igloo munition bunkers located on the MSAAP site, collectively serving as the RSF. Bulk storage of F_2, D_2, and NF_3, chemicals needed in the PTC for laser testing, would be stored in three separate igloos to minimize the possibility of dangerous co-mingling of substances in the event of a release. Bunkers would also be upgraded with chemical monitors to minimize the risk of a large scale substance release. Other hazardous materials required for STF operation, listed in Table 2-2, would be stored. Storage and handling areas at the RSF would consist of concrete pads with associated tanks, piping, valves, and related storage and transfer equipment to provide inert gases and reactants to the test chamber and diesel fuel and water to the PRS. Required emergency response equipment would be included at appropriate locations. Tier II EPCRA reporting may be required to support the storage and handling of hazardous materials.

Small amounts of F_2, D_2, and NF_3, as well as other chemicals/reactants, would be at the PTF in anticipation of testing. Amounts would be equivalent to what is needed for 10 test firings of the LPE. As with the RSF, hazardous materials would be stored and handled in appropriate areas.

Diesel fuel would be used in the PTF as the fuel source for generators providing the primary electrical power to the PTC and PRS during laser performance testing, as well as for the PTC steam-generating boilers. A 15,000-gallon diesel storage tank would be acquired to support the diesel fuel needs at the PTC. The storage tank would be an aboveground, double-walled tank, compliant with applicable state and federal regulations.

Hazardous Waste. 1,511 lbs of hazardous waste would be generated per year (See Table 2-5 for a detailed list). An additional 7,913 pounds of corrosive contaminated water is generated from the Pressure Recovery System operation from the cooling water condensing the HF and DF. This contaminated water will be treated on site using sodium hydroxide to precipitate to safe compounds the HF and DF to allow discharge to the sewer. The treatment will be conducted on a batch basis after every laser test firing. Wastewater collected in the oil/water separator sump would be the only process waste stream not generated at the PTC. Based on typical operating practices, waste collected in the sump would be disposed of on a semi-annual basis, disposal of which would not adversely impact hazardous waste disposal at the STF or SSC. Items such as lead-acid batteries would be recycled, and all other wastes would be disposed of at RCRA-permitted facilities in accordance with SSC hazardous waste management procedures.

The STF program would be responsible for maintaining a hazardous waste satellite accumulation point and 90-day hazardous waste accumulation area, if necessary, in accordance with 40 CFR 262.34. Any permitting required for hazardous waste storage would be separate from SSC permits.

4.1.6.2 Cumulative Impacts

There are no other anticipated, past, or ongoing cumulative actions at SSC that would adversely affect hazardous material and hazardous waste management.

4.1.7 Health and Safety

4.1.7.1 Environmental Effects

Construction Activities

Preparation for new construction would include clearance of existing vegetation, grading, and excavation for foundations. An area would be prepared for construction equipment laydown, personal vehicle parking, temporary mobile offices (trailers), maintenance facilities, and other construction needs. Concrete for foundations and footings and other construction materials would be delivered by truck in accordance with DoT and NASA regulations. Proposed construction and internal renovation of tall STF structures would present a fall hazard to workers. All construction and renovation activities would be conducted in accordance with OSHA and NASA requirements for health and safety to control exposure to occupational safety and health hazards.

Operations

Under the IFX ground-test program, bulk storage of hazardous chemicals would occur at the RSF, with smaller amounts of hazardous materials stored at the PTF. In Table 2-2, it is estimated that a maximum of 231 pounds of F_2 would be stored at the STF Complex at any given time. Minimum thresholds have been established for Tier One and Tier Two reporting under 40 CFR 370 (Title III, Section 312). For Extremely Hazardous Substances (EHSs) designated under Section 302 of Title III, the reporting threshold is 500 pounds or the threshold planning quantity (TPQ), whichever is lower: F_2 is classified as an EHS. For all other hazardous chemicals for which facilities are required to have or prepare an MSDS, the minimum reporting threshold is 10,000 pounds. Section 312 requires that the owner or operator of a facility to comply with Tier One and Tier Two reporting if, under regulations implementing the Occupational Safety and Health Act of 1970, the owner or operator is required to prepare or have available Material Safety Data Sheets (MSDS) for hazardous chemicals present at the facility. MSDS requirements are specified in the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, found in 29 CFR 1910.1200.

Under 40 CFR 373 (Section 313 of Title III), the owner or operator of the facility must submit a Form R report to the USEPA if the facility exceeds an applicable threshold for any of the listed chemicals. Section 313 reportable quantities at the STF Complex would be determined under the 10,000 pounds otherwise used threshold. Therefore, listed Section 313 chemicals used at the STF Complex in excess of 10,000 pounds per calendar year would require the preparation and submission of a Form R report.

Hazardous substances used in conjunction with the IFX ground-test program would be stored in three separate retrofitted munitions igloos to minimize the possibility of dangerous co-mingling of substances in the event of a release. Bunkers would also be upgraded with chemical monitors to minimize the risk of a large-scale substance release. Storage and handling areas at the RSF would consist of concrete pads with associated tanks, piping, valves, and related storage and transfer equipment to provide inert gases and reactants to the test chamber and diesel fuel and water to the PRS. Required emergency response equipment would be included at appropriate locations.

As indicated in Section 4.1.1.1, there is a potential for accidental release of toxic and corrosive gases from the tube tanks of the delivery vehicles, during transfer from the delivery vehicles to the site storage tanks, and during conveyance from the site storage tanks to the laser combustor. Hazardous materials to be used at the PTF would be shipped via truckrail from the manufacturing location in specially designed shipping containers to reduce the potential of a mishap in the event of an accident. Existing installation operating procedures and safety measures have been established to minimize the probability of a release and the potential for health and safety impacts once materials arrive at the installation. Specific STF procedures would also be established by the program.

A 0.75-mile radius safety zone would surround the PTF. The 0.75-mile radius safety zone provides for dispersion of emissions from the laser tests. Any activities within this zone must cease during testing. There are no existing facilities or activities located within this zone that would be affected, therefore potential hazards to workers at adjacent facilities is considered to be minimal (Ballistic Missile Defense Organization, 1999). No personnel shall be present in the PTC during laser testing. A vacuum shall be maintained in the test cell during laser testing, the reactants would only be released through the PRS.

At the AI&TF, support shops and laboratories consisting of machine shops, welding shops, paint shops, electrical shops, and instrument calibration and repair labs would be required. A plant protection support area would house the personnel and equipment to provide fire, medical, and security services. No laser test firing would occur at the AI&TF complex.

Facility and equipment designs would incorporate measures to minimize the potential for and impact of accidental releases. Operating procedures and training would be instituted by the program to minimize the potential for and impact of releases of hazardous materials. Appropriate emergency response plans would be established and implemented by the program to deal with potential chemical releases.

4.1.7.2 Cumulative Impacts

All work on the SSC alternative would be performed in accordance with applicable health and safety regulations. No injuries or illnesses are anticipated. No other activities have been identified that would have a cumulative adverse effect on health and safety.

4.1.8 Land Use and Aesthetics

4.1.8.1 Environmental Effects

Regional Land Use

The proposed PTF would be located in the southeastern portion of the Fee Area of the SSC. This facility is located approximately 0.5 miles from the boundary of the SSC. The support facilities are located further from the SSC boundaries. The entire Fee Area is surrounded by a 6-mile wide Buffer Zone, in which there can be no habitable structures. Therefore, construction and operational activities would not affect the adjacent offsite land uses.

On-base Land Use

New construction, as well as use of existing facilities, would occur at various sites throughout SSC. The PTF would be constructed in the southeast corner of the SSC, at the site of a rocket test facility, including existing Buildings 5001, 5005, and 5008. The PTF would utilize existing facilities for part of the complex, but would also require some new construction. Table 2-7 in Section 2 describes the land and facility requirements for all activities associated with the STF complex. The PTF facility would be 39,300 square feet in size and would occupy a site of approximately 12 acres. An additional 2 acres, in an existing fenced area that was used for construction of the rocket testing facility, would be used temporarily for construction lay down. The existing land uses surrounding the PTF include Propulsion System Testing and open space. However, the PTF also requires a 0.75-mile radius safety zone surrounding it with limited use capabilities; any activities within this zone must cease during testing. There are no existing facilities or activities located within this zone that would be affected. There should be no compatibility problems with this site.

The RCF would be located to the southwest of the PTF, just outside the 0.75-mile PTF safety zone. These existing facilities are called the B-Stand, and test and control facilities would be located in existing Building 4210. The RCF facility would be 4,200 square feet in size. The existing land uses surrounding the RCF include Propulsion System Testing, utility, and open space. The RCF should have no compatibility problems in this area.

The AI&TF complex would be a new facility located about 2 miles west of the PTF next to Building 8201, near the center of SSC at the southern boundary of the MSAAP. It would be 56,900 square feet in size on a site of approximately 5 acres. The site includes about 4 acres of wetlands that would be mitigated in accordance with the SSC wetlands permit and mitigation bank. The AI&TF would require all new construction. Building 8201 would be renovated and used for entry to the AI&TF complex and laboratories. Construction lay down would occur on existing paved parking areas near Building 8201. Land uses surrounding the AI&TF include Test Support and open space. The AI&TF should be a compatible land use.

Engineering and administration personnel would be located within the SSC administration area in existing Building 1100. This facility would be approximately 31,000 square feet in size. There should be no compatibility problems with the engineering and administrative land uses.

Aesthetics

New construction could slightly alter the view surrounding SSC. Several of the proposed facilities would be approximately 160 feet tall, which is not out of character with other structures at SSC that are up to 295 feet tall. The Buffer Zone, the flatness of the land, and the presence of pine plantations substantially decrease the viewpoints of SSC from outside the base. Views are primarily limited to adjacent landowners to the east and visitors to the Visitor's Center. The construction and operation of the STF would not affect the area's aesthetic quality nor would it obstruct any prominent or scenic views. The PTF site is near the eastern boundary of the SSC, and the 0.75 mile safety radius will penetrate the SSC boundary and enter the Buffer Zone in this area. While additional easement agreements with the property owner in the Buffer Zone will be required to ensure safety, the area is currently unoccupied and visual resources should not be affected. Prior to and during testing, the area will be monitored to assure that no individuals are present.

4.1.8.2 Cumulative Impacts

There are no new programs or extensive construction projects at SSC that would create cumulative impacts with the IFX ground-test program. Past actions have resulted in land use and aesthetics that are consistent with the IFX ground-test program. Cumulative personnel levels are projected to remain constant.

4.1.9 Noise

In considering the basis for evaluating significance of noise impacts, several items were examined, including: 1) the degree to which noise levels generated by construction and operational activities were higher than the ambient noise levels; and 2) the degree to which there is annoyance and/or activity interference.

The IFX ground-test program would create noise impacts from three activities. The first is construction activity. The second is use of the PRS at the PTF to create a vacuum for testing. The third is use of the acoustic chamber at the AI&TF to simulate a launch environment for the IFX test vehicle. Other noise producing activities such as vehicular traffic from an estimated 200 additional passenger vehicles are typical of the current installation environment and episodic in nature.

4.1.9.1 Environmental Effects

Construction

Noise levels within and adjacent to the project construction areas would increase during the construction period. However, construction activity would not cause long-term noise impacts since it would be short-term and normally limited to daytime hours. Ignoring the effects of terrain and atmospheric attenuation, noise attenuates by approximately 6 dBA for every doubling of distance. For distances greater than approximately 1,000 feet, the effects of atmospheric attenuation start to become important. While atmospheric attenuation is frequency dependent (Cowan, 1994), for the purposes of this analysis an average non-frequency dependent value of 1 dBA per 1,000 feet is used. At a distance of approximately 50 feet, the noise from typical construction equipment falls in the range of 70 dBA to 100 dBA (with peak noise from pile drivers going as high as 110 dBA) (U.S. Environmental Protection Agency, 1971; Construction Engineering Research Laboratory, 1978). As such, under most meteorological conditions, the maximum construction noise from pile drivers would be anticipated to attenuate to 83 dBA at a radius of approximately 1,000 feet from the construction sites. Typical construction noise would be in the range of 43 dBA to 73 dBA at that distance. At the installation boundary approximately 3,500 feet from the PTF, construction noise would be in the range of 30 dBA to 60 dBA, essentially indistinguishable from background noise.

The AI&TF would be the IFX construction area closest to other facilities at SSC. The nearest facility to the AI&TF is approximately 500 feet distant. Noise levels would range from 50 dBA to 80 dBA at that distance, causing interference with outdoor speech communication at the higher sound levels.

Construction noise may disturb wildlife in the immediate vicinity during the construction period. Since there are no absolute standards of short-term noise impacts for potentially noise-sensitive species, a short-term maximum noise exposure of 95 dBA has been suggested as a significance cut-off for impacts as discussed below under operational impacts (Schmalzer et al., 1998). This noise level is equivalent to being 3 feet from a power lawnmower. Typically the average noise level at 50 feet from a construction site does not exceed an equivalent sound level of 90 dBA. Most of the noise and human activity would be caused by truck traffic to and from the construction site and use of heavy machinery and excavation equipment. If construction occurs during the winter months, wintering shorebirds may be disturbed. Construction activities could also disturb nesting, hatching, and fledging of land and shorebirds, sea turtles, and other wildlife in the area. The combination of increased noise levels and human activity would likely displace some small mammals. Birds, including eagles or other listed bird species, that may be foraging in the area may temporarily avoid the area within approximately 50 feet of the site. Some wildlife would leave the area permanently, while others would likely become accustomed to the increased noise and human presence. Additional foraging habitat occurs in the vicinity of the construction sites.

Operation

While operating, the PRS would be anticipated to generate a noise level of approximately 125 dBA at a distance of 50 feet from the end of the PRS ejectors. At the edge of the 0.75-mile safety zone around the PTF from which personnel would be excluded during tests, the sound level would be approximately 83 dBA, including 4 dBA of atmospheric attenuation. This noise level is equivalent to that experienced by an individual three feet from a kitchen garbage disposal, and substantially less than such typical urban sources as gas lawn mowers at three feet and diesel trucks at 50 feet. During each laser test, the PRS would operate for a few minutes duration and cause some interference with outdoor speech communication. Based on OSHA regulations, there would be no exceedance of permissible workplace exposures.

Based on actual sound tests at another acoustic test chamber that would have similar characteristics to the IFX acoustic test chamber, the sound level at 150 feet from the test chamber would be less than 60 dBA (Ling Electronics, 1998). This level would be essentially indistinguishable from the background noise environment.

In the unlikely event that the reactants would all combine during a test at the PTF and cause a catastrophic explosion, noise levels of approximately 146 dBA would be experienced at the edge of the 0.75-mile safety zone around the PTF (TRW Space and Electronics Group, 1999). This would exceed the OSHA workplace criteria of 140 dBA for peak impulse noise. However, this noise level would not be due to normal workplace conditions, but rather to a single abnormal event that would be unlikely to occur. No property damage such as window breakage or structural damage would be anticipated.

Many studies have addressed noise and disturbance to various species of birds, including several federally threatened or endangered species. The effects of noise on animals is variable, not only between different species, but also between individuals (Evans and Cooper, 1978). In general, field studies on a variety of animals have demonstrated few, if any, measurable lasting physiological or reproductive effects from impulse or steady state noise, particularly at levels below 120 dBA (Evans and Cooper, 1978).

Research on noise thresholds of representative birds and mammals was recently summarized (Schmalzer et al., 1998). Based on a review of the available literature, a noise threshold of 95 dBA was selected as the limit below which such basic activities as mating and nesting would not likely be affected. The USFWS and the Florida Department of Natural Resources (1992) describe the potential effects of human disturbance on birds, and stress that there is great variation among and within species. Potential negative effects of disturbance on nesting raptors include temporary nest abandonment, allowing exposure of eggs or young to excess heating or cooling, reduced reproductive performance, aerie abandonment, accidental death of young due to premature fledging, and other short-term behavior responses. Female hawks left nests when they experienced shock waves, but returned to the nest within 10 minutes. Anderson et al. (1986) reported that red-tailed hawks shift their activity center away from areas of high human activity, but return after the human activity ceases.

Furthermore, many animals, including cattle and raptors, exhibit a startle response to sudden impulse noise. Impulse noise greater than 85 dBA has been shown to cause the startle response in birds. Ducks either lifted for a short flight or interrupted their behavior. Other birds showed increased alertness and many temporarily abandoned their nests, thus leaving eggs open to predation (Evans and Cooper, 1978). However, studies conducted on the response of raptors to noise from low level flights by military jets found no evidence of nest site abandonment or reproductive failure (Institute for Raptor Studies, 1981).

At KSC, a rookery used by wood storks and other species of wading birds is located approximately 2,461 feet from a launch pad. This rookery continues to be used successfully, although a decline in black mangrove habitat due to non-operational factors has reduced wood stork use and nesting success (American Institute of Aeronautics and Astronautics, 1993).

Also, birds within 820 feet of Titan launch complexes at CCAFS have shown no mortality or reduction in habitat use. It was also reported that scrub jays subjected to noise levels of up to 145 to 160 dBA were not affected. However, at CCAFS, Titan launches may have caused a temporary hearing or behavioral change in scrub jays within the 95 dBA contour (U.S. Department of the Air Force, 1990). Type 1 and 2 Titan IV vehicles produce noise levels of approximately 170 dBA in the immediate vicinity of the launch pad. This attenuates to 125 dBA at a distance of 2 miles within about 30 seconds following launch. Two scrub jays in the near-field (within 3 miles) area east of LC-41 did not respond to warning calls shortly after launch. Following the launch of Shuttle mission 34, however, scrub jays west of the pad displayed normal behavior and responded to calls (U.S. Department of the Air Force, 1990).

Noise from the PRS component of the PTF during laser performance tests would have the potential to impact wildlife within the 95 dBA and greater noise contours. Noise levels exceeding 95 dBA would occur up to a distance of 1,600 feet from the PRS. The noise from the PRS would startle wildlife and possibly drive them from the area temporarily. Due to the short duration of the test noise, the only individuals that would likely be affected are those within the peak 95 dBA and greater noise contours.

Birds that are early in the nest initiation/egg laying, nestling and fledgling stages would have the greatest chance of being affected. While adults are away from the nest, eggs and young could potentially be exposed to increased predation and effects of weather. The effects of weather would be minimized by not conducting tests during the mid-day heat. Previous studies of jet aircraft noise have indicated that as long as noise levels drop to ambient levels and no other disturbance occurs, most birds return to nests within only a few minutes. During the winter, foraging shorebirds would be subjected to increased energy demands if they are flushed by the noise, but this would be a short-term, minimal effect. Most species also appear to be more easily startled in circumstances involving sight of an object, such as a plane, combined with the noise caused by such an object. Laser performance testing would not result in this more intense reaction. Animals in the vicinity of engine testing and other similar abrupt, loud noises adapt and do not appear to be unduly disturbed by the activity (National Aeronautics and Space Administration, 1997b).

4.1.9.2 Cumulative Impacts

There would be no anticipated cumulative construction impacts at SSC.

Noise impacts for SSC would include those from current programs and those expected from IFX ground-test activities. These noises are loud but intermittent and are not expected to cumulatively impact the area.

4.1.10 Socioeconomics

4.1.10.1 Environmental Effects

The IFX ground-test program would comprise two components or phases, the construction phase and the operational phase. The economic impacts of these phases have been measured using a development impact assessment model (Urban Land Institute, 1997).

Construction

The SSC alternative would begin with construction of new and refurbishing of existing facilities. Most of the construction program would be expected to draw on local resources including labor and material. It is estimated that the total construction cost of the buildings required at SSC, including labor and materials, would be $203.2 million.

A minimum construction period of approximately 36 months would be required for the PTF. Construction activities are anticipated to begin by the end of fiscal year (FY) 2002. A construction period of approximately 36 months would also be required for the AI&TF. The AI&TF would not be required until after the ITU testing had been performed. Therefore, construction activities for the AI&TF are anticipated to begin in the middle of FY 2007.

Construction personnel requirements would average approximately 600 for the first 6 months and 400 for the remaining 30 months for the PTF. Construction personnel requirements would average approximately 600 for the first 6 months and 400 for the remaining 30 months for the AI&TF. These totals include design teams, procurement, and fabrication specialists. It is estimated that less than half of these personnel would be required at a specific time at the construction sites during construction and assembly operations.

The construction phase would generate an average of approximately 433 full-time construction jobs each year for the three years that it would require to construct the PTF (2002-2004) and another 433 full time jobs for the three years that it would require to construct the AI&TF (2007-2009). This would create an average of $13.0 million in construction wage income (in year 2000 dollars) for each of the six construction years. This wage income would translate into annual personal consumption expenditure within the Region of Influence (ROI) of $10.2 million for each of the six years of construction. In addition, the construction program would require the purchase of raw materials and finished building products. It is estimated that these purchases would equal about $59.7 million over the construction period.

These jobs and expenditures would be substantial, yet transitory, benefits for the local economy. The result of the construction program, however, would be an operational facility that would generate recurring economic benefits.

As the construction phase would be carried out a substantial distance from inhabited areas, the construction impacts would not be expected to affect the quality of life of local residents or visitors to the region.

Operation

The operation of the IFX ground-test program at SSC would add 345 jobs and $21.1 million of annual household income to the local economy. This would result in $17.1 million of additional annual consumption expenditure in the region. This consumption expenditure would result in an additional 166 jobs created in the retail sector of the local economy, with over $2.5 million in additional annual wages. The expenditures from these new employees would also create a number of additional jobs in the region, adding additional consumption expenditure to the local economy and creating additional jobs. In addition, there may be additional jobs created in other sectors of the local economy due to the increased spending. Studies have shown that this “trickle down” effect of new jobs and increased spending in a local economy may result in an additional overall economic benefit to the community of up to 1.2 times the wages of the new industry or business. This could result in additional benefits to the community of up to $25 million.

The creation of these new jobs could have the potential to increase demand for new homes and local services, including health, education, and other publicly-provided facilities. If every job created by the IFX ground-test program brought with it a typical U.S. household (2.64 persons in 1997), the 345 jobs would bring a total of 911 people into the region. If all of those moving into the area came from outside the regional economy, then the population of the region would increase by a maximum of slightly more than 0.1 percent. The current forecast increase in population between 1997 and 2005 (based on existing demographic trends) is about 61,100. The potential increase in population attributed to this action would, therefore, require an increase of the forecast by approximately 1-1/2 percent.

Operational impacts on the quality of life would be minimal due to the relative isolation of the testing site at SSC and the non-invasive character of the IFX ground-test program.

4.1.10.2 Cumulative Impacts

There are no new programs, extensive construction projects, or past activities at SSC that would create cumulative adverse impacts with the IFX ground-test program. Personnel levels are projected to remain constant.

4.1.11 Transportation

4.1.11.1 Environmental Effects

Roadways - Off installation network

The construction of new and refurbished facilities associated with the IFX ground-test program at SSC would result in an average of 433 construction related employees accessing the installation each day for two three-year periods (2002-2004 and 2007-2009). For approximately six months in each of these periods, a maximum of 600 construction employees would access the installation. This would result in 1254 daily auto trips to SSC, as well as 100 heavy truck trips on a peak day. There should be no capacity problems on SSC area roadways associated with this temporary traffic, due to the high levels of service provided on area roadways.

The operation of the IFX ground-test program, assumed to be fully operational in 2009, would result in 345 additional employees accessing SSC each day. This would result in an additional 921 daily auto trips, and an average of 17 heavy truck trips each day. SH-607, between I-10 and SSC, would carry the majority of this traffic, but the Level of Service (LOS) should remain at A. There should be no capacity problems on SSC area roadways associated with this traffic, due to the high levels of service provided on area roadways.

The reactants and other hazardous materials that would be used at the PTF would be shipped via truckrail from the manufacturing location. Transportation of hazardous materials would be accomplished in accordance with DoT regulations for interstate shipment of hazardous substances (49 CFR Parts 100-199). These regulations require that hazardous materials be shipped in specially designed shipping containers to reduce the potential of a mishap in the event of an accident. In addition, shipments would follow state-designated hazardous materials transportation routes. Installation-specific procedures would also be followed upon arrival. Storage and ventilation requirements of applicable state and federal regulations would be followed, along with the environmental, safety, and health requirements of DoD 5000.2-R.

Roadways – On-installation network

The SSC area is well served with an excellent network of roadways. During operation of the IFX ground-test program, approximately 450 of the daily trips would be using Saturn Drive. Approximately 780 vehicles would be added to Shuttle Parkway south of Saturn Drive and 140 vehicles will be added to Shuttle Parkway north of Saturn Drive. During peak travel periods, traffic along Balch Boulevard interferes somewhat with vehicles entering or leaving the Test Area and Engineering and Administration Area (National Aeronautics and Space Administration, 1997b).

The existing infrastructure, such as roads and bridges, should be adequate to handle the transportation of IFX employees, as well as necessary test items.

Waterways

Potential IFX ground-test program barge activities are similar to current activities for SSC. Barge transport of the IFX elements could be accommodated with no impact. The distance from the proposed PTF complex to the barge dock is approximately 2.7 miles. Access to the Intracoastal Waterway is unconstrained, and the deep-water port of Gulfport is available as necessary.

Railways

The railroad system at SSC is utilized for certain shipments needed by NASA and could accommodate shipping and receiving of IFX-related components up to three times per year. Refurbishment could be required, but only if more than occasional railway use was deemed necessary (Operation Enterprise, 1996). Some of the reactants and other hazardous materials may be shipped to the SSC by rail.

Airways

Project requirements for occasional shipping and receiving of IFX-related components approximately three times per year would not impact airway traffic at either Stennis International or Gulfport-Biloxi Regional airports.

4.1.11.2 Cumulative Impacts

There are no new programs, extensive construction projects, or past activities at SSC that would create cumulative adverse impacts with the IFX ground-test program. Personnel levels are projected to remain constant.

4.1.12 Utilities

4.1.12.1 Environmental Effects

Water Supply

Under the IFX ground-test program, construction personnel requirements for both the PTF and AI&TF would average approximately 600 for the first 6 months and 400 for the remaining 30 months of construction. Using the baseline per capita water demand for the base of 32 gallons per day, personnel associated with construction activities would create a water demand of approximately 19,200 gallons per day for the first six months and 12,800 gallons per day during the final 30 months of construction for both projects.

Since construction activities associated with the PTF and AI&TF would not overlap, the first 6 months of construction for each project would create the largest demand of potable water, representing a 16 percent increase over current water consumption rates, or 3.7 percent of the water system capacity and 4.8 percent of the unused system capacity.

Fugitive dust is anticipated to be emitted during preparation of a construction site as a result of ground disturbance (groundbreaking, drilling, etc.) as well as dirt and aggregate spreading or loading from cut and fill activities. Up to an estimated 3,500 gallons per day of water per acre would be required to control fugitive dust during the facility construction. Assuming that up to one acre would require dust control on a given day, 3,500 gallons of water would be required per day of construction, and water consumption would increase 2.9 percent over baseline conditions, representing 0.7 percent of the water supply system capacity. Combined with the water consumption of construction personnel, the overall water consumption during the first six months of construction would increase by 22,800 gallons per day, representing 4.4 percent of the water system capacity, 5.7 percent of the unused system capacity, and an increase of 19 percent over baseline conditions. Increases in water consumption during the construction phase would be temporary.

During the operational phase of the IFX ground-test program there would be a maximum of 345 personnel associated with the STF. Using base per capita water usage rates, it is estimated that increased personnel would consume 11,040 gallons per day of water. This represents approximately 9.2 percent of the current potable water usage, approximately 2.1 percent of the water system capacity, and 2.8 percent of the unused water system capacity.

The steam generators and condensers used in the PTF during laser performance testing would require the use of industrial water. Approximately 26,417 gallons for steam generation and 132,086 gallons for the PRS condensers are needed for each firing of the laser. In order to meet the large water demands during the short duration estimated for each laser firing, water taken from the 66 million-gallon water storage reservoir would be utilized. It is assumed that a maximum of 22 test firings would occur in one year to gain a conservative estimate of industrial water consumption. Assuming that water is flushed and refilled from the condensers twice in one year, test operation of the PTF would require 563,338 gallons of water annually. This represents a less than 1 percent increase over current base non-potable water usage, 0.9 percent of the base water storage reservoir capacity, and 1.2 percent of the unused system capacity.

The IFX ground-test program is not expected to affect the water system demand or capacity at MSAAP.

Wastewater

Construction personnel requirements for both the PTF and AI&T would average approximately 600 for the first 6 months and 400 for the remaining 24 months of construction. Using the baseline wastewater generation rate of 30 gallons per capita per 8-hour shift as discussed in Section 3.1.12.1, wastewater generation would increase by 18,000 gallons per shift during the first six months, or 16 percent, and 12,000 gallons per shift during the final 30 months of construction, or 11 percent. The 6-month and 30-month construction phases would generate 6.3 and 4.3 percent of the wastewater capacity, respectively. Increases in wastewater generation associated with the construction phase of the IFX ground-test program would be temporary.

During the operational phase of the IFX ground-test program, a maximum of 345 personnel would be associated with the STF. As with the construction personnel, it is assumed that wastewater generation rates would remain consistent with the average base rate of 30 gallons per 8-hour shift. Therefore, wastewater generation would increase by 10,350 gallons per shift, the equivalent of 9 percent over baseline conditions, 4 percent of the system capacity, and 6 percent of the unused system capacity.

It is anticipated that wastewater generated that is not exhausted as steam from the PTF during laser performance testing would be treated on site using sodium hydroxide to precipitate to safe compounds the HF and DF to allow discharge to the sewer. The treatment will be conducted on a batch basis after every laser test firing. Therefore no impact to the current base industrial wastewater system is anticipated. In addition, impacts to the MSAAP WWTP system are not anticipated under the IFX ground-test program.

Solid Waste

The waste generated during the construction phase of the project would consist of building materials such as solid pieces of concrete, metals (conduit, piping, wiring), and lumber. It is assumed that 4 lbs of waste debris would be generated per square foot of building area during construction, and 7 lbs of waste debris per square foot for renovation (Butler, 1995). Approximately 66,100 square feet of construction and a maximum of 30,600 square feet of renovation would be required, generating approximately 478,600 lbs of waste over six years of construction. As stated in Section 3, the Pecan Grove Sanitary Landfill receives a daily average of 62 cubic yards of municipal waste. Assuming a density of 450 lbs per cubic yard, the daily load of the landfill would increase by 0.7 cubic yards per day, or 1 percent over current conditions. Increases in solid waste generation would be temporary, with construction activities expected to be complete by FY 2010. This projected usage equates to less than 1 percent of the unused landfill capacity.

The maximum staff allocation for the proposed project would be 345 people, consisting of both full-time and part-time personnel, and would generate about 1,035 lbs of solid waste per day, assuming a daily waste generation rate of 3.0 lbs per person. Assuming a density of 450 lbs per cubic yard, the daily load of the landfill would increase by 2.3 cubic yards per day, or 4 percent over current conditions.

Energy

Under the IFX ground-test program, a natural gas pipeline extension would be installed along existing roads to service the PTF. The gas line would extend from a connection at the intersection of Main Line Road and Standby Road and would follow Lateral Access Road to the PTF complex. Additional power lines would not be required under the IFX ground-test program.

The 24-hour energy usage of the STF facilities is estimated to consume 180,000 Btu per square foot of building area. Using this assumption, 66,100 square feet of additional building area at SSC would increase the base energy consumption by 11,898 MMBtu per year, or 0.03 percent over the 5,442 MMBtu per hour of combined electrical and natural gas energy currently used at SSC. The energy usage equates to less than 1 percent of the combined energy system capacity.

4.1.12.2 Cumulative Impacts

No new programs or changes in personnel are anticipated which would create cumulative adverse personnel or facility construction impacts. Since utilities consumption is dependent upon personnel and facility changes, adverse impacts on utilities resulting from the cumulative actions or past activities are not anticipated.

4.1.13 Water Resources

4.1.13.1 Environmental Effects

Construction

Construction-related impacts to water resources could occur due to sedimentation from erosion, and petroleum and hazardous materials usage in association with construction equipment. Potential impacts associated with erosion and sedimentation include a reduction of basin or channel volumes and reduced availability of dissolved oxygen within receiving waters.

Construction of the PTF at SSC would result in the disturbance of more than 5 acres of land and, therefore, would be subject to Phase I NPDES construction permit requirements. The AI&TF would be subject to the Phase II permit requirements that would be applicable by FY 2003. The Phase II requirements are anticipated to be similar to the Phase I requirements. For either Phase I or II, a NOI would be filed for coverage under the applicable general permit, and construction activities would follow guidelines of the SWPPP that would be developed as required by the permit. The SWPPP would include provisions to minimize erosion and assure that petroleum and hazardous materials were stored and used to minimize contamination of surface waters. Storm water would necessitate a retention pond, with water treatment carried out per applicable local regulations. Onsite demolition would require additional consideration to account for the possibility of special treatment requirements for existing materials, such as lead-based paint or asbestos. Compliance with the SWPPP would minimize soil erosion and pollutant discharges during construction.

Operation

Potential impacts to surface and ground water quality resulting from IFX operations could result from the deposition of airborne emissions generated during laser operations, the accidental release of hazardous materials, and the discharge of wastewater effluents. Hydrogen fluoride would be the primary pollutant generated during operational tests of the laser. Up to approximately 0.0096 pounds of HF would be released to the atmosphere from each test. Upon discharge to the atmosphere, hydrogen fluoride disperses rapidly due to the relatively low weight and size of hydrogen fluoride particles. However, under limited atmospheric conditions when the relative humidity is greater than 90 percent and ambient air temperatures are less than 50°F, the deposition of small quantities of hydrogen fluoride onto the nearby ground and water surfaces may occur (U.S. Army Space and Missile Defense Command, 1998). Depending on the buffering capacity of the receiving water, the deposition of small amounts of hydrogen fluoride may result in a temporary increase in surface water acidity. Under most conditions, the deposition of small amounts of hydrogen fluoride into surface waters would be quickly neutralized by the buffering capacity (alkalinity) of the receiving waters and would not be considered harmful (Agency for Toxic Substances and Disease Registry, July 1998).

Surface waters in the vicinity of SSC are slightly acidic to alkaline in nature. Average surface water pH levels range from a low of 6.1 in nearby freshwater streams to a high of nearly 8.0 in the access canal (National Aeronautics and Space Administration, 1990; John C. Stennis Space Center, 1998). Because emissions of hydrogen fluoride are expected to be minor and intermittent in nature, only slight and temporary reductions in the pH values of surface waters are expected. Small amounts of hydrogen fluoride deposited on surface waters would quickly dissipate due to surface water mixing and the natural buffering capacity of the surface waters.

All construction activities would be required to comply with the SPCC and contingency plans that are required to be developed and implemented. Compliance with these plans would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater resources.

Operations at SSC, including the proposed STF complex, are required to comply with NPDES industrial permit requirements. Treated storm water is currently discharged to local water courses in compliance with a NPDES industrial permit administered by the Mississippi Department of Environmental Quality (MDEQ). Any change in design, construction, operation, or maintenance of facilities that resulted in an increase of pollutant discharge to state waters, would require application for a NPDES permit (or amendment of an existing applicable permit) and potential revisions to the SWPPP associated with the permit. The IFX ground-test program would require an amendment of the existing NPDES industrial permit for inclusion of wastewater discharges associated with the operation of the proposed facilities. IFX operations could affect the NPDES permit for the industrial wastewater treatment plant (WWTP) and the MSAAP storm water permit; however, the permits could be modified accordingly. Compliance with NPDES requirements and the SWPPP would minimize pollutant discharges during project operations.

At SSC, the construction of the STF complex would increase the impervious cover by up to 5.3 acres, resulting in a slight increase in runoff during storm events. The Fee Area of SSC contains approximately 13,800 acres. Therefore, approximately 0.04 percent of the Fee Area would become impervious cover, causing a slight increase in runoff that would not be measurable. The MDEQ OPC's review under Section 401 Water Quality Certification requires applicants to address other aspects of the development that could result in additional impacts and discharges into state waters. The potential for storm water pollution is a concern for this type of facility. A post-construction storm water quality management plan will be developed and will include runoff from impervious surfaces, which are anticipated to total 14.3 acres. At a minimum, the first 0.5 inch of runoff from all impervious surfaces shall be retained/detained on-site and treated through infiltration, evaporation, or other approved methods. The required volume must be restored within 72 hours. OPC will review pertinent plans and specifications for the storm water management system including post-construction contours, all pertinent calculations, specifications for drainage structures including outfalls, and maintenance measures. A minimum 15-foot buffer will be required on the project perimeter. This plan will be submitted and approved prior to issuance of a water quality certification. MDEQ OPC recommended through agency comments the consideration of utilization of existing ponds to meet the storm water requirements. This would provide an opportunity for avoidance and minimization of wetlands impact. In addition, there may also be opportunities for some onsite mitigation through wetland creation.

EO 11988 directs federal agencies to "avoid the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains." Areas proposed for IFX ground-test activities are not located within a 100-year floodplain.

4.1.13.2 Cumulative Impacts

No other activities that would impact water resources have been identified at the proposed SBL complex locations. No future programs or past activities have been identified that would contribute to cumulative adverse water resources impacts.

4.1.14 Environmental Justice

4.1.14.1 Environmental Effects

Construction and operation of the IFX ground-test program at SSC would not disproportionately affect any minority or low-income populations. The potential environmental or human health impacts noted above would be contained within the SSC boundary and would not impact any populated areas. Transport of materials would occur along major roads and not through neighborhoods. No Native American or traditional cultural resources would be impacted from IFX construction and operation.

4.1.14.2 Cumulative Impacts

There are no new programs, extensive construction projects, or past activities at SSC that would create cumulative impacts with the IFX ground-test program. Personnel levels are projected to remain constant.

4.2 REDSTONE ARSENAL/MARSHALL SPACE FLIGHT CENTER

4.2.1 Air Quality

As indicated in Section 3, the region is in attainment and the General Conformity Rule under the Clean Air Act is not applicable.

4.2.1.1 Environmental Effects

Construction

Estimated pollutant emissions from proposed construction activities are calculated using the same criteria, methodologies, and emissions factors as described for construction in Section 4.1.1.1. Annual construction emissions resulting from the construction of the proposed STF facilities at RSA are presented in Table 4.2-1. Estimated pollutant emissions are based on the proposed site areas, the duration of each project, and the specified building square footage for new construction, renovations, and demolition.

Analysis of the data presented in Table 4.2-1 indicates that the overall ambient air quality within the Tennessee River Valley-Cumberland Mountains Interstate AQCR 7 would be slightly affected by the construction of the proposed STF facilities at RSA. Increased emissions from construction activities would produce slightly elevated air pollutant concentrations. However, the increases would be minimal (not exceeding a 0.64 percent increase for any criteria pollutant) when compared to baseline AQCR 7 emissions. The effects would be temporary, fall off rapidly with distance from the proposed construction site, and would not result in any long-term impacts.

Table 4.2-1 Proposed Construction Emissions Within AQCR 7 at RSA

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	NO_X (tpy)	SO_X (tpy)	PM_{10} (tpy)	Pb (tpy)
AQCR 7 Emission Totals[a]	329	3,344	419	455	808	7.4
Proposed Annual Emissions[b]						
Performance Test Facility	0.61	0.09	1.32	0.14	3.40	0.00
Remote Control Facility	0.15	0.02	0.33	0.03	0.35	0.00
Reactant Storage Facility	0.02	0.00	0.05	0.01	0.00	0.00
Assembly, Integration & Test Facility	0.36	0.06	0.78	0.08	0.83	0.00
Engineering & Administration Facility	0.05	0.01	0.12	0.01	0.01	0.00
Utility Improvements	0.00	0.00	0.00	0.00	0.27	0.00
Road Improvements	0.77	0.04	0.12	0.02	0.16	0.00
Total Construction Emissions (tpy)	1.96	0.22	2.72	0.29	5.02	0.00
Percent Change in AQCR 7 (%)	**0.59**	**0.01**	**0.64**	**0.06**	**0.62**	**0.00**

a Summarized from the USEPA's AIRSData Source Count Inventory Report (USEPA, 2000).
b Estimated emissions based on building square footage, site areas, and project durations.
tpy tons per year.

Operation

Estimated pollutant emissions from the proposed increased vehicle and emergency generator operations and the release of hydrogen fluoride during laser testing at RSA are calculated using the same assumptions, methodologies, and emissions factors described in Section 4.1.1.1. Annual emissions resulting from the proposed operation of the STF facilities at RSA are presented in Table 4.2-2.

Table 4.2-2 Proposed Operational Emissions Within AQCR 7 at RSA

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	NO_X (tpy)	SO_X (tpy)	PM_{10} (tpy)	Pb (tpy)	HF (tpy)
AQCR 7 Emission Totals[a]	329	3,344	419	455	808	7.4	NA
Proposed Annual Emissions							
Emergency Generators	0.06	0.02	0.84	0.02	0.05	0.00	0.00
Personal Vehicle Emissions	27.05	2.20	3.57	0.00	0.00	0.00	0.00
Laser Testing	0.00	0.00	0.00	0.00	0.00	0.00	<0.1
Total Operational Emissions (tpy)	27.11	2.22	4.41	0.02	0.05	0.00	<0.1
Percent Change in AQCR 7 (%)	**7.61**	**0.07**	**1.04**	**0.00**	**0.00**	**0.00**	**0.00**

a Summarized from the USEPA's AIRSData Source Count Inventory Report (USEPA, 2000).
tpy tons per year.
NA Not available

Analysis of the data presented in Table 4.2-2 indicates that the overall ambient air quality within the Tennessee River Valley-Cumberland Mountains Interstate AQCR 7 would only be slightly affected by the operation of the proposed STF facilities at RSA. Increased emissions from increased vehicle and emergency generator operations would produce slightly elevated air pollutant concentrations. However, the increases would be minimal (not exceeding a 7.61 percent increase for any criteria pollutant) when compared to baseline AQCR 7 emissions. For areas that are non-attainment for one or more criteria pollutants, a change of less than ten percent in regional emissions is not considered regionally significant by the USEPA. The AQCR is in attainment, and a conformity determination under the Clean Air Act is not required.

As discussed in detail in Section 4.1.1 and Appendix A, operational releases of hydrogen fluoride would not be expected to cause exceedances of health-based standards beyond the laser safety zone. Operational releases of hydrogen fluoride would be subject to the employment of meteorological and/or procedural operational constraints to assure the protection of personnel. Management of such constraints for operations involving hazardous materials are common practices to assure the protection of personnel.

Mishap Impacts

Potential mishaps and their potential impacts at RSA are similar to those described in Section 4.1.1.1. The most likely accidental release would occur during fuel transfer and would be limited to a few ounces of reactant. Due to the greater potential for hazardous releases during refueling, it would only be conducted under meteorological conditions that would not result in hazardous conditions beyond the laser safety zone if a release were to occur. The least likely mishap is one involving the majority of either fluorine or nitrogen trifluoride. If this level of accidental release were to occur under proper weather conditions, it could result in hazardous conditions beyond the laser safety zone as described in Appendix A. The facility Risk Management Plan would include the proper responses to accidental releases in order to minimize its impact to the populace and the environment.

Required Actions. Permitting under the Clean Air Act and preparation of a Risk Management would be required.

4.2.1.2 Cumulative Impacts

At RSA, no new programs or changes in personnel are anticipated which would create cumulative personnel impacts. The Engine Technology Support Program at MSFC for NASA's Advanced Space Transportation Program would create cumulative impacts with the IFX ground-test program. However, the combustive emissions generated from engine testing are episodic events and would not contribute to adverse, cumulative, regional air quality impacts.

Other actions at RSA that would contribute to cumulative air quality impacts are the military construction program projects overlapping with the IFX ground-test program. As described in Section 2.6, over the next twelve years, approximately 161,000 square feet of facilities would be added annually, 97,000 square feet of facilities would be demolished annually, and approximately 23 acres of additional land would be used by the additional facilities annually. Cumulative annual construction emissions at RSA are presented in Table 4.2-3. Estimated pollutant emissions are based on the proposed site areas, the duration of each project, and the specified building square footage for new construction, renovations, and demolition.

Analysis of the data presented in Table 4.2-3 indicates that the overall ambient air quality within the Tennessee River Valley-Cumberland Mountains Interstate AQCR 7 would only be slightly affected by the cumulative actions at RSA. Increased emissions from construction activities would produce slightly elevated air pollutant concentrations. However, the increases would be minimal (not exceeding a 4.68 percent increase for any criteria pollutant) when compared to baseline AQCR 7 emissions.

Table 4.2-3 Cumulative Action Emissions Within AQCR 7 at RSA

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	NO_x (tpy)	SO_x (tpy)	PM_{10} (tpy)	Pb (tpy)
AQCR 7 Emission Totals[a]	329	3,344	419	455	808	7.4
Cumulative Annual Emissions						
Proposed Construction[b]	1.96	0.22	2.72	0.29	5.02	0.00
Other Actions	7.69	1.27	17.85	1.88	27.12	0.00
Total Cumulative Emissions (tpy)	9.65	1.49	20.57	2.17	32.14	0.00
Percent Change in AQCR 7 (%)	**2.85**	**0.04**	**4.68**	**0.47**	**3.83**	**0.00**

a Summarized from the USEPA's AIRSData Source Count Inventory Report (USEPA, 2000).
b From Table 4.2-1
tpy tons per year

4.2.2 Airspace

4.2.2.1 Environmental Effects

Analysis of airspace impacts from the proposed construction and alteration of facilities at RSA/MSFC are based on the criteria established in Section 3.1.2.3, the proposed maximum height of the facilities, and the location of the proposed facilities in relation to the nearest runway. It is assumed that the maximum height of any proposed facility would not exceed 160 feet above ground level (agl), which is less than the 200 feet maximum not requiring notification to the FAA.

The proposed siting location of the PTF at RSA would be located approximately 7.2 miles south-southeast of Redstone Army Airfield. This distance exceeds the 20,000 feet horizontal distance criteria established for notification to the FAA. The heights of the other buildings that would be used for the STF, all of which are existing, would not be increased. Therefore, notification to the FAA Administrator *is not* required prior to construction of the proposed facilities at RSA/MSFC, and proposed activities *would not* adversely affect airspace.

4.2.2.2 Cumulative Impacts

No additional activities that would impact airspace have been identified at RSA/MSFC. Therefore, cumulative activities would not result in adverse impacts to airspace.

4.2.3 Biological Resources

4.2.3.1 Environmental Effects

The analytical approach for determining effects on biological resources is described in the beginning of Section 4.1.3. The following sections discuss the environmental effects of the IFX ground-test program on biological resources found at RSA and MSFC. This section provides an assessment of the impacts of the STF complex, including the PTF and AI&TF, on biological resources. The PTF would have the greatest degree of impact on biological resources, whereas all of the other facilities would only impact previously disturbed areas (parking lots, buildings, or lawns).

The PTF would occupy approximately 10 acres of land in a 0.75-mile radius safety zone near the Tennessee River. Since the exact dimensions and layout of the PTF are not known, it is conservatively assumed that the PTF would require approximately 15 acres of land. Construction of the PTF would affect upland biological habitat in the southern portion of the RSA, and also involve construction of a 1,700-foot overland fiber optic line between the RCF at Building 8876 and the PTF.

The AI&TF in Buildings 4718 and 4755 on MSFC would not affect biological communities. These project components would be constructed within these existing buildings, or would involve only minor expansions in previously disturbed areas such as lawns or parking lots.

Construction

The following sections summarize the potential effects of construction and operation on biological resources associated with the STF complex.

Construction of the PTF would occur in the southern portion of RSA within a pine forest currently occupied by earth-covered concrete storage bunkers (igloos). The center of the proposed PTF would be located approximately at the current location of Bunker 8339. The PTF site would require approximately 15 acres of land centered at this bunker (for purposes of this EA, the site is assumed to be a square area approximately 808 feet on each side). The majority of the area to be cleared within the PTF site consists of pine forest habitat. The areas immediately surrounding each of the bunkers consist of mowed lawn/old field habitat.

Although removal of vegetation from the 15-acre PTF site would displace wildlife, it would not result in a substantial reduction in habitat available for wildlife in the area surrounding the PTF. No threatened or endangered plant species have been identified as occurring within or adjacent to the proposed PTF site, based on a review of the available literature. The US Fish and Wildlife Service, Daphne, Alabama office has concluded that the IFX ground-test program would not have adverse effects (Appendix B) on threatened or endangered species.

The central 15-acre PTF site would be surrounded by a 0.75-mile radius safety zone. Construction of the PTF would not impact any biological resources within this safety zone since no land would be disturbed. A security fence and associated maintenance road surrounding the 1.5-mile wide entire safety arc was originally proposed during the initial design phase, but this concept was dropped due to the potential for adverse impacts on floodplains, wetlands, and protected species within the floodplain of the Tennessee River. To avoid these impacts, the design was changed to include posting warning signs along the perimeter of the safety arc in combination with guards along the Tennessee River, if needed. Since the road and fence would not be constructed, the impacts of construction of the PTF would be limited entirely to clearing of pine forest habitat in upland areas, the area within the main 15-acre site. The 15-acre site would be completely fenced, and it is assumed that the majority of habitat within this area would be eliminated.

Construction of the PTF facility would also require installation of an approximately 1,700-foot fiber optic cable connecting the RCF in Building 8876 to the main PTF building near Bunker 8339. This would require clearing of approximately 34,000 square feet of upland pine forest along a 20-foot wide cable corridor. Based on a review of the literature and discussions with the RSA staff, this corridor does not contain any federally- or state-listed species of plants or animals. No adverse impacts on any listed species are predicted based on this assessment. Approximately 0.78 acres of upland pine forest habitat would be affected within the 20-foot wide by 1,700 foot long corridor, however.

Construction of the PTF would also require extension of electric, natural gas, wastewater, and drinking water utilities from existing utility locations along Buxton Road to the PTF site near Bunker 8339. For the underground utilities (all but electrical), this would involve trenching along the easement of Buxton Road, McAlpine Road, and Blueberry Road. These roads would also have to be widened up to 20 feet in order to accommodate transfer of the test vehicle. Easement construction would only impact previously disturbed areas. Based on this information, discussions with RSA staff and a review of the existing literature, construction of the utilities required to connect the PTF and the RCF would not have an adverse impact on any biological resources, including wetlands, streams, upland forest habitat, or federally- and state-listed protected species. Figure 4.2-1 shows the proposed location of the fiber optic cable and the utilities extensions. Figure 4.2-2 shows the locations of the road widening.

The effects of construction noise on biological resources is discussed in the noise section of this EA, Section 4.2.9.

No impacts to wetlands are expected since wetlands are not present on the PTF site.

The following is a summary of potential impacts of construction of the project in other areas of RSA and MSFC.

- <u>Building 8876 (RCF)</u>: The RCF would be located in Building 8876. This building would be expanded and modified, but these changes would impact a previously disturbed developed area, including a parking lot and a mowed lawn. New access roads would not be required for construction of the RCF. Consequently, adverse impacts on biological communities are not predicted. A

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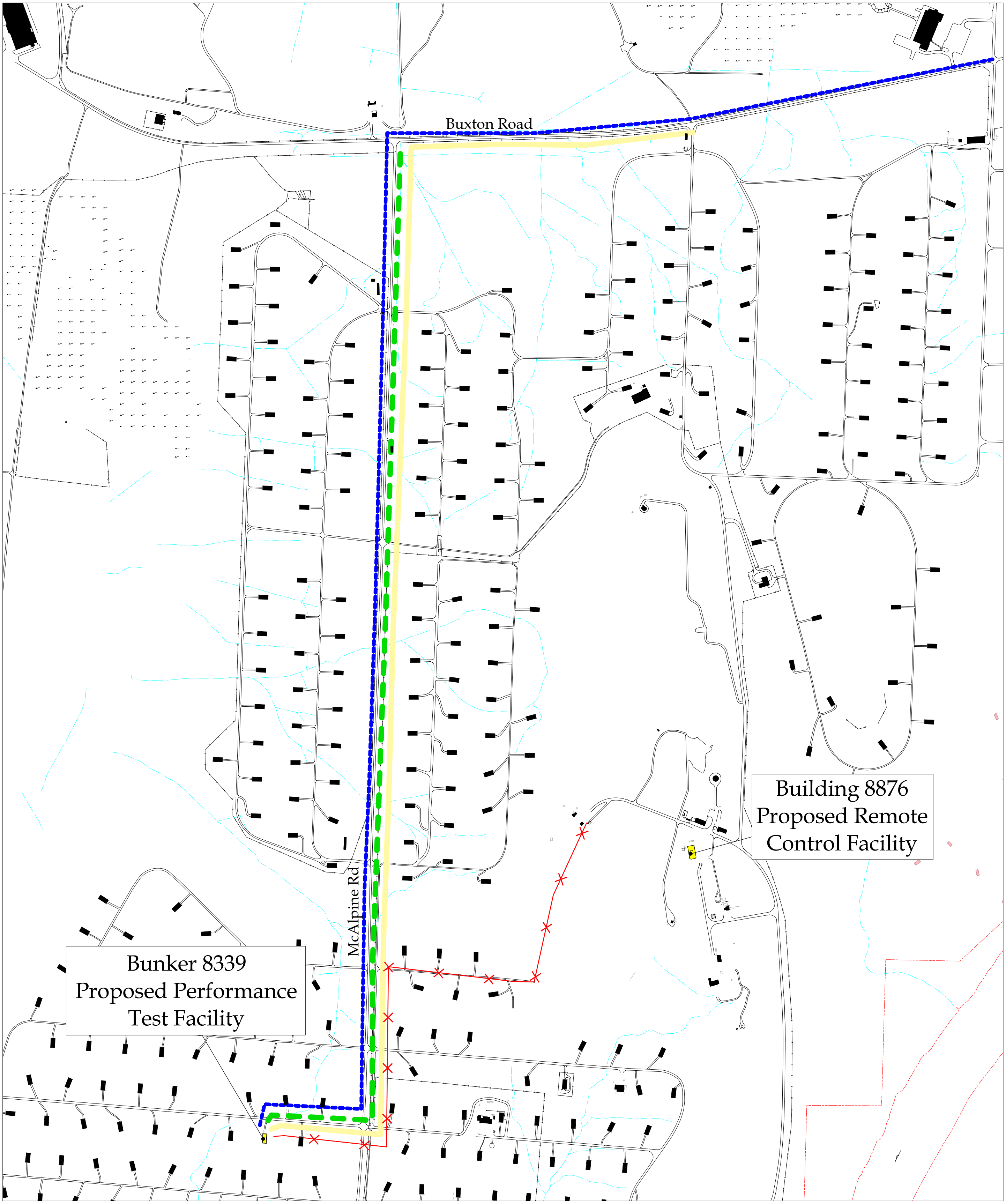

Additional Utility Corridors

Fiber Optic Cable

Natural Gas Lines

Powerlines

Water/Wastewater Lines

500 0 500 1000 Feet

Figure 4.2-1

Proposed Utility Line Extensions
Redstone Arsenal/Marshall
Space Flight Center, AL

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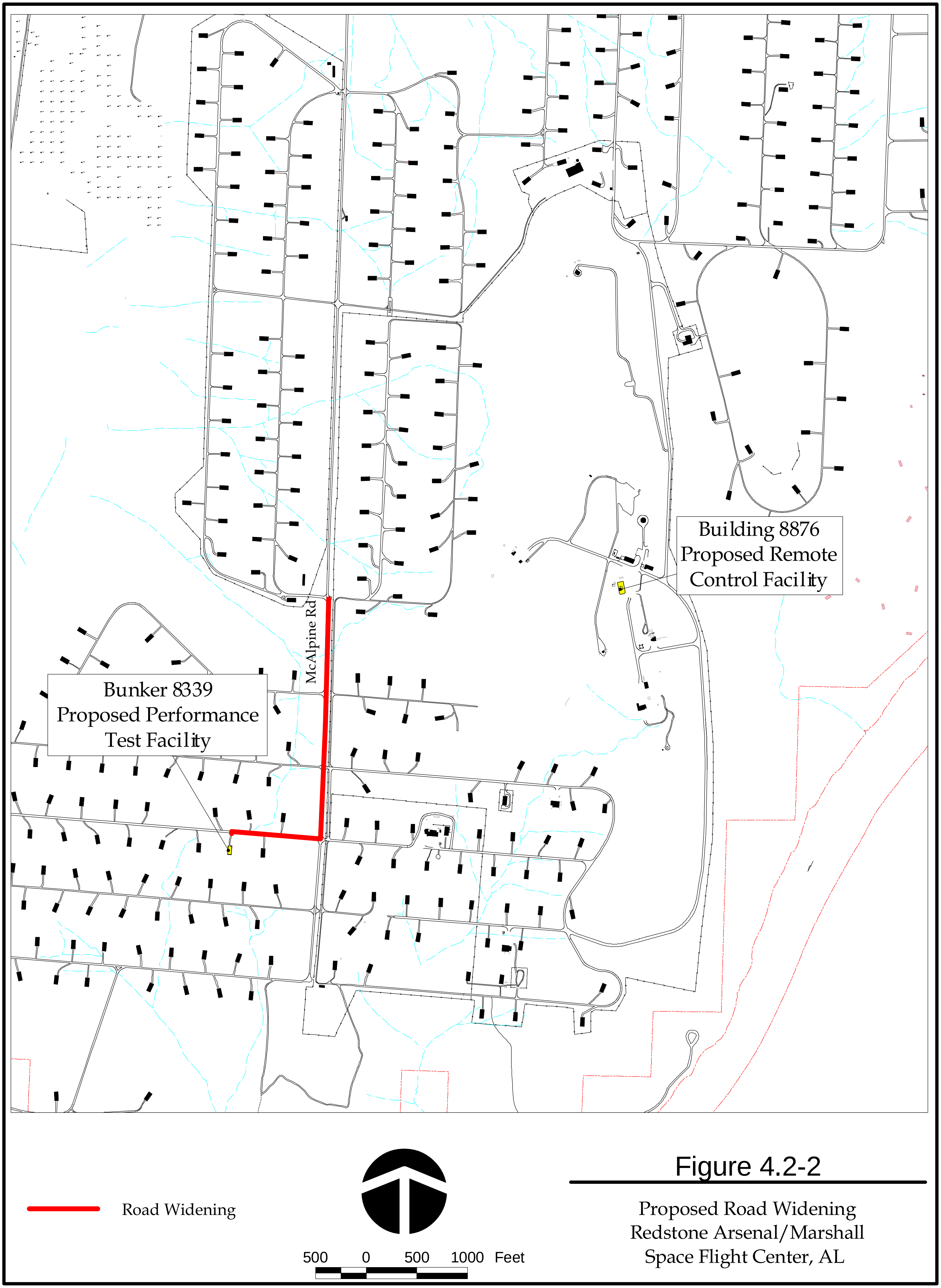

Figure 4.2-2

Proposed Road Widening
Redstone Arsenal/Marshall
Space Flight Center, AL

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fiber optic cable would be required connecting the RCF to the PTF. These impacts have been described previously in the section describing effects of the PTF.

- •Building 8027 (Offices and Storage): Offices and storage would be located in Building 8027. No building additions or new utilities (gas, water, wastewater, electricity) would be required. No impacts on biological resources are predicted.Dock: The existing dock would be used to transport IFX components. The existing dock is owned and maintained by NASA. The Tennessee River in the vicinity of the dock is currently dredged periodically to maintain safe depths for barges. The last maintenance dredging was in 1998 according to NASA representatives. No additional dredging would be required for the IFX ground-test program. Consequently, no adverse impacts on any aquatic species in the Tennessee River are predicted as a result of construction of the PTF.
- Building 4755 (AI&TF): No expansion of the existing building is proposed. However, the rear of the building would be deepened to 10 feet over the existing elevation to accommodate the test vehicle. No external construction or disturbance of natural areas would be required. No impacts on any biological communities are therefore predicted.
- Building 4718 (AI&TF): The existing HVAC system on the east end of the building would be replaced to accommodate the required rehabilitation and expansion. All construction would occur in developed areas. No impacts on biological resources would occur. The test vehicle would be moved from Building 4755 to this facility, but the existing roads would not have to be widened. No adverse impacts on any biological communities are therefore predicted.

In conclusion, construction activities within the other areas would not involve disturbance of any biological habitats, based on a field assessment and review of the most recent project plans.

Operation

The effects of operational noise on biological resources is discussed in the noise section of this EA, Section 4.2.9.

The component of the exhaust that is of concern to biological resources is the hydrogen fluoride. A discussion of the anticipated effects of hydrogen fluoride is contained in Section 4.1.3 relative to SSC and would be generally applicable at RSA.

The species of major concern due to a potential for impacts related to hydrogen fluoride deposition is the green salamander (*Aneides aeneus*) (listed as a Protected Species by the State of Alabama). This species breeds in the hilly area just east of the proposed PTF site from January through March. While no lethal toxicity problems are expected for adult salamanders, the potential exists for impacts to their eggs as a result of acidic water caused by test emissions. Larval stages of aquatic amphibians are most affected by acidic water. As a rule, embryos of sensitive amphibian species are killed by water with a pH of 4.5 or lower, and embryos of more tolerant species can survive down to a pH of 3.7. Soil acidification can influence the species of salamander that breed and spend their lives in the soil, including the green salamander (National Park Service, 1999). Based on the analysis presented previously for SSC, emissions from PTF activities are expected to only slightly reduce current pH levels (essentially an unmeasurable reduction). Consequently, adverse impacts on this species due to changes in pH are not predicted in either the short- or long-term.

4.2.3.2 Cumulative Impacts

At MSFC, construction of the AI&TF would not affect important biological resources. The cumulative action at MSFC, Engine Technology Support for NASA's Advanced Space Transportation Program, would cause minor construction impacts in the immediate area of the test stands and provide continued engine testing support at locations where such activities already occur. Therefore, there would be no change from current conditions and no cumulative adverse effects.

At RSA, approximately 23 net acres of undeveloped land would be used for new facility construction annually for cumulative actions. Therefore, over the twelve-year life of the IFX ground-test program at RSA, approximately 276 acres would be converted to developed usage. The STF complex would increase this amount by less than five percent at locations away from the main RSA facility areas.

4.2.4 Cultural Resources

4.2.4.1 Environmental Effects

Prehistoric and Historic Archaeological Resources

Two archaeological sites recorded near the PTF (site 1Ma 630 and 1Ma 269) are currently believed to be potentially eligible for inclusion in the National Register (Curry, 1998). The cemetery located between igloos 8307 and 8308 is not eligible, but is protected under the Alabama Burial Act. Site 1Ma 630 is located within the direct ground disturbance area and would likely be damaged or possibly destroyed by PTF construction. Based on initial consultation with the Alabama SHPO, if RSA is selected for the STF complex, a Phase II testing program research design would be written and coordinated with the Alabama SHPO for Site 1Ma 630. Based on the results of the Phase II testing, further in-depth testing or Phase III archaeological work could be required for Site 1Ma 630, and appropriate additional mitigation measures, if necessary, would be developed. Site 1Ma 269 is within the ESQD zone and would only be affected in the event of an unexpected explosion. Continued consultation with the SHPO and development of appropriate mitigation measures would offset the potential impacts to Site 1Ma 630 and Site 1Ma 269.

In addition, because archaeological sites, artifacts, and features occur throughout RSA, as well as within, or adjacent to, the proposed PTF site, there is some potential for additional cultural materials to be unexpectedly discovered during the course of project activities. In the event this should occur during construction, all activities would halt in the immediate area and the Alabama SHPO would be consulted through the RSA

Environmental Office. Subsequent actions would follow guidance provided in 36 CFR 800.11 and/or in NAGPRA.

Although cemeteries at RSA are not National Register-eligible, they are protected and cared for by the installation. The unnamed cemetery located between igloos 8307 and 8308 would be maintained by the IFX ground-test program through monthly mowing and maintenance of the fence (Dunn and Wu, 1998). Any ground disturbance within 100 feet of the cemetery fence would require coordination with the RSA Environmental Quality Division to ensure that no graves are disturbed. The unnamed cemetery located between igloos 8307 and 8308 is not eligible for inclusion in the National Register and is not in the direct ground disturbance area; therefore, no effects on historic properties are expected to occur.

In addition, excavations for utilities would be conducted along the east side of McAlpine Road and along the south side of Buxton Road (extending from the intersection of Buxton Road and Patton Road). Of this particular area, running along the roadway, only one NRHP eligible archaeological site is present, Site 1Ma649 (Curry, personal communication). This site is located east of McAlpine Road, and immediately adjacent to the channelized drainage that runs north-south along the east side of the road, near Bunker 8062 (near the northern edge of the site). The site is 75 m by 70 m in extent. A buffer zone has been drawn around the site. In order to avoid impacts to this site, ground disturbance must be confined to the area extending from McAlpine Road to the east side of the existing disturbed area of the drainage ditch. The area beyond the drainage ditch will not be disturbed, and it will not be used for storage, equipment, staging area, or a roadway.

The 1,700-foot x 20-foot fiber optic line constructed between the RTF and PTF sites could impact archeological resources. As a result, a Phase 1 survey of this corridor has been conducted as part of this EA. The survey found no archaeological sites in this corridor.

Historic Buildings and Structures

Of the currently identified National Register-listed buildings and structures on RSA and MSFC, none would be affected by the IFX ground-test program.

Seven World War II-era igloos are located within the direct ground disturbance area of the PTF complex and would need to be demolished for the construction of the new facility; 63 additional igloos are located within the ESQD zone. All 70 igloos, as well as Building 8027, have been evaluated for eligibility for inclusion in the National Register in recent World War II and Cold War properties studies of RSA. Building 8027 has been determined to be not eligible, but the 70 igloos have been determined to be eligible. However, concurrence from the Alabama SHPO has not yet been received. Until concurrence from the SHPO is received, these properties must be treated as potentially eligible for inclusion in the National Register for the purposes of this analysis. The cemetery may not be eligible under the National Register but is protected under the Alabama Burial Act.

Although the seven igloos (Buildings 8330, 8331, 8338, 8339, 8348, 8347, and 8340, which are in the PTF Complex construction area) and Building 8027, which may require modification, have been preliminarily determined eligible and ineligible, respectively, for listing in the National Register, concurrence from the Alabama SHPO has not yet been received. Therefore, before these properties can be modified or demolished, consultation with the Alabama SHPO is required. Mitigation measures to offset potential adverse effects will include recordation through standards acceptable by the Historic American Buildings Survey/Historic American Engineering Record division of the National Park Service, or other such mitigation measures determined to be appropriate during the consultation process. The Army is currently conducting a study of igloos nationwide that is expected to result in changes to how these structures are evaluated in NEPA EAs and EISs. However, this is an ongoing process and has not yet been resolved with the Alabama SHPO. Therefore, the actual regulatory process that these structures will be required to undergo has not yet been determined.

Discussions with the Alabama SHPO by RSA personnel regarding the munitions igloos indicate that RSA will be required to document the various types of munitions igloos at the post and to preserve one row of munitions igloos (not including the seven that would be demolished). After these steps are completed, preservation or documentation of the remaining igloos would not be required.

The remaining 63 igloos are also within the proposed Igloo Area 2 Historic District and therefore eligible within the WW II context, but have been recommended not eligible within the Cold War context. These igloos are not within the direct ground disturbance area; however, they are located within the PTF ESQD zone and have the potential to be damaged in the event of an unexpected explosion. Mitigation measures to offset potential effects on these 63 structures are not proposed because the probability of such an occurrence is low and the cost of mitigation (e.g., Historic American Building Survey/Historic American Engineering Record recordation) is high. In the unlikely event that a mishap occurs, post-mishap recommendations would include post-event inspection, non-archival quality 35-millimeter photography, and documentation revisions (e.g., the World War II and Cold War studies) to determine and record the extent of the damage from impacts or fire. Consultation with the SHPO regarding the National Register status of the structures and the types of mitigation required will be conducted through the RSA Office of Environmental Management (Dunn and Wu, 1998; Wu 1999).

The 1,700-foot x 20-foot fiber optic line constructed between the RTF and PTF sites could impact historical resources. As a result, a Phase I survey of this corridor was conducted as part of this EA. The survey concluded that there were no resources along the corridor.

Native Populations/Traditional Resources

There are no formally identified traditional cultural properties at RSA or MSFC; therefore, no effects are expected.

Required Actions. Site 1Ma 630 requires additional archaeological investigation and consultation with the SHPO. Site 1Ma649 along east side of McAlpine Road must be avoided. Munitions igloos that would be demolished are considered eligible for the National Register. Preliminary coordination with SHPO indicates that documentation and preservation of a portion of the munitions complex would allow construction to proceed. These mitigative measures would reduce the impact on cultural resources to non-significant.

4.2.4.2 Cumulative Impacts

There are no past, present, or reasonably foreseeable future programs identified near the STF complex sites that would cause cumulative impacts.

4.2.5 Geology And Soils

4.2.5.1 Environmental Effects

Construction

Construction activities typically involve the removal of vegetation, cut-and-fill operations, and grading for site preparation and access. Depending on the specific geologic conditions at the proposed STF sites, ground disturbing construction activities could result in a potential for ground instability including temporary and localized occurrences of wind and water erosion. No unique geologic features that could be affected by project construction are known to exist at the project site.

As discussed in Section 4.2.13, site preparation activities at RSA and MSFC would be subject to Phase I and II NPDES construction permit requirements. These requirements call for implementation of an SWPPP, which would identify the Best Management Practices to be implemented both during and following construction activities for the purpose of preventing soil erosion and controlling pollutant discharges into waterways during storm events. Best Management Practices often include the construction of berms, swales, and runoff diversion ditches, hydroseeding, and the use of silt fences or separators. With implementation of the SWPPP and Best Management Practices, the erosion of soil resulting from project construction would be minor and short-term in nature. Additionally, pollutant discharge would not be expected.

Construction of the 50-60 foot deep foundation at the PTF site could potentially impact karst features in this area. In order to test for this possibility, four exploratory boreholes are to be drilled in the area. Should karst features be encountered, a recommendation would be made at that time by the contractor regarding the overall nature of any karst features that might be present, and on the feasibility of construction.

Soils would be disturbed along the 1,700 x 20-foot fiber optic line between the PTF and RTF, along the roads where utility easements are to be disturbed for trenching, and within the 15-acre PTF site. Minor disturbance of soils would occur at the AI&TF sites at MSFC Buildings 4718 and 4755. Approximately 10 feet of soil would also be excavated to create the floor of the high bay building (Building 4755).

Operation

Soils in the area of the PTF are moderately to strongly acidic (average pH levels range from approximately 4.5 to 5.1) (Iowa State University Statistical Laboratory, 1998).

Due to the low buffering capacity of the soils, the deposition of small amounts of hydrogen fluoride may result in a temporary and slight increase in soil acidity. However, because hydrogen fluoride deposition on soil surfaces would occur only during periods of high humidity and because hydrogen fluoride is highly soluble in water, small amounts of hydrogen fluoride residuals would be quickly diluted and buffered by rainfall. As a result, PTF operations are not expected to result in long-term changes in the chemical composition or physical characteristics of soils located within the project's ROI. However, temporary increases in soil acidity may result in short-term impacts to vegetation and soil-dwelling microorganisms.

Because RSA and MSFC are located in a low seismic risk area, the potential occurrence of liquefaction, seismic settlement, or ground rupture at the project sites is considered minimal. In addition, soil at the PTF site exhibits low to moderate shrink/swell susceptibility.

4.2.5.2 Cumulative Impacts

Temporary, minor impacts to geology and soils, when combined with other past, current, and foreseeable future activities, would not result in cumulative impacts. The preparation of SWPPPs and utilization of Best Management Practices during construction, cumulative erosion of soil would be minimized.

4.2.6 Hazardous Materials and Hazardous Waste Management

The primary hazardous materials and the hazardous wastes associated with STF operation and maintenance are listed in Table 2-5.

4.2.6.1 Environmental Effects

Construction

Construction and internal renovation of proposed STF buildings would utilize small amounts of hazardous materials and generate hazardous wastes. Hazardous materials utilized during construction may include paints, oils, and solvents. Usage of materials is anticipated to be minimal and consistent with typical construction activity. These materials would be handled and stored in accordance with RSA and federal regulations. This is not expected to adversely impact RSA hazardous material practices or handling procedures.

Asbestos-Containing Material (ACM), Lead-Based Paint, and PCBs. Internal building renovation activities proposed for Buildings 4718, 4755, 8027, 8876 and several munition bunkers may generate wastes, including ACM, lead-based paints, and PCBs. Although Bunker 8339 and the nearby bunkers that would be demolished have not been tested for ACM, due to the construction style, it is assumed that none is present. Of the proposed STF buildings, only Building 8876 is known to have ACM (Sussa, J., 2000). All renovation work in this facility shall be performed by a licensed asbestos abatement contractor, in accordance with state and federal regulations. Prior to any asbestos demolition or remediation, advance notice would be provided to the Alabama Department of Environmental Management. All removed asbestos shall be disposed in the on-base landfill. Occupancy of disturbed areas would not be permitted until air monitoring results indicated that health quality standards were met.

It is likely that lead-based paint and PCBs would also be encountered during building renovation. Paints that exceed the limits for lead must be removed in accordance with the applicable health and safety standards and disposed of as hazardous waste. A lead based paint survey would be conducted prior to any building modifications, and any paint would be removed and disposed in accordance with Alabama Department of Environmental Management regulations. PCB contamination may be encountered during construction/renovation activities, as on-pole transformers containing PCBs exist at the installation. The exact location of these transformers has not been determined, as a base-wide survey has not been conducted. However, all ground-level equipment has been replaced with PCB-free dielectric fluid. Therefore, release or exposure to PCBs during construction and renovation is not anticipated.

Operation

Hazardous Materials. During the operational phase of the IFX ground-test program, hazardous reactants/chemicals would be stored in three munition bunkers located on the southern portion of RSA, collectively serving as the RSF. Bulk storage of F_2, D_2, and NF_3, chemicals needed in the PTF for laser testing, would be stored in three separate igloos to minimize the possibility of dangerous co-mingling of substances in the event of a release. Bunkers would also be upgraded with chemical monitors to minimize the risk of a large scale substance release. Other hazardous materials required for STF operation, listed in Table 2-2, would be stored. Storage and handling areas at the RSF would consist of concrete pads with associated tanks, piping, valves, and related storage and transfer equipment to provide inert gases and reactants to the test chamber and diesel fuel and water to the PRS. Required emergency response equipment would be included at appropriate locations. Tier II EPCRA reporting may be required to support the storage and handling of hazardous materials.

Small amounts of F_2, D_2, and NF_3, as well as other chemicals/reactants would be at the PTF, in anticipation of testing. Amounts would be equivalent to what is needed for 10 laser test firings. As with the RSF, hazardous materials would be stored and handled in appropriate areas.

Diesel fuel would be used at the PTF as the fuel source for generators providing the primary electrical power to the PTC and PRS during laser performance testing, as well as for the PTC steam-generating boilers. A 15,000-gallon diesel storage tank would be acquired to support the diesel fuel needs at the PTF. The storage tank would be an aboveground, double-walled tank, compliant with state and federal regulations.

Hazardous Waste. 1,511 lbs of hazardous materials would be generated per year (See Table 2-5 for a detailed list). An additional 7,913 pounds of corrosive contaminated water is generated from the Pressure Recovery System operation from the cooling water condensing the HF and DF. This contaminated water will be treated on site using sodium hydroxide to precipitate to safe compounds the HF and DF to allow discharge to the sewer. The treatment will be conducted on a batch basis after every laser test firing.

Wastewater collected in the oil/water separator sump would be the only process waste stream not generated at the PTF. Based on typical operating practices, waste collected in the sump would be disposed of on a semi-annual basis, the disposal of which would not affect waste generation at RSA. Items such as lead-acid batteries would be recycled, and all other wastes would be disposed at RCRA permitted facilities in accordance with the RSA hazardous waste management plan. The IFX ground-test program will comply with the requirements of the Army, including the use of the DRMO for their hazardous waste dispositions.

Environmental Restoration

The proposed RCF, Building 8876, is located within Operable Unit (OU) 13, a site consisting of 2 restoration sites, RSA-115 (Test Area 5 East Blowdown Lagoon) and RSA 116 (Test Area 5 South Blowdown Lagoon). Trichloroethene (TCE) and vinyl chloride (VC) have been identified as contaminants of concern for groundwater for OU-13. Groundwater flow is to the west and then south to an unnamed stream that discharges to the Tennessee River. Study suggests that groundwater contamination currently associated with these sites may be a base-wide problem, rather than a site specific problem (Parsons Engineering Science, 1999). Since elevated contaminant levels were not found in site soils, the groundwater poses the largest risk during the construction and renovation phase of the projects. There are no groundwater wells on RSA that are used for potable water. Furthermore, no raw groundwater is used as a source for a treatment source that produces potable water. Figure 4.2-3 shows restoration sites relevant to the IFX ground-test program at RSA.

Both buildings associated with the AI&TF, Buildings 4718 and 4755, are associated with CERCLA sites. MSFC 2, located southeast of Building 4755 is a waste pile that operated in the 1960s in the 100-year floodplain. VOCs and metals have been identified as potential contaminants of concern for this site. To date, a preliminary assessment /site investigation has been performed. MSFC 53, a former propellant storage area and test stand site, is located approximately 700 feet from Building 4755. Hydrocarbon-based rocket fuels and chlorinated solvents for cleaning were used at this site. Analytical results from a 1997 report indicate that MSFC 53 lies within the source area of a large chlorinated solvent groundwater plume which appears to originate northwest of the site(Redstone Arsenal, 1998c). Figure 4.2-4 shows restoration sites relevant to the IFX ground-test program at MSFC.

Three CERCLA sites are located adjacent to the proposed PTF: RSA 110, 115, and 116. RSA 110 is located approximately 3,000 feet northeast from the PTF, and RSA 115 is located approximately 1,400 feet from Building 8876. The site has been classified as requiring no further action. RSA 116 is an old blowdown lagoon located approximately 1,700 feet from Building 8876. It is not anticipated that contamination associated with RSA 116, or other contaminated sites, would be encountered during excavation activities at the proposed PTF. However, should contaminated groundwater be encountered, institutional controls, specifically land use restrictions and no dig policies would be

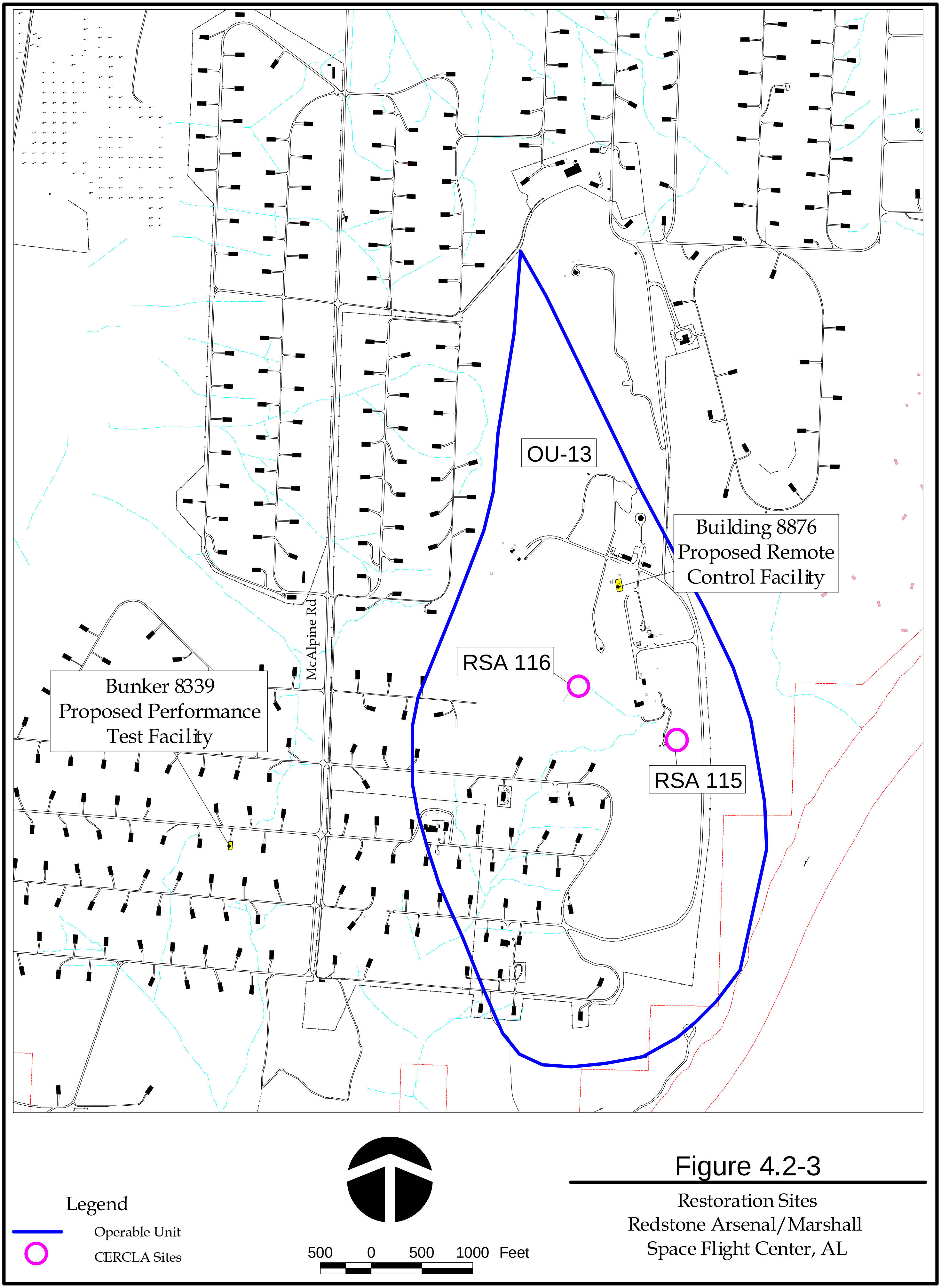

Figure 4.2-3

Restoration Sites
Redstone Arsenal/Marshall
Space Flight Center, AL

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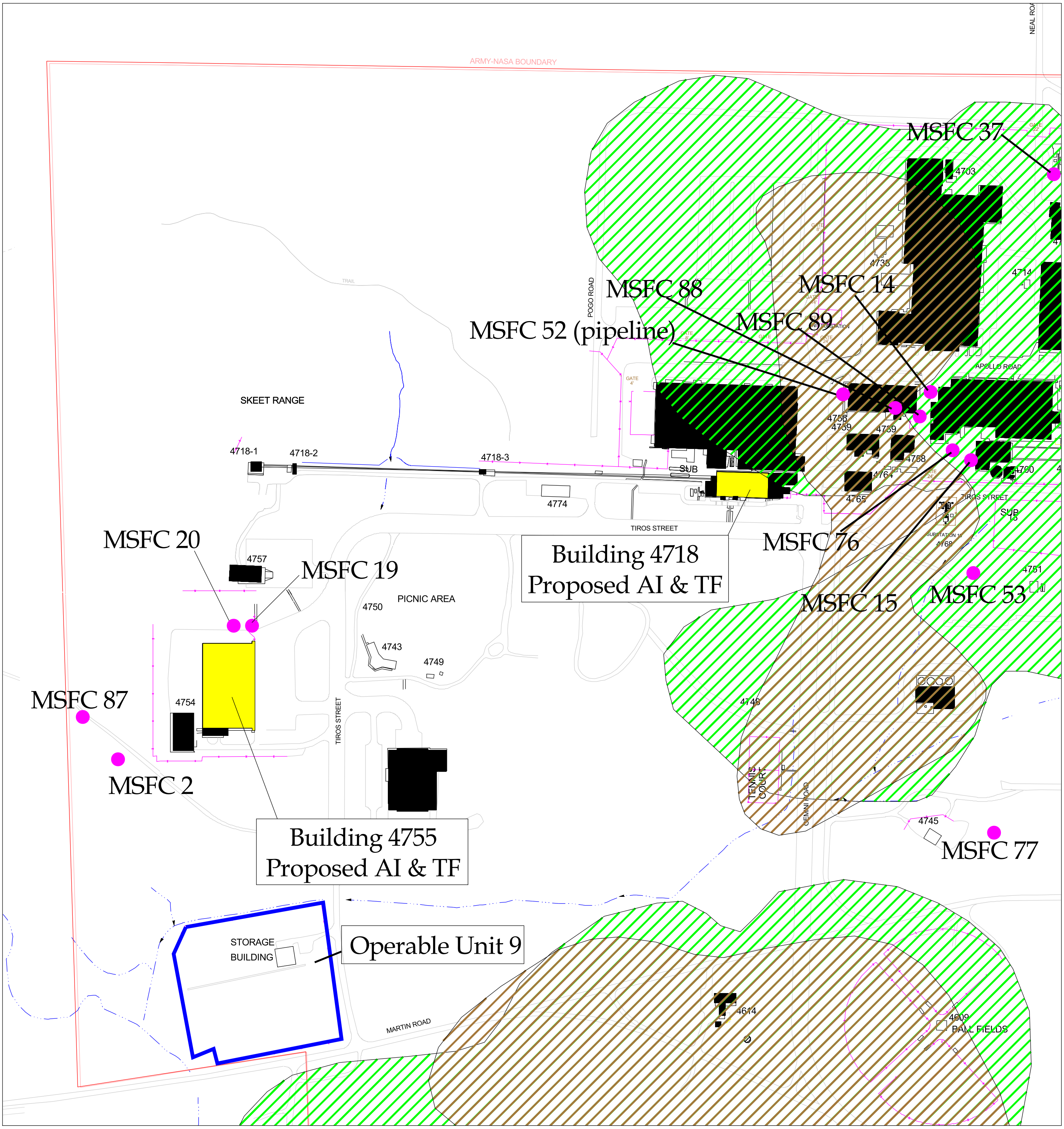

Legend

- MSFC Boundary
- CERCLA Sites (Size of "dot" does not accurately reflect size of restoration site)
- Groundwater TCE Plumes
- Groundwater PCE Plumes

250 0 250 500 Feet

Figure 4.2-4

Restoration Sites
Redstone Arsenal/Marshall
Space Flight Center, AL

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imposed to prevent human contact with the groundwater. The presumed remedy for RSA 116 is land use controls and groundwater monitoring. Land use controls would include fencing and well drilling restrictions.

Potential contaminants at STF facility sites would have to be addressed before and during construction and renovation activities, but should not serve as a hindrance to the long-term operation of the facilities.

4.2.6.2 Cumulative Impacts

The Advanced Space Transportation Program is expected to install a 20,000-gallon AST in the West Test Area of MSFC. The minor construction activity associated with this program is anticipated to utilize small quantities of hazardous materials, such as adhesives and paints. Used items would be disposed of according to manufacturers' recommendations in accordance with regulatory requirements. The combination of the relatively minor quantities associated with construction for this program with other anticipated construction activities at MSFC and RSA would not cause adverse cumulative impacts.

Solvent usage is anticipated with the implementation of the Advanced Space Transportation Program at MSFC. Approximately 3,300 lbs per year is estimated. However, under the IFX ground-test program, the majority of hazardous material storage and usage would occur on the southern portion of RSA. While EPCRA Tier II reporting and other state and federal hazardous material reporting may be altered, it is not expected that the cumulative actions would alter site hazardous material and waste practices and protocols.

4.2.7 Health and Safety

4.2.7.1 Environmental Effects

Construction Activities

Preparation for new construction would include clearance of existing vegetation, grading, and excavation for foundations. An area would be prepared for construction equipment laydown, personal vehicle parking, temporary mobile offices (trailers), maintenance facilities, and other construction needs. Concrete for foundations and footings and other construction materials would be delivered by truck in accordance with DoT and NASA regulations. Proposed construction and internal renovation of tall STF structures would present a fall hazard to workers. All construction and renovation activities would be conducted in accordance with OSHA and NASA requirements for health and safety to control exposure to occupational safety and health hazards.

Operations

Under the IFX ground-test program, bulk storage of hazardous chemicals would occur at the RSF, with smaller amounts of hazardous materials stored at the PTF. In Table 2-2, it is estimated that a maximum of 231 pounds of F_2 would be stored at the STF Complex at any given time. Minimum thresholds have been established for Tier One and Tier Two reporting under 40 CFR 370 (Title III, Section 312). For Extremely Hazardous

Substances (EHSs) designated under Section 302 of Title III, the reporting threshold is 500 pounds or the threshold planning quantity (TPQ), whichever is lower: F_2 is classified as an EHS. For all other hazardous chemicals for which facilities are required to have or prepare an MSDS, the minimum reporting threshold is 10,000 pounds. Section 312 requires that the owner or operator of a facility to comply with Tier One and Tier Two reporting if, under regulations implementing the Occupational Safety and Health Act of 1970, the owner or operator is required to prepare or have available Material Safety Data Sheets (MSDS) for hazardous chemicals present at the facility. MSDS requirements are specified in the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, found in 29 CFR 1910.1200.

Under 40 CFR 373 (Section 313 of Title III), the owner or operator of the facility must submit a Form R report to the USEPA if the facility exceeds an applicable threshold for any of the listed chemicals. Section 313 reportable quantities at the STF Complex would be determined under the 10,000 pounds otherwise used threshold. Therefore, listed Section 313 chemicals used at the STF Complex in excess of 10,000 pounds per calendar year would require the preparation and submission of a Form R report.

Hazardous substances used in conjunction with the IFX ground-test program would be stored in three separate retrofitted munitions igloos to minimize the possibility of dangerous co-mingling of substances in the event of a release. Bunkers would also be upgraded with chemical monitors to minimize the risk of a large-scale substance release. Storage and handling areas at the RSF would consist of concrete pads with associated tanks, piping, valves, and related storage and transfer equipment to provide inert gases and reactants to the test chamber and diesel fuel and water to the PRS. Required emergency response equipment would be included at appropriate locations.

As indicated in Section 4.1.1.1, there is a potential for accidental release of toxic and corrosive gases from the tube tanks of the delivery vehicles, during transfer from the delivery vehicles to the site storage tanks, and during conveyance from the site storage tanks to the laser combustor. Hazardous materials to be used at the PTF would be shipped via truckrail from the manufacturing location in specially designed shipping containers to reduce the potential of a mishap in the event of an accident. Existing installation operating procedures and safety measures have been established to minimize the probability of a release and the potential for health and safety impacts once materials arrive at the installation. Specific STF procedures would also be established by the program.

A 0.75-mile radius safety zone would surround the PTF. The 0.75-mile radius safety zone provides for dispersion of emissions from the laser tests. Any activities within this zone must cease during testing. There are no existing facilities or activities located within this zone that would be affected, therefore potential hazards to workers at adjacent facilities is considered to be minimal (Ballistic Missile Defense Organization, 1999). No personnel shall be present in the PTC during laser testing. A vacuum shall be maintained in the test cell during laser testing, the reactants would only be released through the PRS.

At the AI&TF, support shops and laboratories consisting of machine shops, welding shops, paint shops, electrical shops, and instrument calibration and repair labs would be required. A plant protection support area would house the personnel and equipment to provide fire, medical, and security services. No laser test firing would occur at the AI&TF complex.

Facility and equipment designs would incorporate measures to minimize the potential for and impact of accidental releases. Operating procedures and training would be instituted by the program to minimize the potential for and impact of releases of hazardous materials. Appropriate emergency response plans would be established and implemented by the program to deal with potential chemical releases.

4.2.7.2 Cumulative Impacts

All work on the RSA/MSFC alternative and on other cumulative programs would be performed in accordance with applicable health and safety regulations. There would be no cumulative adverse impact on health and safety.

4.2.8 Land Use and Aesthetics

4.2.8.1 Environmental Effects

Regional Land Use

The PTF and RCF, and IFX ground-test program and administration offices would be located at the extreme southern portion of RSA, which is surrounded by the Tennessee River to the south and the remainder of RSA to the north. The AI&TF and the thermal vacuum test chamber would be located in the MSFC near the center of RSA. Therefore, construction and operational activities would not affect adjacent offsite land uses.

On-base Land Use

Construction and operation of new facilities in the PTF complex would occur in a munitions storage bunker area in the southern part of RSA, which falls under the Ammunition Supply land use category. The site would include a new 39,300 square foot building on a parcel approximately 10 acres in size. An additional 2 acres would be required during construction as a construction lay down area. There would be a 0.75 mile radius safety zone surrounding the site. Land use activity would be strictly limited within the safety zone, particularly during testing operations.

Although the proposed PTF complex is not considered ammunition supply, the facility and site operations (including the inhabited building ESQD and the safety zone) would be compatible with the open nature of the base and existing types of activities, and is consistent with overall base objectives. Several of the existing bunkers would be demolished in the course of construction of the PTF. The nearest bunker to the center of the PTF would be Building 8339. There are storage igloos currently used within the ESQD zone and the safety zone. Further determination would be required for igloos used for storage within the ESQD boundary. Depending on the types of materials stored and the distance from the PTF, some materials may have to be relocated to other storage igloos. Use of the storage igloos within the ESQD would be coordinated to avoid conflict with PTF testing. Igloos that are located outside the ESQD but within the laser safety zone would still be utilized for storage but would not be accessible during times of testing.

The RCF would utilize an existing rocket test remote control facility, Building 8876, outside the 0.75-mile PTF safety zone to the northeast. Additional construction would occur on the 0.3-acre site to provide a total of 4,200 square feet of facilities. Test and control instruments would be installed in this building. The RCF is located in an Ammunition Supply land use category, and is considered compatible for similar reasons listed in the PTF discussion.

The AI&TF would be split between existing Buildings 4718 and 4755 within MSFC. Thermal vacuum testing would occur in Building 4718, and acoustic and EMI/EMC testing would occur in Building 4755. In addition, another 21,200 square feet of new construction will occur to provide a total of 56,900 square feet of facilities for the AI&TF. The site for the AI&TF Complex is approximately 5 acres in size. The AI&TF is located in a Test and Operations land use category and is a compatible use.

The engineering, administration, and warehouse needs for the STF would be located in existing Building 8027 north of the PTF near Buxton Road. This 31,000 square foot building is located on a 0.7 acre site. This is located in a Test and Operations land use category, and while it might be more appropriate in the administration area, there should be no compatibility problems.

Up to 11.6 acres could be disturbed during the construction phase, as well as a 2-acre construction laydown area along the road to the PTF complex. The proposed facilities and operations would not result in a conversion of prime agricultural land or cause a decrease in utilization of the land.

Aesthetics

New construction could slightly alter the views surrounding RSA. Several of the proposed facilities would be approximately 145 feet tall, which is not out of character with some of the other structures on RSA. Views of the proposed site are very limited. It is in the extreme south-central portion of the installation and is surrounded by the Tennessee River to the south, east, and west. The area is fairly hilly and is heavily forested. Therefore, construction and operations of the proposed STF would not affect the area's aesthetic quality nor would it obstruct any scenic views.

4.2.8.2 Cumulative Impacts

At MSFC, the Engine Technology Support Program for NASA's Advanced Space Transportation Program is a project that is planned in the near future. Land use and aesthetics are consistent with current usage for rocket motor testing and other space-related programs.

At RSA, there are no new programs or changes in personnel proposed. However, the Real Property Master Plan Land Use Analysis (Redstone Arsenal, 1999c) identified numerous construction and demolition projects that would result in a net increase of 64,000 square feet of facilities added on an annual basis over the next twelve years. It is assumed that approximately 23 acres of land would be involved with this activity each year. Each project would be planned in accordance with the post Master Plan, and no adverse cumulative impacts to land use and aesthetics are anticipated.

4.2.9 Noise

A general discussion of noise is given in Section 4.1.9.

4.2.9.1 Environmental Effects

Construction

Noise levels within and adjacent to the project construction areas would increase during the construction period. However, construction activity would not cause long-term noise impacts since it would be short-term and normally limited to daytime hours. At a distance of approximately 50 feet, the noise from typical construction equipment falls in the range of 70 dBA to 100 dBA (with peak noise from pile drivers going as high as 110 dBA) (U.S. Environmental Protection Agency, 1971; Construction Engineering Research Laboratory, 1978). As such, under most meteorological conditions, the maximum construction noise from pile drivers would be anticipated to attenuate to 83 dBA at a radius of approximately 1,000 feet from the construction sites. Typical construction noise would be in the range of 43 dBA to 73 dBA at that distance. At the installation boundary approximately 4,000 feet from the PTF along the Tennessee River, construction noise would be in the range of 28 dBA to 58 dBA, essentially indistinguishable from background noise.

The AI&TF in Buildings 4718 and 4755 would be the IFX construction area closest to sensitive noise receptors at MSFC and RSA, specifically MSFC. East of Building 4755 is a MSFC picnic area approximately 400 feet distant. This area is used by NASA personnel, and is not open to the public. Noise levels would range from 52 dBA to 82 dBA at that distance, causing interference with outdoor speech communication at the higher sound levels. During construction, the usage of this area would be affected. However, these impacts would be temporary and short-term in nature.

Construction noise caused by truck traffic to and from the PTF construction site and the use of heavy machinery and excavation equipment would temporarily disturb wildlife in the immediate vicinity during the construction period. Construction activities could disturb nesting, hatching, and fledging of land and shorebirds and other wildlife in the area. However, this would be a short-term effect as described in Section 4.1.9. No federally- or state-listed bird species have been identified as nesting on RSA, or in the vicinity of the PTF site. The likelihood that transient bald eagles would be adversely impacted is anticipated to be slight.

Operation

While operating, the PRS would be anticipated to generate a noise level of approximately 125 dBA at a distance of 50 feet from the end of the PRS ejectors. At the edge of the 0.75-mile safety zone around the PTF from which personnel would be excluded during tests, the sound level would be approximately 83 dBA, including 4 dBA of atmospheric attenuation. This noise level is equivalent to that experienced by an individual three feet from a kitchen garbage disposal, and substantially less than such typical urban sources as gas lawn mowers at three feet and diesel trucks at 50 feet. During each laser test, the PRS would operate for a few minutes duration and cause some interference with outdoor speech communication. Based on OSHA regulations, there would be no exceedance of permissible workplace exposures.

Based on actual sound tests at another acoustic test chamber that would have similar characteristics to the IFX acoustic test chamber, the sound level at 150 feet from the test chamber would be less than 60 dBA (Ling Electronics, 1998). This level would be essentially indistinguishable from the background noise environment. The acoustic chamber would be constructed in Building 4755 near a MSFC picnic area, but the noise levels would not affect the usage of this area.

In the unlikely event that a catastrophic explosion occurred at the PTF, noise levels of approximately 146 dBA would be experienced at the edge of the 0.75-mile safety zone around the PTF (TRW Space and Electronics Group, 1999). This would exceed the OSHA workplace criteria of 140 dBA for peak impulse noise. However, this noise level would not be due to normal workplace conditions, but rather to a single abnormal event that would be unlikely to occur. No property damage such as window breakage or structural damage would be anticipated.

A discussion of the anticipated effects of noise on wildlife is provided in Section 4.1.9. There would be loud, episodic noise events from the PRS component of the PTF during laser performance testing, and wildlife would be expected to exhibit a startle response when the PRS began to exhaust steam. Some would leave the area temporarily. However, animals in the vicinity of engine testing and other similar abrupt, loud noises adapt and do not appear to be unduly disturbed (National Aeronautics and Space Administration, 1997b).

4.2.9.2 Cumulative Impacts

There are no known construction projects near IFX construction sites at RSA or MSFC that would be sufficiently close or have overlapping construction periods that would generate cumulative adverse noise impacts.

Noise impacts for RSA and MSFC would include those from current programs and those expected from IFX ground-test activities. The main potential noise contributor, the PTF, would be located in a munitions storage area away from other post activities. Each test would be completed in periods of less than ten minutes. Other major noise contributors at RSA and MSFC include existing and proposed programs for rocket motor testing. The maximum noise level from rocket motor testing at offsite locations is estimated to be 97 dBA. Each test would be completed in less than five minutes. Concurrent laser tests and rocket motor tests are not anticipated, and there would not be a cumulative adverse impact.

4.2.10 Socioeconomics

4.2.10.1 Environmental Effects

The IFX ground-test program would comprise two components or phases: the construction phase and the operational phase.

Construction

The IFX ground-test program at RSA would begin with construction of new and refurbishing of existing facilities. Most of the construction program would be expected to draw on local resources including labor and material. It is estimated that the total construction cost of the buildings required at RSA, including labor and materials, would be $203.2 million.

A minimum construction period of approximately 36 months would be required for the PTF. Construction activities are anticipated to begin by the end of FY 2002. A construction period of approximately 36 months would also be required for the AI&TF. The AI&TF would not be required until after the ITU testing had been performed. Therefore, construction activities for the AI&TF are anticipated to begin in the middle of FY 2007.

Construction personnel requirements would average approximately 600 for the first 6 months and 400 for the remaining 30 months for the PTF. Construction personnel requirements would average approximately 600 for the first 6 months and 400 for the remaining 30 months for the AI&TF. These totals include design teams, procurement, and fabrication specialists. It is estimated that less than half of these personnel would be required at a specific time at the construction sites during construction and assembly operations.

The construction phase would generate an average of approximately 433 full-time construction jobs each year for the three years that it would require to construct the PTF (2002-2004) and another 433 full time jobs for the three years that it would require to construct the AI&TF (2007-2009). This would create an average of $13.0 million in construction wage income (in year 2000 dollars) for each of the six years of construction. This wage income would translate into annual personal consumption expenditure within the ROI of $10.2 million for each of the six years of construction. In addition, the construction program would require the purchase of raw materials and finished building products. It is estimated that these purchases would equal about $59.7 million over the construction period.

These jobs and expenditures would be substantial, yet transitory, benefits for the local economy. The result of the construction program, however, would be an operational facility that would generate recurring economic benefits.

As the construction phase would be carried out a substantial distance from inhabited areas, the construction impacts would not be expected to affect the quality of life of local residents or visitors to the region.

Operation

The operation of the IFX ground-test program at RSA would add 345 jobs and $21.1 million of annual household income to the local economy. This would result in $17.1 million of additional annual consumption expenditure in the region. This consumption expenditure would result in an additional 166 jobs created in the retail sector of the local economy, with over $2.5 million in additional annual wages. The expenditures from these new employees would also create a number of additional jobs in the region, adding additional consumption expenditure to the local economy and creating additional jobs. In addition, there may be additional jobs created in other sectors of the local economy due to the increased spending. Studies have shown that this "trickle down" effect of new jobs and increased spending in a local economy may result in an additional overall economic benefit to the community of up to 1.2 times the wages of the new industry or business. This could result in additional benefits to the community of up to $25 million.

The creation of these new jobs could have the potential to increase demand for new homes and local services, including health, education, and other publicly-provided facilities. If every job created by the IFX ground-test program brought with it a typical U.S. household (2.64 persons in 1997), the 345 jobs would bring a total of 911 people into the region. If all of those moving into the area came from outside the regional economy, then the population of the region would increase by a maximum of slightly more than 0.1 percent. The current forecast increase in population between 1997 and 2005 (based on existing demographic trends) is about 55,700. The potential increase in population attributed to this action would, therefore, require an increase of the forecast by approximately 1-1/2 percent.

Operational impacts on the quality of life would be minimal due to the relative isolation of the testing site at RSA and MSFC and the non-invasive character of the IFX ground-test program.

4.2.10.2 Cumulative Impacts

At MSFC, the Engine Technology Support Program for NASA's Advanced Space Transportation Program is a project that is planned in the near future. Due to downsizing in other MSFC programs from 2,715 on September 26, 1998, to 2,567 on September 30, 1999, there would be no overall change in personnel levels at MSFC as a result of this program. Furthermore, RSA personnel levels decreased by 621 positions over the same period.

At RSA, there are no new programs or changes in personnel proposed. However, the Real Property Master Plan Land Use Analysis (Redstone Arsenal, 1999c) identified numerous construction and demolition projects that would result in a net increase of 64,000 square feet of facilities added on an annual basis over the next twelve years. Approximately 161,000 square feet would be constructed each year and approximately 97,000 square feet would be demolished. This could result in a small amount of additional employment in the construction industry in the Huntsville area, along with a small corresponding increase in consumption income. There would be no cumulative adverse impact.

4.2.11 Transportation

4.2.11.1 Environmental Effects

Roadways - Off installation network

The construction of new and refurbished facilities associated with the IFX ground-test program at RSA would result in an average of 433 construction related employees accessing the installation for two three-year periods (2002-2004 and 2007-2009). For approximately six months in each of these periods, a maximum of 600 construction employees would access the installation. This would result in 1,254 daily auto trips to RSA, as well as 100 heavy truck trips on a peak day. There should be no capacity problems on RSA area roadways associated with this temporary traffic, due to the generally high levels of service provided on area roadways.

The operation of the IFX ground-test program, assumed to be fully operational in 2009, would result in 345 additional employees accessing RSA each day. This would result in an additional 921 daily auto trips, and an average of 17 heavy truck trips each day. The traffic is distributed between the various gates, but major roadways that would carry IFX traffic into RSA include Memorial Parkway and Redstone Road. Memorial Parkway is estimated to operate at LOS C conditions, and could operate at higher levels of service if the overpasses at Whitesburg Drive and Weatherly Road are completed. Redstone Road is projected to operate at LOS B between Memorial Parkway and the RSA in 2009. There should be no capacity problems on RSA area roadway associated with this traffic, due to the generally high levels of service provided on area roadways.

Roadways – On-installation network

RSA has an excellent network of roads that carry traffic around the installation and provide access to the gates. Roads that will carry the greatest share of IFX traffic include Rideout Road with 370 vehicles per day (VPD), Dodd Road (312 VPD), Buxton Road (406 VPD), Patton Road (406 VPD), Redstone Road (306 VPD), and Martin Road (150 VPD). The facilities have adequate capacity to accommodate this increased traffic.

Waterways

Barge-loading docks on RSA, as well as a supporting road system capable of handling heavy cargo, would allow direct access to deep-water transportation (National Aeronautics and Space Administration, 1997b). Barge transport of the IFX elements at the conclusion of the test program would be accommodated with minimal impacts. The distance from the proposed STF sites to the barge dock is approximately 4.8 miles. If cargo height exceeds the bridge clearance for the Tenn-Tom Waterway, the Tennessee-Ohio-Mississippi route would be utilized. Although this would increase the total shipping time, the rerouting is a routine procedure and would not impact waterway traffic.

Railways

Where warranted, RSA railways and roads could be used up to three times per year for conveying components for test and integration (Redstone Arsenal, 1998a). However, these facilities are only occasionally utilized, and on an as-needed basis (U.S. Department of the Air Force and National Aeronautics and Space Administration, 1993). Any increase in demand of railway facilities would necessitate upgrading and renovation. No impacts to the current, limited railway traffic levels are expected.

Airways

The Redstone Army Airfield would be used approximately three times per year for shipping and receiving IFX related components (Redstone Arsenal, 1998a). Both NASA and NASA-related and civil flights require advance permission before landing (George C.

Marshall Space Flight Center, 1996). Scheduling would help avoid transportation impacts or conflicts with day-to-day traffic levels. No modifications would be needed, as the airfield is currently maintained and operational (Redstone Arsenal, 1998a). Huntsville International Airport would also be available.

No modification to or new construction for the existing transportation network would be required or anticipated for the project, and all modes of transportation at Redstone/MSFC are currently maintained and operational (Redstone Arsenal, 1998a). Any impacts to air traffic levels would be negligible.

4.2.11.2 Cumulative Impacts

At MSFC, the Engine Technology Support Program for NASA's Advanced Space Transportation Program is a project that is planned in the near future. This will result in approximately 29 additional truckloads of propellants arriving at MSFC each week, or approximately six trucks (involving 12 truck trips) on an average day. While this would increase the traffic impacts slightly when added to the traffic generation of the IFX ground-test program, the cumulative impacts would not adversely affect traffic flow.

At RSA, there are no new programs or changes in personnel proposed. However, the Real Property Master Plan Land Use Analysis (Redstone Arsenal, 1999c) identified numerous construction and demolition projects that would result in a net increase of 64,000 square feet of facilities added on an annual basis over the next twelve years. It is assumed that approximately 23 acres of land would be involved with this activity each year. While these changes will add a few construction related employee and truck trips during the construction activity, the impacts during the construction/demolition phase should not effect the level of service on area roadways. The overall increase in facilities is not expected to result in a change of personnel during the operation phase, and therefore, no cumulative adverse effect on traffic conditions would occur as a result of this project.

4.2.12 Utilities

4.2.12.1 Environmental Effects

Water Supply

Under the IFX ground-test program, construction personnel requirements for both the PTF and AI&TF would average approximately 600 for the first 6 months and 400 for the remaining 30 months of construction. Using the baseline per capita water demand for the base of 50 gallons per day, personnel associated with construction activities would create a water demand of approximately 30,000 gallons per day for the first six months and 20,000 gallons per day during the final 30 months of construction for both projects. Since construction activities associated with the PTF and AI&TF would not overlap, the first 6 months of construction for each project would create the largest demand of potable water, representing a less than 1 percent increase over current water consumption rates, less than 1 percent of the water system capacity.

Fugitive dust is anticipated to be emitted during preparation of a construction site as a result of ground disturbance (groundbreaking, drilling, etc.) as well as dirt and aggregate spreading or loading from cut and fill activities. Up to an estimated 3,500 gallons per day of water per acre would be required to control fugitive dust during the facility construction. Assuming that up to one acre would require dust control on a given day, 3,500 gallons of water would be required per day of construction, water consumption would increase less than 1 percent over baseline conditions, representing less than 1 percent of the water supply system capacity. Combined with the water consumption of construction personnel, the overall water consumption during the first six months of construction would increase water demand by 33,500 gallons per day, representing 0.4 percent of the water system capacity, 0.8 percent of the unused system capacity, and an increase of 0.7 percent over baseline conditions. Increases in water consumption during the construction phase would be temporary.

In order to provide water to the proposed PTF (currently Bunker 8339), a water pipeline would be installed, extending from a connection at the intersection of Buxton and McAlpine Roads, following McAlpine Road south, then west on Blueberry Road. No other water line extensions or additions are anticipated to support the STF.

During the operational phase of the IFX ground-test program there would be a maximum of 345 personnel associated with the STF. Using base per capita water usage rates, the increased personnel on base would consume 17,250 gallons per day of water. This represents approximately 0.4 percent of the current water usage, 0.2 percent of the water system capacity, and 0.4 percent of the unused water system capacity.

The steam generators and condensers used in the PTC during LPE and ITU testing would require the use of industrial potable water. Approximately 26,417 gallons for steam generation and 132,086 gallons for the PRS condensers are needed for each firing of the laser. In order to meet the large water demands during the short duration estimated for each laser firing, water would be taken from the 1.7 million-gallon water storage reservoir at RSA. While both the LPE and ITU will be tested, the LPE test schedule, with 22 test firings in one year, is used to gain a conservative estimate of industrial water consumption. Assuming that water is flushed and refilled from the condensers twice in one year, operation of the PTC would require 563,338 gallons of water annually. This represents a less than 1 percent increase over current base non-potable water usage. On the occasion when steam and refilling of condensers would occur within the same 24-hour period, approximately 7.2 percent of the base water reservoir would be consumed.

Wastewater

As previously discussed construction personnel requirements for both the PTF and AI&TF would average approximately 600 for the first 6 months and 400 for the remaining 24 months of construction. Using the baseline per capita wastewater generation rate of 30 gallons per capita per 8-hour shift per day, STF construction personnel would increase wastewater generation by 18,000 gallons per day during the first six months and 12,000 gallons per day during the final 30 months of construction. The 6-month and 30-month construction phases would represent 0.3 and 0.2 percent of the current base wastewater generation, 0.2 and 0.1 percent of the wastewater system capacity, and 6 and 4 percent of the unused wastewater system capacity, respectively.

In order to provide wastewater service to the proposed PTF, it is necessary to install a wastewater pipeline extension. The pipeline would extend from a connection at the intersection of Buxton and McAlpine Roads, follow McAlpine Road south, then turn west on Blueberry Road to proposed PTF Building (currently Bunker 8339). The utility extension would not impact the base wastewater generation rates or system capacity. No other wastewater line extensions or additions are anticipated to support the STF.

During the operational phase of the IFX ground-test program, a maximum of 345 personnel would be associated with the STF. As with the construction personnel, it is assumed that wastewater generation rates would remain consistent with the average baseline generation of 30 gallons per capita per 8-hour shift. Therefore, wastewater generation would increase by 10,350 gallons per day, the equivalent of 0.2 percent over baseline conditions, 0.1 percent of the system capacity, and 3.5 percent of the unused system capacity.

It is anticipated that wastewater generated that is not exhausted as steam from the PTC during testing would be treated on-site and disposed to the wastewater system. Therefore no impact to the current base industrial wastewater system is anticipated.

Solid Waste

The waste generated during the construction phase of the project would consist of building materials such as solid pieces of concrete, metals (conduit, piping, wiring), and lumber. It is assumed that 4 lbs of waste debris would be generated per square foot of building area during construction and 7 lbs per square foot for renovation (Butler, 1995). Approximately 56,700 square feet of construction and a maximum of 71,000 square feet of renovation would be required, generating approximately 723,800 lbs of waste. This waste would represent 0.1 percent increase over the baseline waste construction and demolition disposal rate for RSA. Increases in solid waste generation would be temporary, with construction activities expected to be complete by FY 2010.

The maximum staff allocation for the proposed project would be 345 people, consisting of both full-time and part-time personnel. Assuming a daily waste generation rate of 3.0 lbs per person, approximately 1,035 lbs of solid waste would be generated per day. As stated in Section 3, the landfill receives an annual average of 9,600 tons of waste. Therefore, under the IFX ground-test program, the daily load of the landfill would increase by 119 tons per year, or 1.2 percent over current conditions.

Energy

A powerline and natural gas pipeline extensions would be installed to service the PTF. The natural gas pipeline would extend from a connection at the intersection of Pershing and Buxton Roads, following McAlpine Road south, then west on Blueberry Road to proposed PTF Building (currently Bunker 8339). The powerlines would extend cross-country from an unnamed driveway to the north of Building 8876, to Bayberry Road, then would follow existing roads to the proposed PTF.

As discussed in Section 3.2.12.3, the baseline energy usage is 248,710 MMBtu per day. The 24-hour energy usage of the STF facilities is estimated to consume 180,000 Btu per square foot of building area. Using this assumption, 56,700 square feet of additional building areas at RSA and MSFC would increase the base energy consumption by 10,206 MMBtu per year, or 0.01 percent, representing less than 1 percent of the combined electrical and natural gas system capacities and less than 1 percent of the unused system capacity.

4.2.12.2 Cumulative Impacts

Water Supply and Wastewater

No new programs, effects from past activities, or changes in personnel are anticipated which would increase personnel levels. Since water consumption and wastewater generation is dependent upon personnel changes, there would be no cumulative effects on the water and wastewater systems.

Solid Waste

The military construction program for RSA includes construction projects that would overlap with the IFX ground-test program and use additional land at the post not already occupied by facilities. The current Real Property Master Plan Land Use Analysis (Redstone Arsenal, 1999c) identified numerous construction and demolition projects that would overlap the timeframe for construction of the IFX facility. Based on an analysis of the construction projects, approximately 161,000 square feet of facilities would be added annually, on average, balanced against 97,000 square feet of demolition annually, for a net annual addition of 64,000 square feet over the next twelve years.

As described earlier, it is assumed that 4 lbs of waste debris would be generated per square foot of building area during construction. For demolition, it is estimated that 92 lbs of waste debris would be generated per square foot of building demolished (U.S. Army Corps of Engineers, 1976). Assuming there are 230 construction workdays within a year, a total of 4,784 tons of cumulative construction and demolition waste would be generated per year, representing a 1.8 percent increase over baseline conditions.

In combination with the IFX ground-test program, construction and demolition waste would increase by 5,146 tons, or 2 percent. Cumulative increases in solid waste due to operations are not anticipated, as no increases in the base population are projected beyond personnel associated with the IFX ground-test program.

Energy

The military construction program for RSA includes construction projects that would overlap with the IFX ground-test program and use additional land at the post not already occupied by facilities. The current Real Property Master Plan Land Use Analysis (Redstone Arsenal, 1999c) identified numerous construction and demolition projects that would overlap the timeframe for construction of the IFX facility. Based on an analysis of the construction projects, approximately 161,000 square feet of facilities would be added annually, on average, balanced against 97,000 square feet of demolition annually, for a net annual addition of 64,000 square feet over the next twelve years.

In order to obtain a conservative estimate, it is assumed that net annual building space added to Redstone annually consists of facilities operating 24-hours a day. Under this assumption, the energy consumption is estimated at 180,000 Btu per square foot of building area, yielding an annual energy consumption of 11,520 MMBtu. Therefore, the construction and demolition projects outlined in the base master plan would increase energy usage by less than 1 percent of the baseline energy usage and the base energy capacity per year. Combined with the IFX ground-test program, the base energy usage would increase by 21,726 MMBtu, or 0.02 percent of baseline conditions, representing less than one percent of the base energy system capacity.

4.2.13 Water Resources

4.2.13.1 Environmental Effects

Construction

Construction-related impacts to water resources could occur due to sedimentation from erosion, and petroleum and hazardous materials usage in association with construction equipment. Potential impacts associated with erosion and sedimentation include a reduction of basin or channel volumes and reduced availability of dissolved oxygen within receiving waters.

Construction of the PTF at RSA and MSFC would result in the disturbance of more than 5 acres of land and, therefore, would be subject to Phase I NPDES construction permit requirements. The AI&TF may be subject to the Phase II permit requirements that would be applicable by FY 2003 if more than one acre of land would be disturbed. The Phase II requirements are anticipated to be similar to the Phase I requirements. For either Phase I or II, a NOI would be filed for coverage under the applicable general permit, and construction activities would follow guidelines of the SWPPP that would be developed as required by the permit. The SWPPP would include provisions to minimize erosion and assure that petroleum and hazardous materials were stored and used to minimize contamination of surface waters. Storm water would necessitate a retention pond, with water treatment carried out per applicable local regulations. Onsite demolition would require additional consideration to account for the possibility of special treatment requirements for existing materials, such as lead-based paint or asbestos. Compliance with the SWPPP would minimize soil erosion and pollutant discharges during construction.

Operation

Potential impacts to surface and ground water quality resulting from IFX operations could result from the deposition of airborne emissions generated during laser operations, the accidental release of hazardous materials, and the discharge of wastewater effluents. Hydrogen fluoride would be the primary pollutant generated during operational tests of the laser. Up to approximately 0.0096 pounds of HF would be released to the atmosphere from each test. Upon discharge to the atmosphere, hydrogen fluoride disperses rapidly due to the relatively low weight and size of hydrogen fluoride particles. However, under limited atmospheric conditions when the relative humidity is greater than 90 percent and ambient air temperatures are less than 50°F, the deposition of small quantities of hydrogen fluoride onto the nearby ground and water surfaces may occur (U.S. Army Space and Missile Defense Command, 1998). Depending on the buffering capacity of the receiving water, the deposition of small amounts of hydrogen fluoride may result in a temporary increase in surface water acidity. Under most conditions, the deposition of small amounts of hydrogen fluoride into surface waters would be quickly neutralized by the buffering capacity (alkalinity) of the receiving waters and would not be considered harmful (Agency for Toxic Substances and Disease Registry, July 1998).

Surface waters near RSA and MSFC are slightly acidic to alkaline. Average pH levels range from a low of 6.9 along portions of McDonald Creek to a high of nearly 7.4 along Indian Creek (U.S. Army Aviation and Missile Command, 1994). Due to the natural buffering capacity of nearby surface waters, the deposition of small amounts of hydrogen fluoride are anticipated to result in only minor and temporary decreases in water pH. Small amounts of hydrogen fluoride deposited on water surfaces would quickly dissipate due to surface water mixing and the natural buffering capacity of the surface waters.

All activities conducted on the project site would be required to comply with the SPCC and contingency plans to be developed and implemented as part of this project. Compliance with these plans would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater resources.

Operations at RSA and MSFC would be required to comply with NPDES industrial permit requirements. Treated storm water is currently discharged to local water courses in compliance with a NPDES industrial permit administered by the ADEM. Any change in design, construction, operation, or maintenance of facilities that results in an increase of pollutant discharge to State waters would require application for a NPDES permit (or amendment of an existing applicable permit) and potential revisions to the SWPPP. Proposed activities would require adding a downstream monitoring point to the existing industrial storm water permit. Compliance with NPDES requirements and the SWPPP would minimize pollutant discharges during project operations.

At RSA and MSFC, the construction of the STF complex would increase the impervious cover by up to 13.1 acres, resulting in a slight increase in runoff during storm events. RSA and MSFC contain approximately 37,910 acres. Therefore, approximately 0.03 percent of the area would become impervious cover, causing a slight increase in runoff that would not be measurable. If detailed design of the STF complex sites indicated that the additional runoff would cause localized problems, a detention pond would be incorporated into the site layout to assure that runoff would not increase.

EO 11988 directs federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains. Areas proposed for IFX ground-test activities are located within previously constructed areas that are currently elevated above the 100-year floodplain.

4.2.13.2 Cumulative Impacts

At MSFC, construction of the AI&TF would add less than 0.5 acres of impervious cover. The cumulative action at MSFC, Engine Technology Support for NASA's Advanced Space Transportation Program, would not add impervious cover. Therefore, there would not be cumulative adverse water quality impacts.

At RSA, approximately 23 net acres of undeveloped land would be used for new facility construction annually for cumulative actions. Therefore, over the twelve-year life of the IFX ground-test program at RSA, approximately 276 acres would be converted to developed usage. As necessary, detention ponds would be incorporated into site layouts to assure that no adverse cumulative impacts occurred.

4.2.14 Environmental Justice

4.2.14.1 Environmental Effects

EO 12898 requires that federal agencies identify and address disproportionately high and adverse environmental effects (including human, health, and economic and social effects) of its programs, policies, and activities on minority and low-income populations. An environmental justice impact would be a long-term health, environmental, cultural, or economic effect that has a disproportionately high and adverse effect on a nearby minority or low-income population, rather than all nearby residents. The potential for a disproportionately high and adverse effect could occur under either of two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in the county, the region of comparison, or (2) the percentage of low-income or minority population in the census area exceeds 50 percent.

Construction and operation of the IFX at RSA would not disproportionately affect any minority or low-income populations. The potential environmental or human health impacts noted above would be contained within the RSA boundary and would not impact any populated areas. Transport of materials would occur along major roads and not through neighborhoods. No Native American or traditional cultural resources would be impacted from IFX construction and operation.

4.2.14.2 Cumulative Impacts

At MSFC, the Engine Technology Support Program for NASA's Advanced Space Transportation Program is a project that is planned in the near future. This project would occur on the post, and no adverse impacts to environmental justice populations would occur.

At RSA, there are no new programs or changes in personnel proposed. However, the Real Property Master Plan Land Use Analysis (Redstone Arsenal, 1999c) identified numerous construction and demolition projects that would result in a net increase of 64,000 square feet of facilities added on an annual basis. It is assumed that approximately 23 acres of land would be involved with this activity each year. As the projects would occur on the installation, there should be no adverse cumulative impacts relative to environmental justice.

4.3 CAPE CANAVERAL AFS

4.3.1 Air Quality

As indicated in Section 3, the region is in attainment and the General Conformity Rule under the Clean Air Act is not applicable.

4.3.1.1 Environmental Effects

Construction

Estimated pollutant emissions from proposed construction activities are calculated using the same criteria, methodologies, and emissions factors as described for construction in Section 4.1.1.1. Annual construction emissions resulting from the construction of the proposed STF facilities at CCAFS are presented in Table 4.3-1. Estimated pollutant emissions are based on the proposed site areas, the duration of each project, and the specified building square footage for new construction, renovations, and demolition.

Table 4.3-1 Proposed Construction Emissions Within AQCR 7 at Cape Canaveral AFS

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	NO_X (tpy)	SO_X (tpy)	PM_{10} (tpy)	Pb (tpy)
AQCR 48 Emission Totals[a]	3,470	1,908	29,055	51,402	2,715	5.3
Proposed Annual Emissions[b]						
Performance Test Facility	0.43	0.07	0.93	0.10	2.27	0.00
Remote Control Facility	0.01	0.00	0.03	0.00	0.00	0.00
Reactant Storage Facility	0.02	0.00	0.05	0.01	0.00	0.00
Assembly, Integration & Test Facility	0.16	0.03	0.36	0.04	1.13	0.00
Engineering & Administration Facility	0.05	0.01	0.12	0.01	0.01	0.00
Utility Improvements	0.00	0.00	0.00	0.00	0.01	0.00
Road Improvements	0.38	0.02	0.06	0.01	0.08	0.00
Total Construction Emissions (tpy)	1.06	0.13	1.55	0.17	3.50	0.00
Percent Change in AQCR 48 (%)	**0.03**	**0.01**	**0.01**	**0.00**	**0.13**	**0.00**

a Summarized from the USEPA's AIRSData Source Count Inventory Report (USEPA, 2000).
b Estimated emissions based on building square footage, site areas, and project durations.
tpy tons per year.

Analysis of the data presented in Table 4.3-1 indicates that the overall ambient air quality within the Central Florida Intrastate AQCR 48 would be slightly affected by the construction of the proposed STF facilities at CCAFS. Increased emissions from construction activities would produce slightly elevated air pollutant concentrations. However, the increases would be minimal (not exceeding a 0.13 percent increase for any criteria pollutant) when compared to baseline AQCR 48 emissions. The effects would be temporary, fall off rapidly with distance from the proposed construction site, and would not result in any long-term impacts.

Operation

Estimated pollutant emissions from the proposed increased vehicle and emergency generator operations and the release of hydrogen fluoride during laser testing at CCAFS are calculated using the same assumptions, methodologies, and emissions factors described in Section 4.1.1.1. Annual emissions resulting from the proposed operation of the STF facilities at CCAFS are presented in Table 4.3-2.

Table 4.3-2 Proposed Operational Emissions Within AQCR 48 at Cape Canaveral AFS

Criteria Air Pollutant	CO (tpy)	VOC (tpy)	NO_x (tpy)	SO_x (tpy)	PM10 (tpy)	Pb (tpy)	HF (tpy)
AQCR 48 Emission Totals[a]	3,470	1,908	29,055	51,402	2,715	5.3	NA
Proposed Annual Emissions							
Emergency Generators	0.06	0.02	0.84	0.02	0.05	0.00	0.00
Personal Vehicle Emissions	27.05	2.20	3.57	0.00	0.00	0.00	0.00
Laser Testing	0.00	0.00	0.00	0.00	0.00	0.00	<0.1
Total Operational Emissions (tpy)	27.11	2.22	4.41	0.02	0.05	0.00	<0.1
Percent Change in AQCR 48 (%)	**0.78**	**0.12**	**0.015**	**0.00**	**0.00**	**0.00**	**0.00**

a Summarized from the USEPA's AIRSData Source Count Inventory Report (USEPA, 2000).
tpy tons per year.
NA Not available

Analysis of the data presented in Table 4.3-2 indicates that the overall ambient air quality within the Central Florida Intrastate AQCR 48 would only be slightly affected by the operation of the proposed STF facilities at CCAFS. Increased emissions from increased vehicle and emergency generator operations would produce slightly elevated air pollutant concentrations. However, the increases would be minimal (not exceeding a 0.78 percent increase for any criteria pollutant) when compared to baseline AQCR 48 emissions. The AQCR is in attainment, and a conformity determination under the Clean Air Act is not required.

As discussed in detail in Section 4.1.1 and Appendix A, operational releases of hydrogen fluoride would not be expected to cause exceedances of health-based standards beyond the laser safety zone. Operational releases of hydrogen fluoride would be subject to the employment of meteorological and/or procedural operational constraints to assure the protection of personnel. Management of such constraints for operations involving hazardous materials are common practices to assure the protection of personnel.

Mishap Impacts

Potential mishaps and their potential impacts at CCAFS are similar to those described in Section 4.1.1.1. The most likely accidental release would occur during fuel transfer and would be limited to a few ounces of reactant. Due to the greater potential for hazardous releases during refueling, it would only be conducted under meteorological conditions that would not result in hazardous conditions beyond the laser safety zone if a release were to occur. The least likely mishap is one involving the majority of either fluorine or nitrogen trifluoride. If this level of accidental release were to occur under proper weather conditions, it could result in hazardous conditions beyond the laser safety zone as described in Appendix A. The facility Risk Management Plan would include the proper responses to accidental releases in order to minimize its impact to the populace and the environment.

Required Actions. Permitting under the Clean Air Act and preparation of a Risk Management would be required.

4.3.1.2 Cumulative Impacts

The EELV construction is anticipated to be completed before the proposed new construction for the STF begins. Air emissions are measured by regulatory agencies on an annual basis for the region. Therefore, total construction emissions of the two programs would occur in different years and would not cumulatively create an adverse impact on regional air quality. The emissions constituents from laser tests and launch events are different with the exception of water vapor. Water vapor does not cause adverse effects on air quality. Therefore, there would be no cumulative adverse effects on regional air quality from combined operations. Emissions from each test or launch would disperse in a matter of hours. Other emissions sources such as emergency generators operate intermittently and produce minor amounts of combustive emissions.

4.3.2 Airspace

4.3.2.1 Environmental Effects

Analysis of airspace impacts from the proposed construction and alteration of facilities at CCAFS are based on the criteria established in Section 3.1.2.3, the proposed maximum height of the facilities, and the location of the proposed facilities in relation to the nearest runway. It is assumed that the maximum height of any proposed facility would not exceed 160 feet above ground level (agl), which is less than the 200 feet maximum not requiring notification to the FAA.

The proposed siting locations of the PTF complex at CCAFS would be located approximately 2.4 miles (12,800 feet) north-northwest of CCAFS Skid Strip. Based on this distance, any construction or alteration of a structure exceeding 128 feet in height would require submission of Notice of Proposed Construction or Alteration to the FAA Administrator according to the guidelines and timeline established in FAR Part 77. Since the proposed siting locations are not within the approach and departure paths to CCAFS Skid Strip, the FAA would most likely issue a notification that the proposed construction or alteration exceeds a standard of FAR Part 77, Subpart C, but would not be a hazard to air navigation. Therefore, notification to the FAA Administrator *is* required prior to construction of the proposed facilities at CCAFS, and proposed construction activities would most likely *not* result in any adverse effects to airspace.

Required Actions. Notification to the FAA Administrator of proposed construction activities is required.

4.3.2.2 Cumulative Impacts

No additional activities that would impact airspace have been identified at CCAFS. Therefore, cumulative activities would not result in adverse impacts to airspace.

4.3.3 Biological Resources

4.3.3.1 Environmental Effects

The analytical approach for determining effects on biological resources is described in the beginning of Section 4.1.3. The following sections discuss the environmental effects of the IFX ground-test program on biological resources found at CCAFS.

Construction

The proposed CCAFS alternative includes constructing the PTF at the ESA-60 site, potential use of Buildings 54445 and 54446 and existing facilities in the vicinity, converting Building 1777 to the RCF, and renovating portions of the SMAB facility (Building 70000) for the AI&TF. Vegetation at the PTF, RCF, and AI&TF complexes predominantly comprise disturbed, maintained grass areas. Only internal renovation of Building 1777 would occur; therefore, no impacts to biological resources would occur. No threatened or endangered plant species are expected to be affected by construction activities at the proposed AI&TF complex. Several state-listed gopher tortoises and active burrows and a recently constructed osprey nesting platform were observed during a June 2000 site visit at the proposed PTF complex at ESA-60. The osprey platform is adjacent to and south of the proposed PTF complex.

Installation of a natural gas line and fiber optic communication lines are required at the PTF and the RCF. The installation of the natural gas line would be collocated with the existing utility corridors. No known locations of protected species would be impacted. The fiber optic communication lines would be installed in existing conduit; therefore, no impacts to protected species would occur.

The state listing provides protection for the gopher tortoise and its habitat when developing a site within a gopher tortoise habitat. Precautions must be taken for the protection and preservation of those species and several listed commensal species. The Environmental Support Contractor has obtained a permit for the removal or relocation of gopher tortoises per FAC 39-25.002 following the official Florida Fish and Wildlife Conservation Commission (FWC) methodology. Any tortoises located in areas that may be affected by construction or other activities must relocated out of the area in accordance with the permit. Any relocation of tortoises would occur in compliance with the provisions of this permit.

The osprey is federally protected by the Migratory Bird Treaty Act (16 USC 703-712). Potential impacts (e.g., nesting impacts, nest relocation issues) would be coordinated with the Nongame Wildlife Section of the FWC. However, no impacts to the osprey are anticipated.

Any vegetation impacts associated with clearing areas that could be potentially used by Florida scrub jays would be in compliance with the CCAFS Integrated Natural Resources Management Plan. Affected scrub vegetation would be compensated at a 4:1 ratio. However, no clearing of vegetation is anticipated. Construction at areas adjacent to scrub jay habitat would occur during those months when nesting would not be occurring (March 1 through June 30).

The proposed AI&TF site (SMAB facility) is constructed on artificial spoil material (fill) on the Banana River and is surrounded by water. No wetlands are within the complex boundaries or directly adjacent to the proposed complex. Although wetlands are located in the vicinity of the construction area, they would be avoided, and construction would not result in the loss or disturbance of any wetlands. Therefore, no wetlands impacts would occur with the renovation of the AI&TF complex within the SMAB facility. No wetlands are located within, or directly adjacent to the proposed PTF and RCF complexes; therefore, no impacts to wetlands would occur.

No construction would occur in sea turtle nesting habitat. Lighting would be kept to the absolute minimum required and would comply with the 45 SW Policy on Exterior Lighting to minimize impacts to sea turtle hatchlings and adults.

The effect of construction noise on biological resources is discussed in the noise section of this EA, Section 4.1.9 and 4.3.9.

No impacts to the Canaveral National Seashore or critical manatee habitat are anticipated as a result of construction activities. Since no aquatic habitats are located within or directly adjacent to the proposed STF complex locations, no impacts to Essential Fish Habitats (as amended in the MSFCMA) are anticipated as a result of construction activities.

The USFWS and the National Marine Fisheries Service have reviewed the EA and concurred with the conclusion that there would be no adverse effects.

Operation

The effects of operational noise on biological resources is discussed in the noise section of this EA, Section 4.3.9.

The component of the exhaust that is of concern to biological resources is the hydrogen fluoride. A detailed discussion of the anticipated effects of hydrogen fluoride is contained in Section 4.1.3 relative to SSC and would be generally applicable at CCAFS.

Impacts of lighting on nesting female sea turtles and their hatchlings are discussed under Construction.

During operation, IFX elements would be transported to and from CCAFS. The existing barge system would be used for this purpose. No modifications to the existing barge system would be required. No adverse impacts on any aquatic systems would result from use of the existing barge system, and no dredging would be required to use the barges.

4.3.3.2 Cumulative Impacts

The addition of multiple laser performance tests per year to the current CCAFS project schedule has the potential to result in cumulative impacts to wildlife in the area from elevated noise levels and toxic emissions. However, according to KSC, studies of wildlife impacts have not identified any productivity limiting response to launch noise, and observation has shown that response to high noise levels is short-term and has not caused important adverse impacts (National Aeronautics and Space Administration, 1992). The total number of annual projected launch events is substantially less than past years. The USFWS has reviewed the IFX ground-test program in the context of the CCAFS mission, and concluded that there would be no adverse effects from implementation.

4.3.4 Cultural Resources

4.3.4.1 Environmental Effects

Prehistoric and Historic Archaeological Resources

There are no National Register-listed or -eligible archaeological sites within either the direct ground disturbance areas for STF complexes. As a result, no effects on historic properties are expected to occur.

However, because archaeological sites and artifacts are known to occur within the boundary of the installation, there is some potential for cultural materials to be unexpectedly discovered during the course of project activities. In the event this should occur, all activities would halt in the immediate area and the Florida SHPO would be consulted through the Patrick AFB Environmental Office. Subsequent actions would follow guidance provided in 36 CFR 800.11 and/or in NAGPRA.

Historic Buildings and Structures

Several historic buildings and properties have been identified on CCAFS. Based on CCAFS cultural resource records and interviews with base personnel, no historic buildings or structures are located at the proposed STF, RCF, or AI&TF complexes. The proposed AI&TF complex (SMAB complex), RCF complex (Building 1777), and the STF complex (ESA-60 complex) or their associated structures have not been specifically evaluated for eligibility for inclusion in the National Register.

Native Populations/Traditional Resources

There are no known traditional cultural properties within the direct ground disturbance areas for the proposed STF complexes. As a result, no effects on historic properties are expected to occur.

4.3.4.2 Cumulative Impacts

The only reasonably foreseeable future program identified for the CCAFS area is the EELV program. The EELV program does not overlap with the facilities or areas used for the IFX ground-test program; therefore, no cumulative impacts are expected to occur. The IFX ground-test program would occur in areas that have been previously disturbed by past activities, and where no known cultural resources exist. Therefore, there would be no cumulative adverse impacts to cultural resources.

4.3.5 Geology and Soils

4.3.5.1 Environmental Effects

Construction

Construction activities typically involve the removal of vegetation, cut-and-fill operations, and grading for site preparation and access. Depending on the specific geologic conditions at the proposed STF sites, ground disturbing construction activities could result in a potential for ground instability including temporary and localized occurrences of wind and water erosion. No unique geologic features that could be affected by project construction are known to exist at the project site.

As discussed in Section 4.3.13, site preparation activities at CCAFS would be subject to Phase I and II NPDES construction permit requirements. These requirements call for implementation of an SWPPP, which would identify the Best Management Practices to be implemented both during and following construction activities for the purpose of preventing soil erosion and controlling pollutant discharges into waterways during storm events. Best Management Practices often include the construction of berms, swales, and runoff diversion ditches, hydroseeding, and the use of silt fences or separators. With implementation of the SWPPP and Best Management Practices, the erosion of soil resulting from project construction would be minor and short-term in nature. Additionally, pollutant discharge would not be expected.

Operation

Because emission residuals would be treated to reduce hydrogen fluoride concentration, the deposition of hydrogen fluoride on nearby soils would be minimal. Soils in the area of PTF operations are generally slightly acidic to alkaline (average pH levels range from approximately 6.6 to 8.4) and exhibit moderate to high levels of permeability (Iowa State University Statistical Laboratory, 1998). Due to the natural buffering capacity of the soils, the deposition of small amounts of hydrogen fluoride would result in only minor and temporary decreases in soil pH. Because hydrogen fluoride deposition on soil surfaces would occur primarily during periods of high humidity and because hydrogen fluoride is highly soluble in water, small amounts of hydrogen fluoride residuals would be quickly diluted and buffered by rainfall. PTF operations are not expected to result in long-term changes in the chemical composition or physical characteristics of soils located within the project's ROI. However, temporary increases in soil acidity may result in short-term impacts to vegetation and soil-dwelling microorganisms.

Because CCAFS is located in a low seismic risk area, the potential occurrence of liquefaction, seismic settlement, or ground rupture at the project sites is considered minimal. In addition, soil at the PTF site exhibits low to moderate shrink/swell susceptibility.

4.3.5.2 Cumulative Impacts

Temporary, minor impacts to geology and soils, when combined with other past, current, and foreseeable future activities, would not result in cumulative adverse impacts. The incorporation of required Best Management Practices during construction activities would minimize impacts.

4.3.6 Hazardous Materials and Hazardous Waste Management

The primary hazardous materials and the hazardous wastes associated with IFX operation and maintenance are listed in Table 2-5.

4.3.6.1 Environmental Effects

Construction

Construction and internal renovation of proposed STF buildings would utilize small amounts of hazardous materials and generate hazardous wastes. Hazardous materials utilized during construction may include paints, oils, and solvents. Usage of materials is anticipated to be minimal and consistent with typical construction activity. These materials would be handled and stored in accordance with CCAFS and federal regulations.

Asbestos-Containing Material (ACM), Lead-Based Paint, and PCBs. Demolition/renovation of structures with ACM has a potential for releasing asbestos fibers into the air. Asbestos fibers could be released due to disturbance or damage of various building materials such as pipe and boiler insulation, acoustical ceilings, sprayed-on fireproofing, and other material used for soundproofing or insulation. Testing for ACM is necessary if the absence of asbestos cannot be verified. Similarly, suspected lead-based paints and PCBs encountered during any demolition would require testing and special handling. Paints that exceed the limits for lead must be removed in accordance with the applicable health and safety standards and disposed of as hazardous waste. PCB-contaminated equipment must be either retrofilled (PCB equipment containing greater than 499 ppm will not be retrofilled) with non-PCB dielectric fluid and the PCB-contaminated fluid disposed of as PCB waste, or the entire piece of equipment must be disposed of as PCB waste. Depending on the concentrations, typical PCB waste disposal may be by incineration or landfilling in a specially permitted facility. PCB removal and retrofill would be coordinated through the ESC office.

ESA-60 facilities have been determined to have ACM as discussed in Section 3. All renovation work in these facilities shall be performed by a licensed asbestos abatement contractor, in accordance with state and federal regulations. All removed asbestos shall be disposed at an appropriately permitted landfill.

Environmental Restoration. The PTF would be constructed in the vacant area in the center of the ESA-60 facilities. Although ESA-60 is not considered an IRP site, due to the reported presence of hydrazine and oxidizer USTs at Facility 54445 in the ESA-60 complex, the potential exists for encountering soil contamination during site grading and excavation activities. If dewatering is required to construct building footers and foundations, groundwater contamination may also be encountered during the dewatering process. The uncertainty regarding the potential exposure of site contaminants can be reduced by collecting soil and groundwater samples within the construction area and at potential site source areas such as in the vicinity of the USTs and the facility septic tank. If contamination is found, site soils and removed groundwater would require treatment and disposal during construction activities.

Soil surrounding an electrical transformer-mounting pad at ESA-60 has been identified to contain PCB in excess of the Soil Cleanup Target Levels (SCTL). One sample taken on 10 April 2000 was reported to contain 700 ppm of PCB oil. This transformer was identified to be free of oil containing PCBs since November 24, 1997 (CHS, 2000). It is believed that the identified PCB contaminated soil is the result of an old spill, before the electrical transformer was retrofilled. As part of recent soil sampling activities, the soil contamination at ESA-60 will be removed before the STF complex is constructed/renovated. In compliance with comments from FDEP, the soil at this site will be cleaned to the current Industrial PCB Soil Cleanup Target Level of 2.1mg/kg and a Land Use Control Plan will be completed.

IRP site FT-17 (Fire Training Area #2), is located approximately 1,500 feet south of ESA-60. This site has undergone interim remedial actions that have reduced both source area soil and free product contamination, and have also reduced groundwater concentrations of volatile organic compounds. Groundwater flow at site FT-17 is to the southwest towards a drainage canal that connects with the Banana River (Draft Statement of Basis-USAF, 1999). Since the ESA-60 site is not located downgradient of the IRP site, and the fact that groundwater contaminant concentrations at FT-17 have been reduced sufficiently for long-term monitoring, it is unlikely that groundwater contaminants from IRP site FT-17 have migrated to the ESA-60 site.

Since there are no active IRP sites associated with or near the RCF and AI&TF proposed locations, no impacts to or from construction activities are expected.

Operation

Hazardous Materials. During the operational phase of the IFX ground-test program, hazardous reactants\chemicals would be stored in bunkers in one of the CCAFS FSAs. Bulk storage of F_2, D_2, and NF_3, chemicals needed in the PTF for laser testing, would be stored in separate bunkers to minimize the possibility of dangerous co-mingling of substances in the event of a release. Other hazardous materials required for STF operation, listed in Table 2-2, would be stored. Storage and handling areas at the RSF would consist of concrete pads with associated tanks, piping, valves, and related storage and transfer equipment to provide inert gases and reactants to the test chamber and diesel fuel and water to the PRS. Required emergency response equipment would be included at appropriate locations. Tier II EPCRA reporting may be required to support the storage and handling of hazardous materials.

Small amounts of F_2, D_2, and NF_3, as well as other chemicals/reactants would be at the PTF, in anticipation of testing. Amounts would be equivalent to what is needed for 10 test firings of the LPE. As with the RSF, hazardous materials would be stored and handled in appropriate areas.

Diesel fuel would be used at the PTF as the fuel source for generators providing the primary electrical power to the PTC and PRS during laser performance testing, as well as for the PTF steam-generating boilers. A 15,000-gallon diesel storage tank would be acquired to support the diesel fuel needs at the PTF. The storage tank would be an aboveground, vaulted tank, compliant with state and federal regulations including FAC 62-761.

Hazardous Waste. 1,511 lbs of hazardous waste would be generated per year (See Table 2-5 for a detailed list). An additional 7,913 pounds of corrosive contaminated water is generated from the Pressure Recovery System operation from the cooling water condensing the HF and DF. This contaminated water will be treated on site using sodium hydroxide to precipitate to safe compounds the HF and DF to allow discharge to the sewer. The treatment will be conducted on a batch basis after every laser test firing. Wastewater collected in the oil/water separator sump would be the only process waste stream not generated at the PTC. Based on typical operational practices, waste collected in the sump would be disposed of on a semi-annual basis, the disposal of which would not affect waste management at CCAFS. It is anticipated that items such as lead-acid batteries would be recycled, and that all other wastes would be disposed of at RCRA permitted facilities.

4.3.6.2 Cumulative Impacts

Each launch of an EELV rocket would require the use of 8,930 to 26,130 pounds of hazardous materials with the generation of 10,170 to 16,450 pounds of hazardous waste, depending on the EELV rocket type. The peak-year launch rate would be 26 in 2004. Assuming that each launch would generate an average of 13,310 pounds of hazardous waste, a total of 346,060 pounds of hazardous waste would be generated in 2004 by the EELV program. The relatively minor amounts of hazardous materials used for the IFX ground-test program and the annual 1,511 pounds of hazardous waste produced would not combine with the EELV program to create significant cumulative impacts.

4.3.7 Health and Safety

4.3.7.1 Environmental Effects

Construction Activities

Preparation for new construction would include clearance of existing vegetation, grading, and excavation for foundations. An area would be prepared for construction equipment laydown, personal vehicle parking, temporary mobile offices (trailers), maintenance facilities, and other construction needs. Concrete for foundations and footings and other construction materials would be delivered by truck in accordance with DoT and NASA regulations. Proposed construction and internal renovation of tall STF structures would present a fall hazard to workers. All construction and renovation activities would be conducted in accordance with OSHA and NASA requirements for health and safety to control exposure to occupational safety and health hazards.

Operations

Under the IFX ground-test program, bulk storage of hazardous chemicals would occur at the RSF, with smaller amounts of hazardous materials stored at the PTF. In Table 2-2, it is estimated that a maximum of 231 pounds of F_2 would be stored at the STF Complex at any given time. Minimum thresholds have been established for Tier One and Tier Two reporting under 40 CFR 370 (Title III, Section 312). For Extremely Hazardous Substances (EHSs) designated under Section 302 of Title III, the reporting threshold is 500 pounds or the threshold planning quantity (TPQ), whichever is lower: F_2 is classified as an EHS. For all other hazardous chemicals for which facilities are required to have or prepare an MSDS, the minimum reporting threshold is 10,000 pounds. Section 312 requires that the owner or operator of a facility to comply with Tier One and Tier Two reporting if, under regulations implementing the Occupational Safety and Health Act of 1970, the owner or operator is required to prepare or have available Material Safety Data Sheets (MSDS) for hazardous chemicals present at the facility. MSDS requirements are specified in the Occupational Safety and Health Administration (OSHA) Hazard Communication Standard, found in 29 CFR 1910.1200.

Under 40 CFR 373 (Section 313 of Title III), the owner or operator of the facility must submit a Form R report to the USEPA if the facility exceeds an applicable threshold for any of the listed chemicals. Section 313 reportable quantities at the STF Complex would be determined under the 10,000 pounds otherwise used threshold. Therefore, listed Section 313 chemicals used at the STF Complex in excess of 10,000 pounds per calendar year would require the preparation and submission of a Form R report.

Hazardous substances used in conjunction with the IFX ground-test program would be stored in three separate retrofitted munitions igloos to minimize the possibility of dangerous co-mingling of substances in the event of a release. Bunkers would also be upgraded with chemical monitors to minimize the risk of a large-scale substance release. Storage and handling areas at the RSF would consist of concrete pads with associated tanks, piping, valves, and related storage and transfer equipment to provide inert gases and reactants to the test chamber and diesel fuel and water to the PRS. Required emergency response equipment would be included at appropriate locations.

As indicated in Section 4.1.1.1, there is a potential for accidental release of toxic and corrosive gases from the tube tanks of the delivery vehicles, during transfer from the delivery vehicles to the site storage tanks, and during conveyance from the site storage tanks to the laser combustor. Hazardous materials to be used at the PTF would be shipped via truckrail from the manufacturing location in specially designed shipping containers to reduce the potential of a mishap in the event of an accident. Existing installation operating procedures and safety measures have been established to minimize the probability of a release and the potential for health and safety impacts once materials arrival at the installation. Specific STF procedures would also be established by the program.

A 0.75-mile radius safety zone would surround the PTF. The 0.75-mile radius safety zone provides for dispersion of emissions from the laser tests. Any activities within this zone must cease during testing. There are no existing facilities or activities located within this zone that would be affected, therefore potential hazards to workers at adjacent facilities is considered to be minimal (Ballistic Missile Defense Organization, 1999). No personnel shall be present in the PTC during laser testing. A vacuum shall be maintained in the test cell during laser testing, the reactants would only be released through the PRS.

At the AI&TF, support shops and laboratories consisting of machine shops, welding shops, paint shops, electrical shops, and instrument calibration and repair labs would be required. A plant protection support area would house the personnel and equipment to provide fire, medical, and security services. No laser test firing would occur at the AI&TF complex.

Facility and equipment designs would incorporate measures to minimize the potential for and impact of accidental releases. Operating procedures and training would be instituted by the program to minimize the potential for and impact of releases of hazardous materials. Appropriate emergency response plans would be established and implemented by the program to deal with potential chemical releases.

4.3.7.2 Cumulative Impacts

All work on the CCAFS alternative would be performed in accordance with applicable health and safety regulations. No injuries or illnesses are anticipated. No other activities have been identified that would have a cumulative adverse impact on health and safety.

4.3.8 Land Use And Aesthetics

4.3.8.1 Environmental Effects

Regional Land Use

The proposed project would be located in the northwest section of CCAFS just to the north of the NASA Parkway and east of the Banana River. The Banana River is an aquatic preserve in this area, and no motorized boats are permitted. Construction and operational activities would not affect adjacent offsite land uses.

On-base Land Use

The PTF would be constructed at the site of ESA-60, a former NASA complex on CCAFS. Approximately 11,400 square feet of existing facilities on the 8.9-acre site would be renovated and reused, but the main PTF (22,200 square feet) would be constructed in a vacant area in the center of the ESA-60 facilities. This area is designated Launch and Range Support on the CCAFS existing land use map, and is adjacent to another area designated Station Support Area. This land use category includes industrial, administrative, launch and range support, and outdoor recreation facilities. The 0.75 mile laser safety zone would just meet the demarcation line between the two land use categories. As long as activities do not occur within the safety zone during testing, there should be no compatibility problems. However, the safety zone also extends nearly 1.2 km (0.75 miles) into the Banana River. Prior to any operation that would result in releases to the air, 45 SW toxic modelers within Range Safety run a dispersion model. Based on the model output, security forces would be directed to ensure the area is clear of personnel. If the model indicated the plume would dissipate in the direction of the Banana River, air and boat patrols would be dispatched to assure the area was clear.

The RCF would be located in existing Building 1777 northeast of the ESA-60 complex. Test and control instruments would be installed in this existing 14,200 square foot building. This 0.1 acre site would also be located in a designated Launch and Range Support area and would be a compatible use.

The AI&TF would be located in the SMAB. The SMAB currently supports the Titan IV launch program. Reactants would be stored in one of the existing FSAs south of ESA-60. The AI&TF would use an existing 43,300 square foot building and an additional 8,000 square feet of facilities would be constructed. The site is located on a 1.2 acre parcel. It is located in a Launch and Range Support designated area. Although the nature of the AI&TF is more industrial in nature, there should be no compatibility problems.

Engineering and administration facilities would be situated in existing facilities at CCAFS. The engineering and administration facilities would use an existing 31,000 square feet of space and would be situated in compatible land use.

Coastal Zone Management

The IFX facilities do not lie within the FCMA no development zone, or within the more stringent regulations set forth by CCAFS. Therefore, construction and modification of facilities are consistent with the FCMA. All facility designs will be coordinated with 45 SW Civil Engineering to ensure adherence to siting criteria. However, the site does lie within a coastal zone and is subject to federal coastal zone consistency determination, which is administered by the FDCA. Concurrence regarding this consistency determination has been sought and will be completed before this EA is finalized.

Aesthetics

New construction would slightly alter the views surrounding CCAFS. Several of the proposed facilities would stand approximately 145 feet tall, and although different than the existing launch facilities, they would not be out of character for the area as some of the existing structures and launch complexes are similar in height, color, and shape. Views of CCAFS are all distant views and are primarily limited to marine traffic to the east and west and distant offsite beach areas and small communities to the south. Therefore, construction and operations of the proposed IFX ground-test program would result in minor effects on the area's aesthetic quality, and would not obstruct any scenic views.

4.3.8.2 Cumulative Impacts

The EELV program will convert an inactive launch facility to meet its needs. The EIS for the EELV has determined that the project is compatible with regional and CCAFS land uses. Likewise, the IFX ground-test program is compatible with regional and CCAFS land uses. Therefore, there would be no adverse cumulative effects.

4.3.9 Noise

A general discussion of noise is given in Section 4.1.9.

4.3.9.1 Environmental Effects

Construction

Noise levels within and adjacent to the project construction areas would increase during the construction period. However, construction activity would not cause long-term noise impacts since it would be short-term and normally limited to daytime hours. At a distance of approximately 50 feet, the noise from typical construction equipment falls in the range of 70 dBA to 100 dBA (with peak noise from pile drivers going as high as 110 dBA) (U.S. Environmental Protection Agency, 1971; Construction Engineering Research Laboratory, 1978). As such, under most meteorological conditions, the maximum construction noise from pile drivers would be anticipated to attenuate to 83 dBA at a radius of approximately 1,000 feet from the construction sites. Typical construction noise would be in the range of 43 dBA to 73 dBA at that distance. At the nearest installation boundary approximately 5,000 feet from the SMAB where the AI&TF would be constructed, construction noise would be in the range of 25 dBA to 55 dBA, essentially indistinguishable from background noise.

The nearest facility usage at CCAFS by other programs would occur at the SMAB at a distance of approximately 100 feet. Exterior noise levels at that distance would range from 64 dBA to 94 dBA, adversely affecting outdoor speech communication at the SMAB. Typically, a concrete block building will attenuate sound by up to 49 dBA (U.S. Department of Transportation, 1992). Therefore, although the construction noise would be audible within the SMAB, facility usage would still be feasible.

Construction noise caused by truck traffic to and from the construction sites and the use of heavy machinery and excavation equipment would temporarily disturb wildlife in the immediate vicinity during the construction period. Construction activities could disturb nesting, hatching, and fledging of land and shorebirds and other wildlife in the area. However, this would be a short-term effect as described in section 4.1.9.

Operation

While operating, the PRS would be anticipated to generate a noise level of approximately 125 dBA at a distance of 50 feet from the end of the PRS ejectors. At the edge of the 0.75-mile safety zone around the PTF from which personnel would be excluded during tests, the sound level would be approximately 83 dBA, including 4 dBA of atmospheric attenuation. This noise level is equivalent to that experienced by an individual three feet from a kitchen garbage disposal, and substantially less than such typical urban sources as gas lawn mowers at three feet and diesel trucks at 50 feet. During each laser test, the PRS would operate for a few minutes duration and cause some interference with outdoor speech communication. Based on OSHA regulations, there would be no exceedance of permissible workplace exposures.

Based on actual sound tests at another acoustic test chamber that would have similar characteristics to the IFX acoustic test chamber, the sound level at 150 feet from the test chamber would be less than 60 dBA (Ling Electronics, 1998). This level would be essentially indistinguishable from the background noise environment. The acoustic chamber would be constructed at the SMAB.

In the unlikely event that the reactants would all combine during a test at the PTF and cause a catastrophic explosion, noise levels of approximately 146 dBA (0.056 pounds per square inch overpressure) would be experienced at the edge of the 0.75-mile safety zone around the PTF (TRW Space and Electronics Group, 1999). This would exceed the OSHA workplace criteria of 140 dBA for peak impulse noise. However, this noise level would not be due to normal workplace conditions, but rather to a single abnormal event that would be unlikely to occur. No property damage such as window breakage or structural damage would be anticipated.

A detailed discussion of the anticipated effects of noise on wildlife is provided in Section 4.1.9, including several studies relative to CCAFS. Although there would be loud, episodic noise events from the PRS component of the PTF during laser performance testing, wildlife would be expected to exhibit a startle response when the PRS began to exhaust steam. Some would leave the area temporarily. However, animals in the vicinity of engine testing and other similar abrupt, loud noises adapt and do not appear to be unduly disturbed.

Noise from the PRS component of the PTF during laser performance tests would have the potential to impact wildlife within the 95 dBA and greater noise contours. Noise levels exceeding 95 dBA would occur up to a distance of 1,600 feet from the PRS. The noise from the PRS would startle wildlife and possibly drive them from the area temporarily. However, animals in the vicinity of engine testing and other similar abrupt, loud noises adapt and do not appear to be unduly disturbed by the activity (National Aeronautics and Space Administration, 1997b).

Launch-related noise from Space Shuttle and Titan launches has not had a substantial effect on wildlife on or near the launch complexes (U.S. Department of Transportation, 1996). The level of noise impacts resulting from laser performance testing is expected to be less than those associated with launch impacts due to the lower noise levels.

4.3.9.2 Cumulative Impacts

There are no EELV construction projects near IFX construction sites at CCAFS that would be sufficiently close or have overlapping construction periods that would generate cumulative noise impacts.

Noise impacts for CCAFS would include those from current programs and those expected from IFX ground-test activities. These noises are loud but intermittent, have been ongoing for years, and are not expected to create cumulative adverse impacts. The IFX ground-test activities are substantially less noisy than a typical launch event. At the edge of the 0.75-mile safety zone, noise levels are estimated to be 83 dBA during the few minutes that the PRS will be operating during tests, similar to the noise levels experienced by an individual three feet from a garbage disposal. Equivalent launch noise levels occur up to five miles from the launch pad. The laser tests and launch events would not occur at the same time, and there would not be cumulative noise levels.

4.3.10 Socioeconomics

4.3.10.1 Environmental Effects

For the purposes of this EA, the IFX ground-test program is divided into two components: the construction phase and the operational phase.

Construction

The IFX ground-test program at CCAFS would begin with construction of new and refurbishing of existing facilities. Most of the construction program would be expected to draw on local resources including labor and material. It is estimated that the total construction cost of the buildings required at CCAFS, including labor and materials, would be $203.2 million.

A minimum construction period of approximately 36 months would be required for the PTF. Construction activities are anticipated to begin by the end of FY 2002. A construction period of approximately 36 months would also be required for the AI&TF.

The AI&TF would not be required until after the ITU testing had been performed. Therefore, construction activities for the AI&TF are anticipated to begin in the middle of FY 2007.

Construction personnel requirements would average approximately 600 for the first 6 months and 400 for the remaining 30 months for the PTF. Construction personnel requirements would average approximately 600 for the first 6 months and 400 for the remaining 30 months for the AI&TF. These totals include design teams, procurement, and fabrication specialists. It is estimated that less than half of these personnel would be required at a specific time at the construction sites during construction and assembly operations.

The construction phase would generate an average of approximately 433 full-time construction jobs each year for the three years that it would require to construct the PTF (2002-2004) and another 433 full time jobs for the three years that it would require to construct the AI&TF (2007-2009). This would create an average of $13.0 million in construction wage income (in year 2000 dollars) for each of the six years of construction. This wage income would translate into annual personal consumption expenditure within the ROI of $10.2 million for each of the six years of construction. In addition, the construction program would require the purchase of raw materials and finished building products. It is estimated that these purchases would equal about $59.7 million over the construction period.

These jobs and expenditures would be substantial, yet transitory, benefits for the local economy. The result of the construction program, however, would be an operational facility that would generate recurring economic benefits.

As the construction phase would be carried out a substantial distance from inhabited areas, the construction impacts would not be expected to affect the quality of life of local residents or visitors to the region.

Operation

The operation of the IFX ground-test program at CCAFS would add 345 jobs and $21.1 million of annual household income to the local economy. This would result in $17.1 million of additional annual consumption expenditure in the region. This consumption expenditure would result in an additional 166 jobs created in the retail sector of the local economy, with over $2.5 million in additional annual wages. The expenditures from these new employees would also create a number of additional jobs in the region, adding additional consumption expenditure to the local economy and creating additional jobs. In addition, there may be additional jobs created in other sectors of the local economy due to the increased spending. Studies have shown that this “trickle down” effect of new jobs and increased spending in a local economy may result in an additional overall economic benefit to the community of up to 1.2 times the wages of the new industry or business. This could result in additional benefits to the community of up to $25 million.

The creation of these new jobs could have the potential to increase demand for new homes and local services, including health, education, and other publicly-provided facilities. If every job created by the IFX ground-test program brought with it a typical U.S. household (2.64 persons in 1997), the 345 jobs would bring a total of 911 people into the region. If all of those moving into the area came from outside of the regional economy, then the population of the region would increase by a maximum of slightly more than 0.1 percent. The current forecast increase in population between 1997 and 2005 (based on existing demographic trends) is about 95,830. The potential increase in population attributed to this action would, therefore, require an increase of the forecast by less than one percent.

Operational impacts on the quality of life would be minimal due to the relative isolation of the testing site at CCAFS and the non-invasive character of the IFX ground-test program.

4.3.10.2 Cumulative Impacts

The EELV program would convert an inactive launch facility to meet its needs. The EIS for the EELV has determined that the project will not result in an increase in employment or population in the ROI for CCAFS. However, the construction of the EELV facilities would result in a temporary increase in construction employment in the ROI, as well as an increase in expenditures for building materials. This would result in an increase in consumption income in the ROI during the EELV construction period. Construction for the IFX ground-test program would occur soon after cessation of the EELV construction, and would provide beneficial further opportunities in the area for construction workers and suppliers.

4.3.11 Transportation

4.3.11.1 Environmental Effects

Roadways - Off installation network

The construction of new and refurbished facilities associated with the IFX ground-test program at CCAFS would result in an average of 433 construction related employees accessing the installation for two three-year periods (2002-2004 and 2007-2009). For approximately six months in each of these periods, a maximum of 600 construction employees would access the installation. This would result in 1254 daily auto trips to CCAFS, as well as 100 heavy truck trips on a peak day. There should be no capacity problems on CCAFS area roadway associated with this temporary traffic, due to the generally high levels of service provided on area roadways.

The operation of the IFX ground-test program, assumed to be fully operational in 2009, will result in 345 additional employees accessing CCAFS each day. This will result in an additional 921 daily auto trips, and an average of 17 heavy truck trips each day. The facility that is projected to carry the largest share of the traffic is the NASA Causeway, with approximately 690 vehicles per day. The LOS on the NASA Causeway is expected to remain at A, however. US-1, to the south of SR 528, will accommodate less than 60 IFX trips, but is projected to operate at LOS E at its current four lane configuration, with or without the IFX related traffic. This facility is programmed for improvement to six lanes, and the improvement should be completed by 2009.

Improvements are also scheduled for I-95 and SR 528, although the facilities are projected to operate at LOS B and C with project traffic. I-95 has high level of service standards that have been set by Florida Department of Transportation to maintain the high speed carrying capabilities of the facility. There should be no capacity problems on CCAFS area roadway associated with the IFX traffic.

Transportation of hazardous material would be accomplished in accordance with DoT regulations for interstate shipment of hazardous substances (49 CFR 100-199).

Roadways – On-installation network

The roadway on CCAFS that is projected to carry the largest share of the IFX traffic is Industry Road/NASA Causeway, with 691 VPD. Phillips Parkway is projected to carry approximately 230 VPD. With the drawdown in personnel at CCAFS in recent years and the lack of any existing capacity problems, the IFX traffic would not adversely affect the on-installation roadway network.

Waterways

The distance from the proposed PTF site to the dock facilities is 7.5 miles. Access and facilities at Port Canaveral are more than adequate to meet project-related demands.

Railways

A rail spur is available approximately 1.3 miles northwest from the proposed PTF complex. Use of the spur approximately three times per year for shipping and receiving IFX-related components would result in minimal impacts.

Airways

Project-related requirements for airways would include use for shipping and receiving IFX-related components approximately three times per year. The Class B Skid Strip Airfield, augmented by facilities at Patrick AFB and (for civilian traffic) Brevard County, offers more than adequate air services for CCAFS.

4.3.11.2 Cumulative Impacts

The EELV program will convert an inactive launch facility to meet its needs. The EIS for the EELV has determined that the project would not result in additional employees at CCAFS for operation of the EELV. There would be a small amount of additional traffic associated with construction of the EELV, but it is not anticipated that the added traffic would result in a deterioration of levels of service on area roadways. The additional launches associated with the program could result in a temporary increase in traffic during launch times as people gather to view the launches. The current level of traffic is substantially reduced from prior years when higher personnel levels were present.

4.3.12 Utilities

4.3.12.1 Environmental Effects

Water Supply

Under the IFX ground-test program, construction personnel requirements for both the PTF and AI&TF would average approximately 600 for the first 6 months and 400 for the remaining 30 months of construction. Using the baseline per capita water demand for the base of 50 gallons per day, personnel associated with construction activities would create a water demand of approximately 30,000 gallons per day for the first six months and 20,000 gallons per day during the final 30 months of construction for both projects. Since construction activities associated with the PTF and AI&TF would not overlap, the first 6 months of construction for each project would create the largest demand of potable water, representing a 4 percent increase over current water consumption rates, 1 percent of the water system capacity, and 1.3 percent of the unused system capacity.

Fugitive dust is anticipated to be emitted during preparation of a construction site as a result of ground disturbance (groundbreaking, drilling, etc.) as well as dirt and aggregate spreading or loading from cut and fill activities. Up to an estimated 3,500 gallons per day of water per acre would be required to control fugitive dust during the facility construction. Assuming that up to one acre would require dust control on a given day, 3,500 gallons of water would be required per day of construction and water consumption would increase 0.5 percent over baseline conditions, representing less than 1 percent of the water supply system capacity. Combined with the water consumption due to construction personnel, the overall water consumption during the first six months of construction would increase water demand by 33,500 gallons per day, representing 1.1 percent of the water system capacity, 1.5 percent of the unused system capacity, and an increase of 4.5 percent over baseline conditions. Increases in water consumption during the construction phase of the IFX ground-test program would be temporary, with construction activities expected to be complete by FY 2010.

During the operational phase of the IFX ground-test program there would be a maximum of 345 personnel associated with the STF. Using the base per capita water consumption rate of 50 gallons per day, the increased personnel on base would consume 17,250 gallons per day. This represents approximately 2.3 percent of the current water usage, approximately 0.6 percent of the water system capacity, and 0.8 percent of the unused system capacity.

The steam generators and condensers used in the PTC during LPE and ITU testing would require the use of industrial potable water. Approximately 26,417 gallons for steam generation and 132,086 gallons for the PRS condensers is needed for each firing of the laser. In order to meet the large water demands during the short duration estimated for each laser firing, water would be taken from the ground-level water storage tanks, with a combined capacity of 5.9 million-gallon water storage reservoir at Cape Canaveral. While both the LPE and ITU will be tested, the LPE test schedule, with 22 test firings in one year, is used to gain a conservative estimate of industrial water consumption. Assuming that water is flushed and refilled from the condensers twice in one year, operation of the

PTC would require 563,338 gallons of water annually. On the occasion when steam and refilling of condensers would occur within the same 24-hour period, approximately 2 percent of the base ground-level water storage tanks would be consumed.

No water pipeline extensions or additions are anticipated to support the IFX ground-test program.

Wastewater

As previously discussed, construction personnel requirements for both the PTF and AI&TF would average approximately 600 for the first 6 months and 400 for the remaining 30 months of construction. Assuming the per capita wastewater generation rate of 30 gallons per capita per 8-hour shift per day, STF construction personnel would increase wastewater generation by 18,000 gallons per day during the first six months and 12,000 gallons per day during the final 30 months of construction. The 6-month and 30-month construction phases would represent 6 and 4 percent of the current base wastewater generation, 2.1 and 1.4 percent of the wastewater system capacity, and 3 and 2 percent of the unused system capacity, respectively.

During the operational phase of the IFX ground-test program, a maximum of 345 personnel would be associated with the STF. As with the construction personnel, it is assumed that per capita wastewater generation rates would remain consistent with the baseline rate of 30 gallons per capita per 8-hour shift per day. Therefore, under the IFX ground-test program wastewater generation would increase by 10,350 gallons per day, the equivalent of 3.5 percent over baseline conditions, 1.2 percent of the system capacity, and 2 percent of the unused system capacity.

It is anticipated that wastewater generated that is not exhausted as steam from the PTC during testing of the LPE and ITU would be classified as hazardous waste due to the corrosive nature of the water. Therefore no impact to the current base industrial wastewater system is anticipated.

No wastewater line extensions or additions are anticipated to support the IFX ground-test program.

Solid Waste

The waste generated during the construction phase of the project would consist of building materials such as solid pieces of concrete, metals (conduit, piping, wiring), and lumber. It is assumed that 4 lbs of waste debris would be generated per square foot of building area during construction and 7 lbs per square foot for renovation (Butler, 1995). Approximately 30,200 square feet for construction and a maximum of 86,200 square feet of renovation would be required, generating approximately 724,200 lbs of construction waste. This waste would represent a 1.1 percent increase over the baseline waste disposal rate. Increases in solid waste generation would be temporary, with construction activities expected to be complete by FY 2010.

The maximum staff allocation for the proposed project would be 345 people, consisting of both full-time and part-time personnel. Assuming a daily waste generation rate of 3.0 lbs per person, approximately 1,035 lbs of solid waste would be generated per day. As stated in Section 3, the landfill receives an annual average of 28,397 tons of waste. Therefore, under the IFX ground-test program, the daily load of the landfill would increase 0.4 percent over current conditions.

Energy

Approximately 9,600 feet of natural gas line would be extended along existing roads to the PTF. Figure 4.3-1 shows the location of the proposed gas line. As discussed in Section 3.3.12, the baseline energy usage is 248,710 MMBtu per day. The 24-hour energy usage of the STF facilities is estimated to consume 180,000 Btu per square foot of

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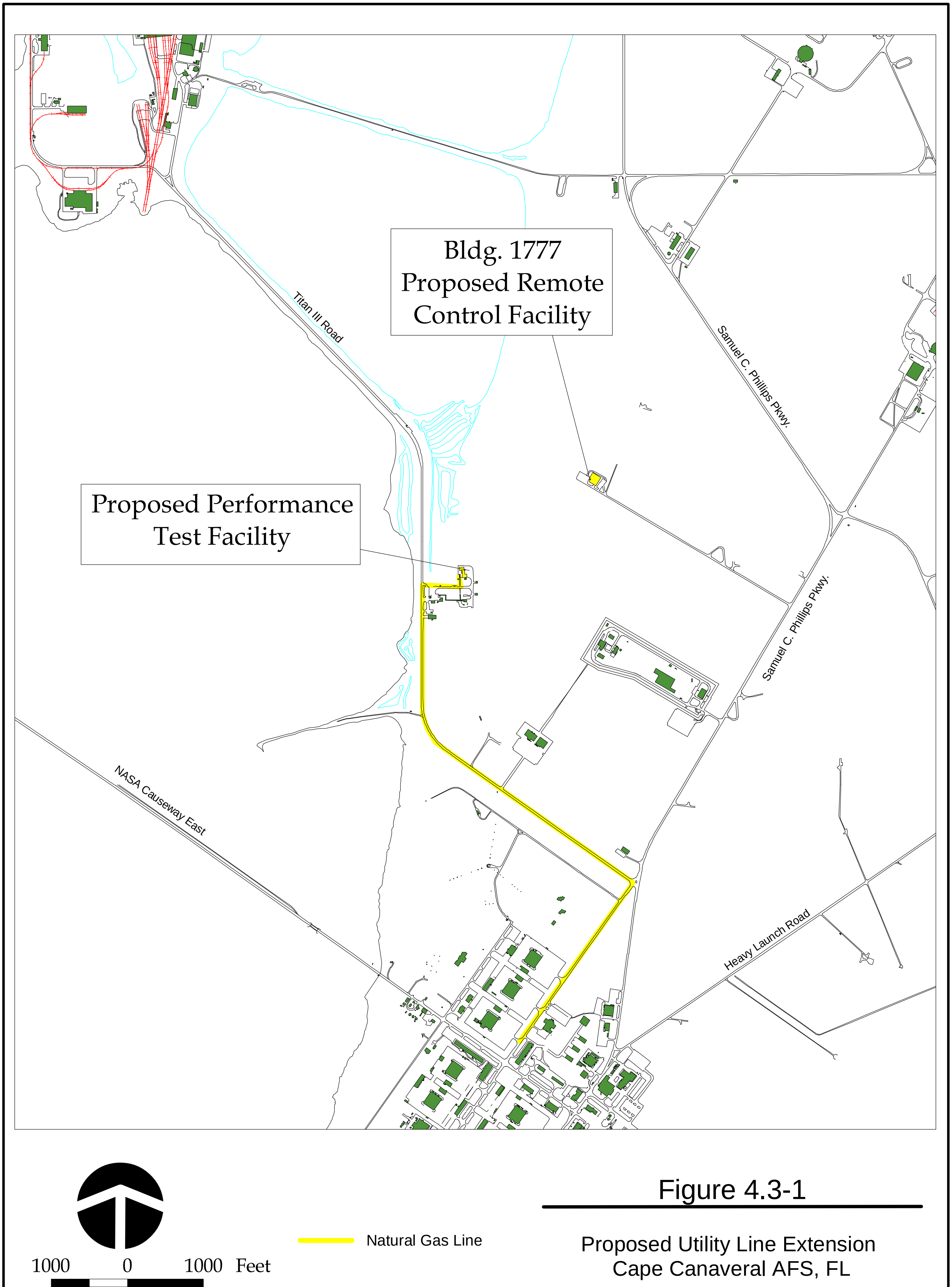

Figure 4.3-1

Proposed Utility Line Extension
Cape Canaveral AFS, FL

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building area. Using this assumption, 30,200 square feet of additional CCAFS building area would increase the base energy consumption by 5,436 MMBtu per year, or 0.5 percent, representing less than 1 percent of the combined electrical and natural gas system capacities.

4.3.12.2 Cumulative Impacts

In combination with the termination of other programs at CCAFS such as the Titan IV, overall personnel levels and facility usage are not anticipated to cumulatively change adversely with the IFX ground-test program.

4.3.13 Water Resources

4.3.13.1 Environmental Effects

Construction

Construction-related impacts to water resources could occur due to sedimentation from erosion. Potential impacts associated with erosion and sedimentation include a reduction of basin or channel volumes and reduced availability of dissolved oxygen within receiving waters.

Construction of the PTF at CCAFS would result in the disturbance of more than 5 acres of land and, therefore, would be subject to Phase I NPDES construction permit requirements. The AI&TF may be subject to the Phase II permit requirements that would be applicable by FY 2003, depending on the final site layout. The Phase II requirements are anticipated to be similar to the Phase I requirements. For either Phase I or II, a NOI would be filed for coverage under the applicable general permit, and construction activities would follow guidelines of the SWPPP that would be developed as required by the permit. The SWPPP would include provisions to minimize erosion and assure that petroleum and hazardous materials were stored and used to minimize contamination of surface waters. Storm water would necessitate a retention pond, with water treatment carried out per applicable local regulations. Onsite demolition would require additional consideration to account for the possibility of special treatment requirements for existing materials, such as lead-based paint or asbestos. Compliance with the SWPPP and Florida storm water management requirements would minimize soil erosion and pollutant discharges during construction.

Within the State of Florida, storm water management activities are also governed by the Florida ERP program. Under the ERP program, a permit application would be developed and submitted to initiate concurrent review by the FDEP and the USACE. The FDEP utilizes the ERP application for the review of State of Florida storm water management requirements, as an application for use of state owned submerged lands, and for ensuring compliance with state water quality standards. The ERP also serves as an application to the USACE for federal dredge and fill permitting review; however, it is not anticipated that wetlands would be affected by the SBL complex.

Operation

Potential impacts to surface and ground water quality resulting from IFX operations could result from the deposition of airborne emissions generated during laser operations, the accidental release of hazardous materials, and the discharge of wastewater effluents. Hydrogen fluoride would be the primary pollutant generated during operational tests of the laser. Up to approximately 0.0096 pounds of HF would be released to the atmosphere from each test. Upon discharge to the atmosphere, hydrogen fluoride disperses rapidly due to the relatively low weight and size of hydrogen fluoride particles. However, under limited atmospheric conditions when the relative humidity is greater than 90 percent and ambient air temperatures are less than 50°F, the deposition of small quantities of hydrogen fluoride onto the nearby ground and water surfaces may occur (U.S. Army Space and Missile Defense Command, 1998). Depending on the buffering capacity of the receiving water, the deposition of small amounts of hydrogen fluoride may result in a temporary increase in surface water acidity. Under most conditions, the deposition of small amounts of hydrogen fluoride into surface waters would be quickly neutralized by the buffering capacity (alkalinity) of the receiving waters and would not be considered harmful (Agency for Toxic Substances and Disease Registry, July 1998).

Surface waters near CCAFS are slightly acidic to alkaline. Average pH levels range from a low of approximately 6.9 in Banana River to a high of nearly 7.6 in Mosquito Lagoon (National Aeronautics and Space Administration, 1998). Due to the natural buffering capacity of these surface waters, the deposition of small amounts of hydrogen fluoride are anticipated to result in only minor and temporary decreases in water pH. Small amounts of hydrogen fluoride deposited on water surfaces would quickly dissipate due to surface water mixing and the natural buffering capacity of the nearby surface waters.

All activities conducted on the project site would be required to comply with the SPCC and contingency plans to be developed and implemented as part of this project. Compliance with these plans would minimize the potential for accidental spills of hazardous chemicals to affect surface and groundwater resources.

Operations at CCAFS would be required to comply with NPDES industrial permit requirements and the CCAFS *Storm Water Pollution Prevention Plan*. The CCAFS *Storm Water Pollution Prevention Plan* was prepared to support a NPDES multi-sector industrial storm water permit. Discharges of treated wastewater are regulated by the St. Johns River Water Management District for compliance with federal and State of Florida water quality standards. Any change in design, construction, operation, or maintenance of facilities that result in an increase of pollutant discharge to State waters would require application for a NPDES permit (or amendment of an existing applicable permit) and potential revisions to the SWPPP. Operation of the proposed facility would require an amendment of the existing NPDES multi-sector permit for inclusion of wastewater discharges associated with the operation of the proposed facilities. Compliance with NPDES requirements and the SWPPP would minimize pollutant discharges during project operations.

At CCAFS, the construction of the STF complex would increase the impervious cover by up to 11.1 acres, resulting in a slight increase in runoff during storm events. CCAFS contains approximately 15,800 acres. Therefore, approximately 0.07 percent of the area would become impervious cover, causing a slight increase in runoff. The required incorporation of detention ponds would assure that runoff would not increase.

EO 11988 directs federal agencies to "avoid to the extent possible the long- and short-term adverse impacts associated with occupancy and modification of floodplains…" The areas proposed for IFX ground-test activities are located within previously constructed areas that are currently elevated above the 100-year floodplain. However, because average surface elevations are low (approximately 10 feet msl), the IFX areas may be subject to flooding from storm surge tides. Potential impacts to the STF complex from storm surge tides would be considered in the design. Although construction and operation of the proposed facilities would occur within an area subject to storm surge tides, the STF complex would not increase the potential for floods and no adverse impacts to water quality or quantity are expected.

4.3.13.2 Cumulative Impacts

The cumulative action at CCAFS, the EELV program would have essentially completed construction by the time construction of the PTF began. All projects are required to include detention ponds which minimize impacts to water resources.

Launches associated with the EELV program would be episodic events similar to IFX test firings. Because of operational constraints, these tests would not occur together with launches at CCAFS. Cumulative water quality impacts relative to lowering of the pH of surface water are not anticipated to occur because of the high buffering capacity of the waters which allows for rapid recovery to normal pH levels. Furthermore, the analysis in Section 4.1.3.1 of the EA indicates that there would be negligible loss of alkalinity due to the IFX test firings. Each launch or test event would occur separately. As noted in prior analyses in the EA, there have not been long-term adverse effects from past and current activities at CCAFS, and the minor cumulative addition from the IFX ground-test program would not cause cumulative adverse impacts.

4.3.14 Environmental Justice

4.3.14.1 Environmental Effects

EO 12898 requires that federal agencies identify and address disproportionately high and adverse environmental effects (including human, health, and economic and social effects) of its programs, policies, and activities on minority and low-income populations. An environmental justice impact would be a long-term health, environmental, cultural, or economic effect that has a disproportionately high and adverse effect on a nearby minority or low-income population, rather than all nearby residents. The potential for a disproportionately high and adverse effect could occur under either of two conditions: (1) the percentage of persons in low-income or minority populations in the census tracts exceeds the percentage in the county, the region of comparison, or (2) the percentage of low-income or minority population in the census area exceeds 50 percent.

Construction and operation of the IFX ground-test program at CCAFS would not disproportionately affect any minority or low-income populations. The potential environmental or human health impacts noted above would be contained within the CCAFS boundary and would not impact any populated areas. Transport of materials would occur along major roads and not through neighborhoods.

4.3.14.2 Cumulative Impacts

The EELV program will convert an inactive launch facility to meet its needs. The EIS for the EELV has determined that the project will not result in environmental justice impacts for the CCAFS area. The effects of the IFX ground-test program would be contained within the CCAFS boundary, and there would be no cumulative adverse effects.

4.4 ENVIRONMENTAL EFFECTS OF THE NO-ACTION ALTERNATIVE

Under the No-action Alternative, the IFX ground testing portion of the overall SBL program would not occur, and no facilities would be constructed or renovated. The proposed locations at each candidate site would continue in their present or planned use as described in installation master plans.

4.4.1 Stennis Space Center

Air Quality

SSC is currently designated by the USEPA as an attainment area and complies with air quality regulations, as described in Chapter 3.1.1. Continued levels of activity at the proposed STF areas would have no adverse effect on air quality.

Airspace

Under the No-action Alternative, airspace use would continue in accordance with FAA regulations, as described in Chapter 3.1.2. Continued levels of activity would use the existing airspace. No impacts to the surrounding airspace are anticipated to occur from the No-action Alternative.

Biological Resources

Threatened and endangered species and wetlands areas would continue to be protected by natural resource management practices, as described in Chapter 3.1.3. Continued levels of activity at the proposed STF areas would have no adverse effects on local vegetation, wildlife, or habitats.

Cultural Resources

Natural processes would continue to affect existing cultural resources with protection of cultural resources continuing under current management practices, as described in Chapter 3.1.4. Continued levels of activity at the proposed STF areas would have no adverse effects on potentially eligible National Register sites and other cultural resources.

Geology and Soils

Geology and soils would remain in their current state, as described in Chapter 3.1.5. Continuing levels of activity at the proposed STF areas would have no adverse effect on geological and soil resources.

Hazardous Materials and Hazardous Waste Management

Existing plans and procedures would be followed for ongoing operations, as described in Chapter 3.1.6. Continuing levels of activity at the proposed STF areas would cause no adverse effects to hazardous materials and wastes management.

Health and Safety

Existing plans and procedures would continue to be followed, as described in Chapter 3.1.7. Continuing levels of activity at the proposed STF areas would have no adverse effect on public exposure or occupational safety or health hazards.

Land Use and Aesthetics

Use of the proposed STF areas would continue per current uses. No additional tall buildings would be built. Continuing levels of activity would not impact land use. Future land use is expected to remain compatible with the current uses. Aesthetics would not be affected by the No-action Alternative.

Noise

Noise levels would continue per current conditions with episodic engine test events, as described in Chapter 3.1.9. Continuing levels of activity at the proposed STF areas would have no adverse effect on current noise levels.

Socioeconomics

Under the No-action Alternative, the economic impact on the region would remain consistent with baseline conditions, as described in Chapter 3.1.10.

Transportation

Use of transportation resources would be unchanged from current conditions, as described in Chapter 3.1.11. Continuing levels of activity at the proposed STF areas would have no adverse effect on land, water, rail, or air transportation. The current transportation patterns and rates of usage would continue.

Utilities

Current adequate systems would continue in use unchanged, as described in Chapter 3.1.12. Continuing levels of activity at the proposed STF areas would result in maintaining the existing level of potable water consumption, wastewater treatment demand, municipal solid waste generation, and energy demand.

Water Resources

Groundwater and surface water resources would continue to be managed per applicable regulations and permits, as described in Chapter 3.1.13.

Environmental Justice

Low-income and/or minority populations, as described in Chapter 3.1.14, would not be disproportionately affected under the No-action Alternative.

4.4.2 Redstone Arsenal/Marshall Space Flight Center

Air Quality

RSA and MSFC are currently designated by the USEPA as an attainment area and comply with air quality regulations, as described in Chapter 3.2.1. Continued levels of activity at the proposed STF areas would have no adverse effect on air quality.

Airspace

Under the No-action Alternative, airspace use would continue in accordance with FAA regulations, as described in Chapter 3.2.2. Continued levels of activity would use the existing airspace. No impacts to the surrounding airspace are anticipated to occur from the No-action Alternative.

Biological Resources

Threatened and endangered species and wetlands areas would continue to be protected by natural resource management practices, as described in Chapter 3.2.3. Continued levels of activity at the proposed STF areas would have no adverse effects on local vegetation, wildlife, or habitats.

Cultural Resources

Natural processes would continue to affect existing cultural resources with protection of cultural resources continuing under current management practices, as described in Chapter 3.2.4. Continued levels of activity at the proposed STF areas would have no adverse effects on potentially eligible National Register sites and other cultural resources.

Geology and Soils

Geology and soils would remain in their current state, as described in Chapter 3.2.5. Continuing levels of activity at the proposed STF areas would have no adverse effect on geological and soil resources.

Hazardous Materials and Hazardous Waste Management

Existing plans and procedures would be followed for ongoing operations, as described in Chapter 3.2.6. Continuing levels of activity at the proposed STF areas would cause no adverse effects to hazardous materials and wastes management.

Health and Safety

Existing plans and procedures would continue to be followed, as described in Chapter 3.2.7. Continuing levels of activity at the proposed STF areas would have no adverse effect on public exposure or occupational safety or health hazards.

Land Use and Aesthetics

Use of the proposed STF areas would continue per current uses. No additional tall buildings would be built. Continuing levels of activity would not impact land use.

Future land use is expected to remain compatible with the current uses. Aesthetics would not be affected by the No-action Alternative.

Noise

Noise levels would continue per current conditions with episodic engine test events, as described in Chapter 3.2.9. Continuing levels of activity at the proposed STF areas would have no adverse effect on current noise levels.

Socioeconomics

Under the No-action Alternative, the economic impact on the region would remain consistent with baseline conditions, as described in Chapter 3.2.10.

Transportation

Use of transportation resources would be unchanged from current conditions, as described in Chapter 3.2.11. Continuing levels of activity at the proposed STF areas would have no adverse effect on land, water, rail, or air transportation. The current transportation patterns and rates of usage would continue.

Utilities

Current adequate systems would continue in use unchanged, as described in Chapter 3.2.12. Continuing levels of activity at the proposed STF areas would result in maintaining the existing level of potable water consumption, wastewater treatment demand, municipal solid waste generation, and energy demand.

Water Resources

Groundwater and surface water resources would continue to be managed per applicable regulations and permits, as described in Chapter 3.2.13.

Environmental Justice

Low-income and/or minority populations, as described in Chapter 3.2.14, would not be disproportionately affected under the No-action Alternative.

4.4.3 Cape Canaveral AFS

Air Quality

CCAFS is currently designated by the USEPA as an attainment area and complies with air quality regulations, as described in Chapter 3.3.1. Continued levels of activity at the proposed STF areas would have no adverse effect on air quality.

Airspace

Under the No-action Alternative, airspace use would continue in accordance with FAA regulations, as described in Chapter 3.3.2. Continued levels of activity would use the existing airspace. No impacts to the surrounding airspace are anticipated to occur from the No-action Alternative.

Biological Resources

Threatened and endangered species and wetlands areas would continue to be protected by natural resource management practices, as described in Chapter 3.3.3. Continued levels of activity at the proposed STF areas would have no adverse effects on local vegetation, wildlife, or habitats.

Cultural Resources

Natural processes would continue to affect existing cultural resources with protection of cultural resources continuing under current management practices, as described in Chapter 3.3.4. Continued levels of activity at the proposed STF areas would have no adverse effects on potentially eligible National Register sites and other cultural resources.

Geology and Soils

Geology and soils would remain in their current state, as described in Chapter 3.3.5. Continuing levels of activity at the proposed STF areas would have no adverse effect on geological and soil resources.

Hazardous Materials and Hazardous Waste Management

Existing plans and procedures would be followed for ongoing operations, as described in Chapter 3.3.6. Continuing levels of activity at the proposed STF areas would cause no adverse effects to hazardous materials and wastes management.

Health and Safety

Existing plans and procedures would continue to be followed, as described in Chapter 3.3.7. Continuing levels of activity at the proposed STF areas would have no adverse effect on public exposure or occupational safety or health hazards.

Land Use and Aesthetics

Use of the proposed STF areas would continue per current uses. No additional tall buildings would be built. Continuing levels of activity would not impact land use. Future land use is expected to remain compatible with the current uses. Aesthetics would not be affected by the No-action Alternative.

Noise

Noise levels would continue per current conditions with episodic launch events, as described in Chapter 3.3.9. Continuing levels of activity at the proposed STF areas would have no adverse effect on current noise levels.

Socioeconomics

Under the No-action Alternative, the economic impact on the region would remain consistent with baseline conditions, as described in Chapter 3.3.10.

Transportation

Use of transportation resources would be unchanged from current conditions, as described in Chapter 3.3.11. Continuing levels of activity at the proposed STF areas would have no adverse effect on land, water, rail, or air transportation. The current transportation patterns and rates of usage would continue.

Utilities

Current adequate systems would continue in use unchanged, as described in Chapter 3.3.12. Continuing levels of activity at the proposed STF areas would result in maintaining the existing level of potable water consumption, wastewater treatment demand, municipal solid waste generation, and energy demand.

Water Resources

Groundwater and surface water resources would continue to be managed per applicable regulations and permits, as described in Chapter 3.3.13.

Environmental Justice

Low-income and/or minority populations, as described in Chapter 3.3.14, would not be disproportionately affected under the No-action Alternative.

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CHAPTER 5

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Rachey Peten	B.S., Civil Engineering	Civil/environmental engineer	2
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CHAPTER 6

LIST OF PERSONS AND AGENCIES CONSULTED

The following individuals were consulted during preparation of this Environmental Assessment.

6.1 UNITED STATES AIR FORCE

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6.2 UNITED STATES ARMY AVIATION AND MISSILE COMMAND

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6.3 NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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Gordon, Jenette B.
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Marshall Space Flight Center

Armstrong, Bob
Elliot, Allen
Holland, Donna
McCaleb, PhD., Rebecca C
Stevens, Scott D.

Cape Canaveral Air Force Station

Angy Chambers
Ken Hefner
Eric Johnson
Mark Kershner
Dan Phillips
Randall Rowland
Dave Stone

6.4 FEDERAL AGENCIES

US Fish and Wildlife Service

Porter, Bruce
Goldman, Lawrence

6.5 JOINT VENTURE/CONTRACTORS

Conrad, Richard (LMAC)
Garrett, Bill (Stratus/TRW)
Johnson, Ronald (Boeing)
Jones, Michael A. (TRW)
Mortaloni, Lou (TRW)
Mowrey, Jim (SAIC)
Netcher, Morris (TRW)
Tays, Stu (ASCI)

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APPENDIX A

AIR QUALITY

APPENDIX A

AIR QUALITY

This appendix addresses the operational release of hydrogen fluoride (HF) and deuterium fluoride (DF) during laser testing and the potential accidental release of nitrogen trifluoride (NF_3) or fluorine (F_2). Deuterium is an isotope of hydrogen and DF is similar to HF in chemical characteristics. Both HF and DF share the same Chemical Abstracts Service number which is used to categorize chemical substances for occupational safety and health regulations and guidelines. Therefore, for this analysis, HF and DF are combined and referred to as HF/DF.

Operational Releases

The Space-Based Laser (SBL) is being developed as a chemical laser. The end product of the laser reaction of primary concern for air quality is hydrogen fluoride/deuterium fluoride (HF/DF). The test system would include two condensers in series, each of which would remove at least 99 percent of the HF/DF passing through them. This is a design requirement for the PRS. Therefore, of the 96 pounds of HF/DF produced for each test, only 0.0096 pounds would be released to the atmosphere. Although there will be a designed release height of 98.43 feet, to address any concern for hydrofluoric acid mist emission, a conservative ground-level analysis was conducted. The screening process is based on conservative assumptions. If the screen indicates there is the potential for exceedances of the specified concentrations, then either refined analysis or the employment of operational constraints may be warranted. On the other hand, if the screening process indicates no potential for exceedances, then there is no reason to pursue refined analyses.

HF/DF exposure standards exist for the exposure of healthy, trained occupational workers for routine operational releases as well as protection of the general public from accidental releases. For occupational workers, Occupational Safety and Health Administration (OSHA) requirements are 3 parts per million (ppm) time weighted average and 6 ppm for ceiling and short-term excursion levels. Furthermore, USAF Surgeon General requirements per AFOSH Standard 48-8, in concert with National Academy of Sciences recommendations and numerous other Federal agencies' criteria, require recognition of workers' Threshold Limit Values (TLV) in establishing the Occupational Exposure Level (OEL). With a ceiling HF/DF TLV of 3 ppm, the criteria for occupational worker exposure is a ceiling level (OEL-C) of 3 ppm.

For the protection of the general public from accidental releases, the HF/DF level that is Immediately Dangerous to Life and Health (IDLH) is a ceiling of 30 ppm. Unless determined otherwise by a Local Emergency Planning Committee (LEPC), a Level Of

Concern (LOC) is typically established as a ceiling requirement to be one-tenth of the IDLH level and is to be used for emergency planning and community right-to-know purposes. Therefore, unless determination is made otherwise, the LOC for HF/DF is anticipated to be a ceiling requirement of 3 ppm.

Screening was performed using the TSCREEN/PUFF computer model to determine maximum concentrations for an instantaneous release at ground level. In actuality, the release height would be 98.43 feet, but the ground level release assumption provides for a conservative analysis. TSCREEN is a USEPA approved modeling suite used to screen potential emissions. The PUFF model indicates the maximum average concentration beyond a specified "fence" boundary. For purposes of this analysis the boundary was set at 0.75 miles, which coincides with the edge of the safety zone. Table A-1 indicates the results of the TSCREEN/PUFF modeling.

Table A-1 Summary of TSCREEN/PUFF Results for Hydrogen/Deuterium Fluoride Emissions

Chemical	Level of Concern	Maximum Potential Concentration (gm/m^3) at a Distance of:					
HF/DF	3 ppm (2.5 gm/m^3)	0.75 mi[(1)]	1.86 mi	3.11 mi	4.35 mi	6.21 mi	18.64 mi
	Concentrations	0.00121[(1)]	0.00014	<0.0001	<0.0001	<0.0001	<0.0001

Note: Concentrations were determined using assumptions outlined in text above and the TSCREEN/PUFF screening model.
(1) Maximum concentration to which operations personnel or the general public could be exposed occurs at the edge of the safety zone.

Modeling assumptions:

- Mass of emitted HF/DF = 0.0096 pounds
- Atmospheric mixing height = 1,050 feet (automatically assigned by the model and is the height above which no further vertical dispersion of contaminant plumes occurs)
- Averaging time = instantaneous
- Wind speed = 3.28 feet/second (automatically assigned by the model)
- Release height (stabilization height) above ground = 0 feet

The maximum concentration occurs at the fence line, which was set to coincide with the edge of the 0.75-mile safety zone. For the actual operational scenario with a release height of 98.43 feet as opposed to the modeled ground level release, the maximum concentration would be 0.000006 gm/m^3. This compares to the concentration of 0.00121 gm/m^3 for the ground level release from Table A-1. Higher concentrations would likely occur within the safety zone during testing. However, the safety zone would be evacuated before each test. As such, no personnel would be present and there would be no chance of exposure to emissions at higher concentrations than those that would occur at the safety zone boundary. The modeling indicates that under the assumptions presented above, there would be no adverse exposure to HF/DF. To assure protection of personnel and the environment, meteorological and/or procedural operational constraints would be employed. Management of such constraints for operations involving similar hazardous materials is routine for protection of adjacent workers, national assets, and environmentally sensitive receptors.

Accidental Releases

An Offsite Consequence Analysis (OCA) for the SBL IFX project has been completed (TRW Space and Electronics Group, 2000). The analysis was based on the procedures established in the *Risk Management Program for Offsite Consequence Analysis* (U.S. Environmental Protection Agency, 1999) for the primary reactants of the SBL IFX. The analysis was conducted using the plume dispersion code SLAB, developed by Livermore National Laboratory personnel. SLAB was specifically developed for denser than air plume dispersion.

The chemicals of concern for accidental releases would be HF_3 and F_2. The proposed action requires the storage of up to 1,102 pounds of HF_3 and up to 231 pounds of F_2. The primary hazards of an accidental release involve the transfer of the reactants from the loading truck to the ground storage tanks, transfer from the storage tank to the test apparatus, a catastrophic storage container failure, and a massive release of hydrogen fluoride resulting either from the slow combustion or the detonation of compounds while reactants are stored in the Performance Test Chamber.

All reactant transfer operations would follow an established procedure to minimize the potential for accidental releases. Since this is a planned event, it would be possible to conduct meteorological monitoring and dispersion modeling prior to transfer operations. If conditions indicate that there would be no potential for hazardous concentrations beyond the safety zone, the transfer operation would continue. If the modeling indicated a potential for a leak to result in hazardous concentrations beyond the 0.75-mile safety zone, then the operations would be delayed until conditions changed sufficiently to assure safe conditions beyond the boundary.

Other accidental release scenarios involve some form of catastrophic container failure that would cause a complete loss of reactant at an unspecified time or the massive release of HF resulting either from the slow combustion or the detonation of F2/NF3 with H2/D2 while reactants are stored in the Performance Test Chamber. The likelihood of these catastrophic events is remote. However, the Risk Management Plan, required by Clean Air Act section 112(r), would address the immediate response to be taken in order to minimize the impacts such an event could have on human health and the environment. Information presented in the OCA analysis indicates that a person at the boundary of the 0.75-mile safety zone downwind of the NF_3 storage facility may be subjected to NF_3 levels that would cause temporary health effects.

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APPENDIX B

INTERAGENCY COORDINATION

Space-Based Laser Integrated Flight Experiment Ground Testing
Public Draft Environmental Assessment
9/10/2000

Comment No.	Drawing or Reference No.	Comment	Response
		Comments Made by: *Maya Rao, Mississippi Department of Environmental Quality*	
1	p. 2-31, 3-4	Hancock County and the rest of the State of Mississippi is currently under attainment status for all pollutants. However, if the new standards are implemented (which could be in Spring 2001) some of the coastal counties may be non attainment for Ozone.	Additional note added that pending new standards could change the future attainment status for ozone.
2	p. 3-2	Mississippi has adopted the NAAQS standards for all pollutants. We have one additional air quality standard for total suspended particles. The Mississippi ambient air quality standard for total suspended particles is 150 micrograms per cubic meter on a 24-hour average.	Note added to the NAAQS table to reflect this additional standard.
3	p. 4-64, Table 4.3-2	There is a typo on the percentage change in AQCR for NOX. That number should be changed from 0.12 to 0.015, based on the information provided in the table.	Corrected as noted.
4	p. 3-41, sec 3.1.13	The third paragraph should be changed as follows: The 1987 amendments to the CWA required the USEPA to establish a National Pollutant Discharge Elimination System (NPDES) permit program for storm water discharges associated with industrial activities. The Mississippi Department of Environmental Quality (MDEQ) has been delegated authority from the EPA to administer this program in the state of Mississippi. Industrial facilities subject to these regulations are permitted either with an individual NPDES permit or through coverage under a general permit. Under Phase 1 of the storm water regulations, coverage under a general construction storm water permit is required for construction activities that result in the disturbance of five acres or more. Coverage under the general construction storm water permit requires the preparation of a Storm Water Pollution Prevention Plan (SWPPP).	Paragraph changed as suggested.

Space-Based Laser Integrated Flight Experiment Ground Testing
Public Draft Environmental Assessment
9/10/2000

Comment No.	Drawing or Reference No.	Comment	Response
5	p. 3-43, sec 3.1.13.4	The second paragraph should be changed as follows: The waters of the nearby Pearl and Jourdan Rivers are classified by the Mississippi Department of Environmental Quality as Recreational. Mike's River and Lion and Wolf branches are classified as Fish and Wildlife.	Text changed to reflect the comment.
		Comments Made by: *Robert Seyfarth, Mississippi Department of Environmental Quality*	
1	p. 2-3; p. 4-7	As stated in the document the detailed facility designs and site layouts for the facility have not been designed, however space requirements have been compiled. Under current calculations it is anticipated that approximately 12.1 acres of land will be needed to construct the facility. Existing structures would be utilized to the maximum extent possible. Direct impacts to wetlands are projected to be approximately 8.0 acres (page 4-7), however, if you total those impacts listed it appears that 10.5 acres of wetlands would be impacted.	The totals included in the EA of eight acres appear correct. It appears that the summary bullet at the bottom page 4-7 and the subbullets at the top of page 4-8 may have both been added, resulting in double counting. The icon for the subbullets has been changed for clarity.
2	p. 4-10	As stated, the project's wetland impact would be evaluated under Section 404(b)(1) guidelines of the Clean Water Act. These regulations require a review sequence of avoidance, minimization, and compensation for unavoidable impacts to wetlands. Office of Pollution Control (OPC) regulations require the same considerations before a Section 401 Water Quality Certification can be issued. Our sequential review is typically conducted during the U. S. Army Corps of Engineers Section 404 Public Notice period. It is during this time that we will need to review detailed facility designs and site layouts in order to determine if wetlands impacts have been avoided and minimized to the maximum extent practicable. Wetland mitigation requirements will vary depending on specific wetlands types to be impacted. In regards to mitigation, we believe the wetland impacts can be mitigated on-site through utilization of SSC's existing mitigation bank.	Text added relative to 401 certification.

Comment No.	Drawing or Reference No.	Comment	Response
3	p. 4-29	OPC's review under Section 401 Water Quality Certification requires applicants to address other aspects of the development that could result in additional impacts and discharges into state waters. The potential for storm water pollution is a concern for this type of facility. A post-construction storm water quality management plan should be developed and should include runoff from impervious surfaces, which are anticipated to total 14.3 acres. At a minimum, the first 0.5 inch of runoff from all impervious surfaces shall be retained/detained on-site and treated through infiltration, evaporation, or other approved methods. The required volume must be restored within 72 hours. OPC will need to review pertinent plans and specifications for the storm water management system including post-construction contours, all pertinent calculations, specifications for drainage structures including outfalls, and maintenance measures. A minimum 15-foot buffer will be required on the project perimeter. This plan must be submitted and approved prior to issuance of a water quality certification. We recommend consideration of the utilization of the existing ponds to meet the storm water requirements. This would provide an opportunity for avoidance and minimization of wetlands impact. In addition, there may also be opportunities for some onsite mitigation through wetland creation.	Text added in Section 4.1.13.1.
		Comments Made by: *Marlane Castellanos, Florida Department of Environmental Protection, Office of Legislative and Governmental Affairs*	
1		We recommend that Cape Canaveral Air Force Station clean the soil at this site to the current Industrial PCB Soil Cleanup Target Level of 2.1mg/kg and complete a Land Use Control Plan.	Text has been changed to reflect the necessary soil cleanup.
		Comments Made by: *Elizabeth Ann Brown, Alabama Historical Commission*	
1	page 3-53, line 27	Please send an archaeological site form for the site included with the Harris House.	RSA has been requested to submit this form.
2	page 4-39, line 37	The cemetery may not be NR eligible but it must be protected under the Alabama Burial Act.	Need for protection added as suggested.

Com-ment No.	Drawing or Reference No.	Comment	Response
3	page 4-40, line 1	We agree that 1 Ma 630 will require Phase II testing prior to ground disturbance. Phase II proposals should be developed and submitted to our office for review and approval prior to implementation. Also, 1 Ma 269 could be destroyed by explosives and we request consultation regarding further testing at this site.	This section has been expanded to include this initial determination.
4	page 4-40, line 22	We agree that a Phase I survey should be conducted for the fiber optic line prior to construction activities.	The Phase I survey is in progress as of this writing.
5		We continue to wait for the determination of eligibility for building 8027 and the igloos. It would be a great assistance to have the completed World War II and Cold War reports in our evaluation of these structures.	The efforts identified in the comments are separate from the EA and were begun prior to the EA. The reports and determination are not complete.
		Comments Made by: *Reginald C. Matthews, Federal Aviation Administration*	
1	Sec 3.1.2, pp. 3-5 – 3-6, para 1	There are really just two categories of airspace in the U.S.: -- controlled and uncontrolled. The terms "special use" and "other" as used in this paragraph are simply types of airspace that may be established within either controlled or uncontrolled airspace, or both. Therefore, special use airspace and other areas are not separate entities from controlled or uncontrolled airspace. The following is a suggested re-write of the 1st paragraph (changes are underlined and in italics): There are two categories of airspace or airspace areas above the continental United States. They are regulatory and non-regulatory. Within these categories, the Federal Aviation Administration (FAA) *has established various classes of airspace that fall under the generic terms of controlled and uncontrolled airspace. Controlled airspace is airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification, and within which all aircraft operations are subject to certain pilot qualifications, operating rules, and equipment requirements. Controlled airspace is a generic term that identifies five different classes of airspace: Class A, Class B, Class C, Class D, and Class E airspace areas. Airspace that is not designated as A, B, C, D, or E, is Class G (or uncontrolled) airspace. The Class F designation is not used in the United States.*	Text changed as suggested.

Comment No.	Drawing or Reference No.	Comment	Response
		Special use airspace is a type of airspace that is designated where there is a need to confine certain activities because of their nature, or wherein limitations may be placed on non-participating aircraft. Prohibited areas, restricted areas, warning areas, alert areas, and military operations areas (MOA) are special use airspace areas that are depicted on aeronautical charts.	
2	Sec 3.1.2, p. 3-6, para 2	We suggest the following revisions to the 2nd paragraph to clarify the text and complement changes suggested in paragraph 1, above. Also, the air-space above 60,000 (FL 600) over the U.S. is now designated as Class E airspace (see 14 CFR section 71.71), therefore, the existing last sentence in paragraph 2 should be deleted: There are *five* distinct airspace *classes* established for the control of aircraft. Class A airspace is that airspace between 18,000 feet and 60,000 feet above mean sea level (MSL), *wherein all aircraft must operate under instrument flight rules (IFR), unless otherwise authorized by air traffic control (ATC)*. Class B airspace is controlled airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. *An air ATC clearance is required to operate in Class B airspace*. Class C airspace is that airspace from the surface to 4,000 feet above the airport elevation surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of *IFR* operations or passenger enplanements wherein *ATC* provides radar vectoring and sequencing for all IFR and visual flight rule (VFR) aircraft. Class D airspace is normally that airspace from the surface to 2,500 square feet above the airport elevation surrounding those airports with an operating tower. The configuration of each Class D airspace area is individually tailored *to allow for the safe and efficient handling of traffic and to contain instrument procedures serving the airport*. Class E airspace is controlled airspace extending upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace up to but not including, 18,000 feet MSL, excluding *those areas designated as* Class A, Class B, Class C, *or* Class D airspace. *Within the United States, all airspace above Flight Level (FL) 600 MSL is Class E (controlled) airspace.*	Text changed as suggested.

Com-ment No.	Drawing or Reference No.	Comment	Response
3	Sec 3.1.2, p. 3-6, 3rd para	This should also mention Jet Routes which provide routings in the U.S. high altitude airspace structure. Therefore, suggest adding the following new sentence after the existing last sentence in the 3rd paragraph: *Jet Routes are established in Class A airspace between 18,000 feet MSL and Flight Level (FL) 450, inclusive, between the navigational aids and intersections specified for that route.*	Text changed as suggested.
4	Sec 3.1.2.2, p. 3-7, para 2, sent 2	In the parentheses, delete “Low Altitude Tactical Navigation [LATN] areas.” LATN areas are not coordinated with FAA and they are not depicted on aeronautical charts. Therefore, these areas would not necessarily be considered by the FAA in assessing airspace configurations.	Text changed as suggested.
5	Sec 3.1.2.2, p. 3-7, para 4, sent 2	The text identifies 3 types of MTR (IR, VR, and SR). This is correct, but the FAA deals only with IRs and VRs. SRs are handled entirely within DoD and are not coordinated with FAA. SRs are not depicted on aeronautical charts.	Text changed as suggested.
6	Sec 3.1.2.3, p 3-8, para 2, sent 1	Change that part of the sentence that reads: “… shall send one executed form set (four copies) of FAA Form 7460-1 … to read “… shall send one executed FAA Form 7460-1 …” The form has been changed to a “single sheet” rather than a form set.	Text changed as suggested.
7	Sec 3.2.2, p. 3-52, para 2	In the 2nd paragraph under Regional Airspace, change the last sentence as follows: Change “… 6 hours in advance or by NOTAM …” to read “… *by NOTAM 6 hours in advance* …”	Text changed as suggested.
8	Sec 3.3.2, p. 3-84, para 2	In the 2nd paragraph under Regional Airspace, change the second sentence as follows: Insert the words “*but not including*” between “surface up to” and “5,000 feet MSL.”	Text changed as suggested.

U.S. Department
of Transportation
**Federal Aviation
Administration**

Memorandum

Subject: **INFORMATION**: Environmental Assessment Review

Date: OCT 3[illegible]

From: Airspace and Rules Division, ATA-400

Reply to Attn. of:

Herb HB 10/31/00

To: Manager, ~~Space~~ Systems Development ~~Division, AST-100~~

We have reviewed the draft environmental assessment entitled "Space-Based Laser Integrated Flight Experiment Ground Testing," dated August 2000.

Please find attached a list of comments for your consideration.

Thank you for the opportunity to review this document. If you have any questions on this matter, please contact Paul Gallant, ATA-421, on 267-9361.

Reggie

Reginald C. Matthews

Attachment

ATA-400 Comments on Airspace Sections in
Draft EA: Space-Based Laser Integrated Flight Experiment Ground Testing; August 2000

Pp. 3-5 to 3-6, Section 3.1.2 Airspace; Subsection 3.1.2.1 Airspace Designations:

- Comments on the 1st paragraph (on pp. 3-5 & 3-6): There are really just two categories of airspace in the U.S.: -- controlled and uncontrolled. The terms "special use" and "other" as used in this paragraph are simply types of airspace that may be established within either controlled or uncontrolled airspace, or both. Therefore, special use airspace and other areas are not separate entities from controlled or uncontrolled airspace. The following is a suggested re-write of the 1st paragraph (changes are underlined and in italics):

  There are two categories of airspace or airspace areas above the continental United States. They are regulatory and non-regulatory. Within these categories, the Federal Aviation Administration (FAA) *has established various classes of airspace that fall under the generic terms of controlled and uncontrolled airspace. Controlled airspace is airspace of defined dimensions within which air traffic control service is provided to IFR flights and to VFR flights in accordance with the airspace classification, and within which all aircraft operations are subject to certain pilot qualifications, operating rules, and equipment requirements. Controlled airspace is a generic term that identifies five different classes of airspace: Class A, Class B, Class C, Class D, and Class E airspace areas. Airspace that is not designated as A, B, C, D, or E, is Class G (or uncontrolled) airspace. The Class F designation is not used in the United States. Special use airspace is a type of airspace that is designated where there is a need to confine certain activities because of their nature, or wherein limitations may be placed on non-participating aircraft. Prohibited areas, restricted areas, warning areas, alert areas, and military operations areas (MOA) are special use airspace areas that are depicted on aeronautical charts.*

- Comments on 2nd paragraph (on page 3-6): We suggest the following revisions to the 2nd paragraph to clarify the text and compliment changes suggested in paragraph 1, above. Also, the airspace above 60,000 feet (FL 600) over the U.S. is now designated as Class E airspace (see 14 CFR section 71.71), therefore, the existing last sentence in paragraph 2 should be deleted:

  There are *five* distinct airspace *classes* established for the control of aircraft. Class A airspace is that airspace between 18,000 feet and 60,000 feet above mean sea level (MSL), *wherein all aircraft must operate under instrument flight rules (IFR), unless otherwise authorized by air traffic control (ATC)*. Class B airspace is controlled airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. *An air ATC clearance is required to operate in Class B airspace*. Class C airspace is that airspace from the surface to 4,000 above the airport elevation surrounding those airports that have an operational control tower, are serviced by a radar approach control, and that have a certain number of

IFR operations or passenger enplanements wherein *ATC* provides radar vectoring and sequencing for all IFR and visual flight rule (VFR) aircraft. Class D airspace is normally that airspace from the surface to 2,500 feet above the airport elevation surrounding those airports with an operating tower. The configuration of each Class D airspace area is individually tailored *to allow for the safe and efficient handling of traffic and to contain instrument procedures serving the airport.* Class E airspace is controlled airspace extending upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace up to but not including, 18,000 feet MSL, excluding *those areas designated as* Class A, Class B, Class C, *or* Class D airspace. *Within the United States, all airspace above Flight Level (FL) 600 MSL is Class E (controlled) airspace.*

- Comments on 3rd paragraph (on page 3-6): This should also mention Jet Routes which provide routings in the U.S. high altitude airspace structure. Therefore, suggest adding the following new sentence after the existing last sentence in the 3rd paragraph:

  Jet Routes are established in Class A airspace between 18,000 feet MSL and Flight Level (FL) 450, inclusive, between the navigational aids and intersections specified for that route.

Pp. 3-6 to 3-7, Subsection 3.1.2.2 Flight Rules and Runway Orientations

- 2nd paragraph (on page 3-7), 2nd sentence: In the parentheses, delete "Low Altitude Tactical Navigation [LATN] areas." LATN areas are not coordinated with FAA and they are not depicted on aeronautical charts. Therefore, these areas would not necessarily be considered by the FAA in assessing airspace configurations.

- 4th paragraph (on page 3-7): The text identifies 3 types of MTR (IR, VR, and SR). This is correct, but the FAA deals only with IRs and VRs. SRs are handled entirely within DOD and are not coordinated with FAA. SRs are not depicted on aeronautical charts.

Page 3-8, Subsection 3.1.2.3 Obstructions Affecting Navigable Airspace

- 2nd paragraph, 1st sentence: Change that part of the sentence that reads: "...shall send one executed form set (four copies) of FAA Form 7460-1...." to read "...shall send one executed FAA Form 7460-1...." The form has been changed to a "single sheet" rather than a form set.

Page 3-52, Subsection 3.2.2 Airspace, Regional Airspace

- In the 2nd paragraph under Regional Airspace, change the last sentence as follows:

  Change "...6 hours in advance or by NOTAM...." to read "...*by NOTAM 6 hours in advance*...."

Page 3-84, Subsection 3.3.2 Airspace, Regional Airspace

- In the 2nd paragraph under Regional Airspace, change the second sentence as follows:

  Insert the words "***but not including***" between "surface up to" and "5,000 feet MSL."

United States Department of the Interior

FISH AND WILDLIFE SERVICE
P. O. Drawer 1190
Daphne, Alabama 36526

IN REPLY REFER TO:

October 13, 2000

Mr. Craig McColloch
Wendy Lopez & Associates
1825 Market Center Blvd., Suite 510
Dallas, TX 75207

Dear Mr. McColloch:

This letter is in response to a review of the Environmental Assessment on the Space and Missile Systems Center, U.S. Air Force proposal to construct and operate a Space-Based Laser Integrated Flight Experiment Ground Testing facility at Stennis Space Center, Mississippi. We have reviewed the information you enclosed and are providing the following comments in accordance with the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

The action proposal as specified in the Environmental Assessment is not likely to adversely affect federally listed species. Therefore, no further endangered species consultation will be required for this portion of the project unless: 1) the identified action is subsequently modified in a manner that causes an effect on listed species or designated Critical Habitat; 2) new information reveals the identified action may affect Federally protected species or designated Critical Habitat in a manner or to an extent not previously considered; or 3) a new species is listed or Critical Habitat is designated under the Endangered Species Act that may be affected by the identified action.

If you need any additional information, please contact Mr. Bruce Porter, at 334-441-5181 x 37 and kindly refer to the reference number above.

Sincerely,

Larry E. Goldman
Field Supervisor

PHONE: 334-441-5181 www.fws.gov FAX: 334-441-6222
SHIPPING ADDRESS: 1208-B Main Street, Daphne, AL 36526

-----Original Message-----
From: Maya_Rao@deq.state.ms.us [mailto:Maya_Rao@deq.state.ms.us] Sent: Tuesday, October 10, 2000 7:50 AM
To: CMcColloch@wendylopez.com
Cc: adel.hashad@losangeles.af.mil
Subject: RE: EA for Space-Based Laser at Stennis Space Center

Attached are our comments:

(See attached file: space EIS.wpd)

Please call me at 601-961-5242, if you jave any questions.
****

We have done a cursory review of this document and have the following comments on Air and Water discharge issues:

Air

1. Page 2:31, Page 3-4

Hancock County and the rest of the State of Mississippi is currently under attainment status for all pollutants. However, if the new standards are implemented (which could be in Spring 2001) some of the coastal counties may be non attainment for Ozone..

2. Page 3-2:
Mississippi has adopted the NAAQS standards for all pollutants. We have one additional air quality standard for total suspended particles. The Mississippi ambient air quality standard for total suspended particles is 150 micrograms per cubic meter on a 24-hour average.

3. Page 4-64, **Table 4.3-2**:
There is a typo on the percentage change in AQCR for Nox. That number should be changed from 0.12 to 0.015, based on the information provided in the table.

Water
Water comments are as follows:

<u>WATER RESOURCES</u>

Section 3.1.13, page 3-41, : The third paragraph should be changed as follows:

The 1987 amendments to the CWA required the USEPA to establish a National Pollutant Discharge Elimination System (NPDES) permit program for storm water discharges associated with industrial activities. The Mississippi Department of Environmental Quality (MDEQ) has been delegated authority from the EPA to administer this program in the state of Mississippi. Industrial facilities subject to these regulations are permitted either with an individual NPDES permit or through coverage under a general permit. Under Phase 1 of the storm water regulations, coverage under a general construction storm water permit is required for construction activities that result in the disturbance of five acres or more. Coverage under the general construction storm water permit requires the preparation of a Storm Water Pollution Prevention Plan (SWPPP).

WATER QUALITY

Section 3.1.13.4, page 3-43: The second paragraph should be changed as follows:

The waters of the nearby Pearl and Jourdan Rivers are classified by the Mississippi Department of Environmental Quality as Recreational. Mike=s River and Lion and Wolf branches are classified as fish and wildlife.

MEMORANDUM

To: Maya Rao

From: Robert Seyfarth, Office of Pollution Control, Water Quality Management Branch

Re: Draft Environmental Assessment - July 2000
Space-Based Laser Integrated Flight Experiment Ground Testing
Stennis Space Center
Hancock County, Mississippi

Date: October 6, 2000

The Water Quality Management Branch has completed our cursory review of this document and have the following comments on Water Quality issues:

PAGE 2-3, PAGE 4-7

As stated in the document the detailed facility designs and site layouts for the facility have not been designed, however space requirements have been compiled. Under current calculations it is anticipated that approximately 12.1 acres of land will be needed to construct the facility. Existing structures would be utilized to the maximum extent possible. Direct impacts to wetlands are projected to be approximately 8.0 acres (page 4-7), however, if you total those impacts listed it appears that 10.5 acres of wetlands would be impacted.

PAGE 4-10

As stated, the project's wetland impact would be evaluated under Section 404 (b)(1) guidelines of the Clean Water Act. These regulations require a review sequence of avoidance, minimization, and compensation for unavoidable impacts to wetlands. OPC regulations require the same considerations before a Section 401 Water Quality Certification can be issued. Our sequential review is typically conducted during the U. S. Army Corps of Engineers Section 404 Public Notice period. It is during this time that we will need to review detailed facility designs and site layouts in order to determine if wetlands impacts have been avoided and minimized to the maximum extent practicable. Wetland mitigation requirements will vary depending on specific wetlands types to be impacted. In regards to mitigation, we believe the wetland impacts can be mitigated on-site through utilization of SSC's existing mitigation bank.

PAGE 4-29

OPC's review under Section 401 Water Quality Certification requires applicants to address other aspects of the development that could result in additional impacts and discharges into state waters. The potential for storm water pollution is a concern for this type of facility. A post-construction storm water quality management plan should be developed and should include runoff from impervious surfaces, which are anticipated to total 14.3 acres. At a minimum, the first 0.5 inch of runoff from all impervious surfaces shall be retained/detained on-site and treated through infiltration, evaporation, or other approved methods. The required volume must be restored within 72 hours. OPC will need to review pertinent plans and specifications for the storm water management system including post-construction contours, all pertinent calculations, specifications for drainage structures including outfalls, and maintenance measures. A minimum 15-foot buffer will be required on the project perimeter. This plan must be submitted and approved prior to issuance of a water quality certification. We recommend consideration of the utilization of the existing ponds to meet the storm water requirements. This would provide an opportunity for avoidance and minimization of wetlands impact. In addition, there may also be opportunities for some onsite mitigation through wetland creation.

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
9721 Executive Center Drive North
St. Petersburg, Florida 33702

October 5, 2000

Adel Hashad, P.E.
HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles AFB, California 90245-4659

Dear Mr. Hashad:

The National Marine Fisheries Service has reviewed the Draft Environmental Assessment (EA) and Finding of No Significant Impact (FONSI) dated September 2000, for the Space-Based Laser Integrated Flight Experiment Facilities program. The US Air Force is investigating three locations for further development of this project including Stennis Space Center in Mississippi, Cape Canaveral Air Force Station in Florida, and Redstone Arsenal/Marshal Space Flight Center in Mississippi.

Based on our review of the documents, we find that the description of fishery resources and habitats in the project areas is adequate as well as the assessment of potential adverse impacts associated with the proposed alternatives. Therefore, we have no comments to offer on the Draft EA and FONSI. If we can be of further assistance, please advise. Related comments, questions or correspondence should be directed to Mr. David N. Dale in St. Petersburg, Florida. He may be contacted at 727/570-5311 or at the letterhead address above.

Sincerely,

W. Mark Thompson/for
Andreas Mager, Jr.
Assistant Regional Administrator
Habitat Conservation Division

cc:
Randall Rowland
45 CES/CEVP
1224 Jupiter Street, MS 9125
Patrick AFB, FL 32925-3343

F/SER4
F/SER43

United States Department of the Interior

FISH AND WILDLIFE SERVICE
6620 Southpoint Drive South
Suite 310
Jacksonville, Florida 32216-0958

IN REPLY REFER TO:
FWS/R4/ES-JAFL

September 27, 2000

Mr. Clay Gordin
Environmental Planning
45CES/CEV
1224 Jupiter Street
Patrick Air Force Base, Florida 32925

FWS Log No: 00-810

Dear Mr. Gordin:

This responds to your letter of August 3, 2000, requesting informal section 7 consultation for the Space Based Laser Test Facility at Cape Canaveral Air Force Station, Brevard County. The list of species evaluated in the Draft Environmental Assessment for this project are identified in Table 3.3-2, page 3-78.

On September 20, 2000, a biologist from this office visited the project site. The proposed site has existing buildings and is completely enclosed by a cyclone fence. The vegetation inside the fence is grass. There is no suitable habitat for any of the species listed in the above referenced table that fall under the jurisdiction of the Fish and Wildlife Service. The proposed project will be confined to that area enclosed by the existing fence, no additional land clearing will be necessary. The Service believes, therefore, this project is not likely to adversely affect those species listed in Table 3.3-2 which are under the jurisdiction of the Fish and Wildlife Service.

Although this does not represent a biological opinion as described in section 7 of the Act, it does fulfill the requirements of the Act and no further action is required. If modifications are made in the project or additional information becomes available on listed species, reinitiation of consultation may be required. This consultation only addresses the test facility. A separate consultation may be required when the Air Force moves into the next phase of the project, the actual testing of the laser on missile.

Sincerely,

Don Palmer

for David L. Hankla
Field Supervisor

S: 00-810\DP\acm\9.27.00

STATE OF FLORIDA

DEPARTMENT OF COMMUNITY AFFAIRS

"Dedicated to making Florida a better place to call home"

JEB BUSH
Governor

STEVEN M. SEIBERT
Secretary

September 26, 2000

Mr. Adel A. Hashad
Environmental Management
HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles Air Force Base, California 90245-4659

RE: U.S. Department of the Air Force - Ballistic Missile Defense - Draft Environmental Assessment Space-Based Laser Integrated Flight Experiment Ground Testing - July 2000 - Cape Canaveral Air Force Station, Brevard County, Florida
SAI: FL200007200512C

Dear Mr. Hashad:

The Florida State Clearinghouse, pursuant to Presidential Executive Order 12372, Gubernatorial Executive Order 95-359, the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended, and the National Environmental Policy Act, 42 U.S.C. §§ 4321, 4331-4335, 4341-4347, as amended, has coordinated a review of the above-referenced project.

The Florida Fish and Wildlife Conservation Commission (FWC) offers a number of comments regarding the proposed project and notes that, based on the information provided, the implementation of the project on the Cape Canaveral Air Force Station (CCAFS) site would result in the fewest impacts to biological resources. The CCAFS site is the only proposed project site that results in no disturbance to fish and wildlife resources, natural habitats, or wetlands. Conversely, locating the project at the Stennis Space Center or the Redstone Arsenal/Marshall Space Flight Center sites would result in either loss of fish and wildlife habitat, filling of wetlands, or potential impacts to listed species. Therefore, the FWC recommends that the Air Force select the CCAFS site to implement the project, and that both primary facilities (Primary Test Facility and the Assembly, Integration and Test Facility) be housed at the CCAFS. Please refer to the enclosed FWC comments.

Mr. Adel A. Hashad
September 26, 2000
Page Two

The Department of Environmental Protection (DEP) recommends that Cape Canaveral Air Force Station clean the soil at this site to the current Industrial PCB Soil Cleanup Target Level and complete a Land Use Control Plan. Cape Canaveral Air Force Station, the Environmental Protection Agency and DEP entered into a Memorandum of Agreement, dated December 23, 1999, for Land Use Controls. For additional information regarding this recommendation, the applicant should contact DEP's Waste Management Division. Please refer to the enclosed DEP comments.

Based on the information contained in the draft environmental assessment and the enclosed comments provided by our reviewing agencies, the state has determined that the above-referenced project is consistent with the Florida Coastal Management Program.

If you have any questions regarding this letter, please contact Ms. Cherie Trainor, Clearinghouse Coordinator, at (850) 414-5495.

Sincerely,

Chris McCay

for Ralph Cantral, Executive Director
Florida Coastal Management Program

RC/cc

Enclosures

cc: Bradley Hartman, Florida Fish and Wildlife Conservation Commission
Marlane Castallanos, Department of Environmental Protection

COUNTY: Brevard

DATE: 07/20/2000
COMMENTS DUE DATE: 08/04/2000
CLEARANCE DUE DATE: 08/04/2000
SAI#: FL200007200512C

Message:

STATE AGENCIES	WATER MANAGEMENT DISTRICTS	OPB POLICY UNITS
X Agriculture Community Affairs Environmental Protection Fish & Wildlife Conserv. Comm State Transportation	St. Johns River WMD	Environmental Policy/C & ED

The attached document requires a Coastal Zone Management Act/Florida Coastal Management Program consistency evaluation and is categorized as one of the following:

- Federal Assistance to State or Local Government (15 CFR 930, Subpart F). Agencies are required to evaluate the consistency of the activity.
- Direct Federal Activity (15 CFR 930, Subpart C). Federal Agencies are required to furnish a consistency determination for the State's concurrence or objection.
- Outer Continental Shelf Exploration, Development or Production Activities (15 CFR 930, Subpart E). Operators are required to provide a consistency certification for state concurrence/objection.
- Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

Project Description:

U.S. Department of the Air Force - Ballistic Missile Defense - Draft Environmental Assessment Space-Based Laser Integrated Flight Experiment Ground Testing - July 2000 - Cape Canaveral Air Force Station, Brevard County, Florida. Note: available on the web at: http://ax.laafb.af.mil/axf/sbl/
Username: eshipt
Password: stfea

To: Florida State Clearinghouse
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, FL 32399-2100
(850) 922-5438 (SC 292-5438)
(850) 414-0479 (FAX)

EO. 12372/NEPA

- [x] No Comment
- [ ] Comments Attached
- [ ] Not Applicable

Federal Consistency

- [x] No Comment/Consistent
- [ ] Consistent/Comments Attached
- [ ] Inconsistent/Comments Attached
- [ ] Not Applicable

From:

Jack P. Dodd, Planner
Division of Forestry
Forest Resource Planning
& Support Services Bureau
3125 Conner Blvd., Mail Stop C23
Tallahassee, FL 32399-1650

Division/Bureau:

Reviewer: [signature]

Date: 8-4-00

August 11, 2000

Cherie Trainor
State Clearinghouse
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, Florida 32399-2100

RE: USAF/Space-Based Laser Integrated Flight Experiment Ground Testing (missile defense system), Cape Canaveral AFS, Brevard County

SAI: FL00-512C

Dear Ms. Trainor:

The Florida Department of Environmental Protection (FDEP) has completed its review of the materials that were provided for the above-referenced project. This project concerns the ground-testing phase of the Integrated Flight Experiment program that would require a new facility complex for high performance testing of the laser in a simulated space environment. This project requires new construction as well as refurbishment of existing facilities.

We recommend that Cape Canaveral Air Force State clean the soil at this site to the current Industrial PCB Soil Cleanup Target Level of 2.1 mg/kg. and complete a Land Use Control Plan. Cape Canaveral Air Force Station, the Environmental Protection Agency and FDEP entered into a Memorandum of Agreement, dated December 23, 1999, for Land Use Controls. If there are questions concerning this recommendation, please contact Michael J. Deliz, P.G., of the FDEP Waste Management Division at (850) 921-9991.

Thank you for the opportunity to comment on this project. If I can be of further assistance, please contact me at (850) 487-2231.

Sincerely,

MC

Marlane Castellanos
Office of Legislative and Governmental Affairs

MC/

FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION

AN L. EGBERT, Ph.D., Executive Director
TOR J. HELLER, Assistant Executive Director

OFFICE OF ENVIRONMENTAL SERVICES
BRADLEY J. HARTMAN, DIRECTOR
(850)488-6661 TDD (850)488-9542
FAX (850)922-5679

August 18, 2000

Ms. Cherie Trainor
Florida State Clearinghouse
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, FL 32399-2100

RE: SAI #FL200007200512C, Brevard County, U.S. Department of the Air Force-Ballistic Missile Defense-Draft Environmental Assessment Space-Based Laser Integrated Flight Experiment Ground Testing-Cape Canaveral Air Force Station

Dear Ms. Trainor:

The Office of Environmental Services of the Florida Fish and Wildlife Conservation Commission has reviewed the referenced document, and offers the following comments.

The U. S. Department of the Air Force proposes to construct the Space-Based Laser (SBL) Test Facility complex, and perform ground demonstration and validation testing for the Integrated Flight Experiment Project (IFX). The SBL system is a spaced-based energy weapon for global ballistic missile defense that may have the capability of negating ballistic missiles in the boost phase. The objective of the IFX project is to conduct research to advance and assess the feasibility of the SBL concept in ballistic missile defense. The IFX project includes two phases: 1) design, development, and ground testing of the SBL; 2) launch, in-orbit testing, and lethal demonstration of the SBL. The referenced Environmental Assessment (EA) relates only to the first phase of ground testing. If the ground testing phase is successful, a decision would be made to implement the second phase of testing.

The SBL ground testing program would proceed in two primary facilities. The first is the Primary Test Facility (PTF) where all laser test firing would occur. The PTF would also include areas for Remote Control of Testing, and Reactant Storage. Due to safety considerations, there would be a 0.75-mile radius safety zone around the PTF performance test chamber. The second proposed facility is the IFX test vehicle Assembly, Integration and Test Facility (AI&TF). This facility would be located outside the PTF safety zone, and is the location where the payload elements would be integrated with a spacecraft element to constitute the IFX test vehicle (a potential functional space vehicle). Additional space would also be required for engineering and administration offices. The Air Force has chosen three sites in the United States that could potentially house the SBL test complex: Stennis Space Center (SSC), Mississippi; Redstone Arsenal/Marshall Space Flight Center (RSA/MSFC), Alabama; or Cape Canaveral Air Force Station (CCAFS), Florida. The two primary facilities could be housed at any of the three sites either singly or in combination. Any future launch of the SBL would occur at CCAFS, Florida. Detailed facility designs for each of the candidate sites have not been prepared, although potential locations at each installation have been identified.

The EA indicates that construction and ancillary development of the proposed SBL complex facilities would result in the following impacts to Biological Resources:

> **SSC** - Some clearing of natural vegetation would occur associated with road widening, expansions of buildings, utility corridors/trenches, and igloo storage bunker ramps. Further, up to 8 acres of wetlands would be filled by the proposed construction of buildings, road widening, and expansion of a natural gas pipeline.
>
> **RSA/MSFC** - Construction activities for the PTF facility would result in the clearing of about 15 acres of land consisting primarily of pine forest habitat. In addition, about 0.78 acres of upland pine forest would be cleared for fiber-optic cable installation. The project also has the potential to impact listed species. The federally listed cave shrimp (*Palaeomonias alabamae*) could potentially occur in karst caverns on the site. Drilling of four exploratory boreholes at the PTF site, as well as excavation of the 50 to 60-foot-deep foundation for the main PTF building could affect karst features on the primary site, and consequently, cave shrimp. Moreover, the green salamander (*Aneides aeneus*), listed as protected by the State of Alabama, breeds in the hilly area just east of the proposed PTF site. Testing of the SBL will result in the production of hydrogen fluoride in the exhaust stream and may reduce pH levels in the surrounding soil and watershed. While no lethal toxicity problems are expected for adult salamanders, the increase in acidity potentially could affect salamander eggs and larvae.
>
> **CCAFS** - Construction activities would consist of modifying and renovating existing buildings and structures. Vegetation at all proposed locations currently consists of disturbed, maintained grass areas. Installation of a natural gas line and fiber optic communication line would be located within the existing utility corridor. Accordingly, no natural vegetation or wetlands would be impacted due to implementation of the project.

Based on the information provided, we note that the implementation of the project on the CCAFS site would result in the least impacts to biological resources. The CCAFS site is the only proposed project site that results in no disturbance to fish and wildlife resources, natural habitats, or wetlands. Conversely, locating the project at the SSC or RSA/MSFC sites would result in either loss of fish and wildlife habitat, filling of wetlands, or potential impacts to listed species. Consequently, we recommend that the Air Force select the CCAFS site to implement the project, and that both primary facilities (PTF and AI&TF) be housed at the CCAFS.

Sincerely,

Bradley J. Hartman, Director
Office of Environmental Services

BJH/JMW
ENV 1-3-2
spacelaser.sai.wpd
cc: U.S. Department of the Air Force
ATTN: Mr. Adel Hashad, P.E.
HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles AFB, CA 90245-4659

COUNTY: Brevard

DATE:	07/20/2000
COMMENTS DUE DATE:	08/04/2000
CLEARANCE DUE DATE:	08/04/2000
SAI#:	FL200007200512C

Message:

STATE AGENCIES	WATER MANAGEMENT DISTRICTS	OPB POLICY UNITS
Agriculture Community Affairs Environmental Protection Fish & Wildlife Conserv. Comm X State Transportation EA previously reviewed. 8-4-00	St. Johns River WMD RECEIVED AUG 1 0 2000 State of Florida Clearinghouse	Environmental Policy/C & ED Brevard SAI-USAF-EA-CC 839 2000-0594

The attached document requires a Coastal Zone Management Act/Florida Coastal Management Program consistency evalutation and is categorized as one of the following:

__ Federal Assistance to State or Local Government (15 CFR 930, Subpart F). Agencies are required to evaluate the consistency of the activity.

_X_ Direct Federal Activity (15 CFR 930, Subpart C). Federal Agencies are required to furnish a consistency determination for the State's concurrence or objection.

__ Outer Continental Shelf Exploration, Development or Production Activities (15 CFR 930, Subpart E). Operators are required to provide a consistency certification for state concurrence/objection.

__ Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

Project Description:

U.S. Department of the Air Force - Ballistic Missile Defense - Draft Environmental Assessment Space-Based Laser Integrated Flight Experiment Ground Testing - July 2000 - Cape Canaveral Air Force Station, Brevard County, Florida. Note: available on the web at: http://ax.laafb.af.mil/axf/sbl/
Username: eshipt
Password: stfea

To: **Florida State Clearinghouse**
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, FL 32399-2100
(850) 922-5438 (SC 292-5438)
(850) 414-0479 (FAX)

EO. 12372/NEPA

- [x] No Comment
- [ ] Comments Attached
- [ ] Not Applicable

Federal Consistency

- [x] ~~No~~ Comment/Consistent
- [ ] Consistent/Comments Attached
- [ ] Inconsistent/Comments Attached
- [ ] Not Applicable

From: Historical Resources
Division/Bureau: DHR/BHP — Frederick P. Gaske, Deputy SHPO 8/7/00
Reviewer: W.B. Yates
Date: 8-4-00

COUNTY: Brevard

Message:

DATE: 07/20/2000
COMMENTS DUE DATE: 08/04/2000
CLEARANCE DUE DATE: 08/04/2000
SAI#: FL200007200512C

STATE AGENCIES	WATER MANAGEMENT DISTRICTS	OPB POLICY UNITS
Agriculture Community Affairs Environmental Protection Fish & Wildlife Conserv. Comm State X Transportation	St. Johns River WMD	Environmental Policy/C & ED

RECEIVED
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State of Florida Clearinghouse

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Project Description:

U.S. Department of the Air Force - Ballistic Missile Defense - Draft Environmental Assessment Space-Based Laser Integrated Flight Experiment Ground Testing - July 2000 - Cape Canaveral Air Force Station, Brevard County, Florida. Note: available on the web at: http://ax.laafb.af.mil/axf/sbl/
Username: eshlpt
Password: stfea

To: Florida State Clearinghouse
Department of Community Affairs
2555 Shumard Oak Boulevard
Tallahassee, FL 32399-2100
(850) 922-5438 (SC 292-5438)
(850) 414-0479 (FAX)

EO. 12372/NEPA

- [x] No Comment
- [ ] Comments Attached
- [ ] Not Applicable

Federal Consistency

- [x] No Comment/Consistent
- [ ] Consistent/Comments Attached
- [ ] Inconsistent/Comments Attached
- [ ] Not Applicable

From:

Division/Bureau: Florida Dept. of Transportation - Aviation Office
Reviewer: Tom Duncan, Aviation Policy & Program Development Analyst
Date: 7/31/2000

COUNTY: Brevard

Rec'd 7/24/00

Message:

#1719

✓ 8/15

DATE: 07/20/2000

COMMENTS DUE DATE: 08/04/2000 7

CLEARANCE DUE DATE: 08/04/2000 8/18

SAI#: FL200007200512C

For Clear 8/3

STATE AGENCIES	WATER MANAGEMENT DISTRICTS	OPB POLICY UNITS
Agriculture Community Affairs Environmental Protection Fish & Wildlife Conserv. Comm State Transportation	X St. Johns River WMD	Environmental Policy/C & ED

RECEIVED
AUG 21 2000
State of Florida Clearinghouse

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- Federal Licensing or Permitting Activity (15 CFR 930, Subpart D). Such projects will only be evaluated for consistency when there is not an analogous state license or permit.

Project Description:

U.S. Department of the Air Force - Ballistic Missile Defense - Draft Environmental Assessment Space-Based Laser Integrated Flight Experiment Ground Testing - July 2000 - Cape Canaveral Air Force Station, Brevard County, Florida. Note: available on the web at: http://ax.laafb.af.mil/axf/sbl/
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(850) 414-0479 (FAX)

EO. 12372/NEPA

- ☐ No Comment
- ☐ Comments Attached
- ☐ Not Applicable

Federal Consistency

- ☒ No Comment/Consistent
- ☐ Consistent/Comments Attached
- ☐ Inconsistent/Comments Attached
- ☐ Not Applicable

From:

Division/Bureau: SJRWMD/OPP

Reviewer: [signature]

Date: 8/15/00

FLORIDA STATE CLEARINGHOUSE BR 00 250
RPC INTERGOVERNMENTAL COORDINATION AND RESPONSE SHEET

RECEIVED JUL 2 4 2000

SAI #: FL200007200512C

DATE: 07/20/2000

COMMENTS DUE TO CLEARINGHOUSE: 08/19/2000

AREA OF PROPOSED ACTIVITY: COUNTY: Brevard County

☐ FEDERAL ASSISTANCE ☒ DIRECT FEDERAL ACTIVITY ☐ FEDERAL LICENSE OR PERMIT ☐ OCS

PROJECT DESCRIPTION

U.S. Department of the Air Force - Ballistic Missile Defense - Draft Environmental Assessment Space-Based Laser Integrated Flight Experiment Ground Testing - July 2000 - Cape Canaveral Air Force Station, Brevard County, Florida. Note: available on the web at: http://ax.laafb.af.mil/axf/sbl/ USERNAME: ESHIPT PASSWORD: STFEA

ROUTING:

RPC

X E. Central FL RPC

PLEASE CHECK ALL THE LOCAL GOVERNMENTS BELOW FROM WHICH COMMENTS HAVE BEEN RECEIVED; ALL COMMENTS RECEIVED SHOULD BE INCLUDED IN THE RPC'S CLEARINGHOUSE RESPONSE PACKAGE. IF NO COMMENTS WERE RECEIVED, PLEASE CHECK "NO COMMENT" BOX AND RETURN TO CLEARINGHOUSE.

COMMENTS DUE TO RPC: 08/10/2000

NO COMMENTS: ✓

(IF THE RPC DOES NOT RECEIVE COMMENTS BY THE DEADLINE DATE, THE RPC SHOULD CONTACT THE LOCAL GOVERNMENT TO DETERMINE THE STATUS OF THE PROJECT REVIEW PRIOR TO FORWARDING THE RESPONSE PACKAGE TO THE CLEARINGHOUSE.)

NOTES:

ALL CONCERNS OR COMMENTS REGARDING THE ATTACHED PROJECT (INCLUDING ANY RPC COMMENTS) SHOULD BE SENT IN WRITING BY THE DUE DATE TO THE CLEARINGHOUSE. PLEASE ATTACH THIS RESPONSE FORM AND REFER TO THE SAI # IN ALL CORESPONDENCE.

IF YOU HAVE ANY QUESTIONS REGARDING THE ATTACHED PROJECT, PLEASE CONTACT THE STATE CLEARINGHOUSE AT (904) 922-5438 OR SUNCOM 272-5438.

STATE OF ALABAMA
ALABAMA HISTORICAL COMMISSION
468 SOUTH PERRY STREET
MONTGOMERY, ALABAMA 36130-0900

LEE H. WARNER
EXECUTIVE DIRECTOR

TEL: 334-242-3184
FAX: 334-240-3477

August 4, 2000

Adel Hashad
P.E., HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles, California 90245-4659

Re: AHC 00-0241
Draft Environmental Assessment
Space-Based Laser Integrated Flight Experiment Ground Testing
Redstone Arsenal
Madison County, Alabama

Dear Mr. Hashad:

Upon review of the Draft EA submitted by your office, the Alabama Historical Commission has determined that the overall EA is well done. However, we have a few comments which need to be addressed which basically outline the stipulations in the EA.

1. Page 3-53, Line 27: Please send an archaeological site form for the site included with the Hams House.
2. Page 40-39, Line 37: The cemetery may not be NR eligible but it must be protected under the Alabama Burial Act.
3. Page 4-40, Line 1: We agree that 1 Ma 630 will require Phase II testing prior to ground disturbance. Phase II proposals should be developed and submitted to our office for review and approval prior to implementation. Also, 1 Ma 269 could be destroyed by explosives and we request consultation regarding further testing at this site.
4. Page 4-40, Line 22: We agree that a Phase I survey should be conducted for the fiber optic line prior to construction activities.
5. We continue to wait for the determination of eligibility for building 8027 and the igloos. It would be a great assistance to have the completed World War II and Cold War reports in our evaluation of these structures.

We appreciate your efforts on this project and we look forward to working with you to its conclusion. Should you have any questions or comments, please contact Stacye Hathorn, Blythe Semmer, or Greg Rhinehart of our office.

Sincerely,

Elizabeth Ann Brown
Deputy State Historic Preservation Officer

EAB/SGH/JBS/GCR

United States Department of the Interior

FISH AND WILDLIFE SERVICE
P. O. Drawer 1190
Daphne, Alabama 36526

IN REPLY REFER TO:

July 13, 2000

Dr. Steven D. Bach
Parsons Engineering Science, Inc.
5390 Triangle Parkway, Suite 100
Norcross, GA 30092

Dear Dr. Bach:

Thank you for your letter dated, June 20, 2000, requesting comments on the Space and Missile Systems Center, U.S. Air Force proposal to construct and operate a Space-Based Laser Integrated Flight Experiment Ground Testing facility at Redstone Arsenal, Alabama. We have reviewed the information you enclosed and are providing the following comments in accordance with the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

Although a known population of Alabama cave shrimp (*Palaemonias alabamae*) exist in Bobcat Cave on Redstone Arsenal, the action as specified in your letter is not likely to adversely affect this species. Therefore, no further endangered species consultation will be required for this portion of the project unless: 1) the identified action is subsequently modified in a manner that causes an effect on listed species or designated Critical Habitat; 2) new information reveals the identified action may affect Federally protected species or designated Critical Habitat in a manner or to an extent not previously considered; or 3) a new species is listed or Critical Habitat is designated under the Endangered Species Act that may be affected by the identified action.

If you need any additional information, please contact Mr. Bruce Porter, at 334-441-5181 x 37 and kindly refer to the reference number above.

Sincerely,

Larry E. Goldman
Field Supervisor

AUG 3 2000

MEMORANDUM FOR UNITED STATES DEPARTMENT OF INTERIOR
Fish and Wildlife Service
6620 Southpoint Drive South Suite 310
Jacksonville FL 32216-0912

FROM: 45 CES/CEV
1224 Jupiter Street MS 9125
Patrick AFB FL 32925-3343

SUBJECT: Initiation of Section 7 Consultation for the Space Based Laser Test Facility at Cape Canaveral Air Force Station (CCAFS) FL

1. The Space and Missile Systems Center (SMC), Air Force Materiel Command, Department of the Air Force is the executing agent for the Ballistic Missile Defense Organization (BMDO) Space-Based Laser (SBL) Integrated Flight Experiment (IFX) ground testing facility, under consideration for siting at CCAFS. A draft Environmental Assessment (EA) has been prepared and is posted on the Internet (http://ax.laafb.af.mil/axf/sbl/), SMC/AXF Intranet web site. Two additional locations in Alabama and Mississippi are also being considered. In order to facilitate your review and advance the consultation process to a quick conclusion, extracted portions of the draft EA relevant to your analysis are attached to this letter. This program is on a compressed schedule and I would appreciate your earliest possible review.

2. SMC is requesting that you review the EA for the potential impacts of this program at CCAFS. Your office had reviewed an earlier proposal for a Space Based Laser Test Facility (STF). This earlier proposal included locations on Kennedy Space Center and use of a CCAFS launch complex. The new proposal includes locations only on CCAFS at three primary locations on near the western boundary, away from sea turtle nesting areas. Most of the program requirements would be met using existing facilities, and all construction would occur in previously disturbed areas within existing facility complex boundaries. In addition, all STF facilities will minimize exterior lights and comply with 45th Space Wing Light Management Policies.

3. Your comments are requested. The technical point of contact is Mr. Michael Camardese at (321) 853-0910 or E-mail *michael.camardese@patrick.af.mil*.

Randall Roland
For A. CLAY GORDIN, GM-13
Chief, Environmental Planning

Attachments:
1. Excerpted Portions of DRAFT EA for LTF
2. Excerpted Figures of DRAFT EA for LTF

cc:
Adel Hashad, P.E.

APPENDIX C

PUBLIC COMMENTS

Space-Based Laser Integrated Flight Experiment Ground Testing
Public Draft Environmental Assessment—Public Comments
9/10/2000

Comment No.	Drawing or Reference No.	Comment	Response
		Comments Made by: *Hal Brokaw*	
1		I am writing because I feel that the environmental assessment fails to adequately address the socioeconomic impacts of the program. The development and testing of a space based laser will have devastating impacts upon our society as it will consume huge quantities of money which if not spent (the no action alternative) could be spent to better the lives of people who need better access to health care, food and adequate housing. Every penny spent on unnecessary military expenditures means lower quality of life for the people of our nation and the world. The no action alternative will more likely bring about a more just and peaceful world than proceeding with this program. This program is destabilizing politically and long term will be destabilizing economically. The consumption of resources that this program envisions will hasten and add to Global Warming and overall environmental degradation. The No action alternative would not consume precious resources and would give our environment a little more slack to recover from humankind abuses.	The estimated socioeconomic impacts of the program are provided within the EA. The author's comments reflect an assessment that the money proposed for expenditure on the program could be better spent on other needs. This is a policy-level assessment which is beyond the scope of NEPA. No specific analysis included in the EA has been noted as deficient. The inadequacy noted appears to not reflect a deficiency in the analysis, but a comment on better alternative uses of the proposed program funding.
		Comments Made by: *Mark Gubrud*	
1	Sec 1.1	This section, subtitled "Background," misstates the history and significance of the SBL program as follows: "The Space-Based Laser (SBL) is a research program aimed at developing and demonstrating the technology for a space-based directed energy weapon for ballistic missile defense that has the global capability for negating ballistic missiles in the boost phase. The program has its roots in the Defense Advanced Research Projects Agency (DARPA), beginning over 20 years ago (ca. 1977). The program transitioned to the Strategic Defense Initiative Organization (SDIO). The current SBL program is the culmination of previous space-based directed energy programs." The text then goes on to acknowledge that the "previous space-based directed energy programs" which the SBL "is the culmination of" include the "Alpha High Energy Laser (HEL), a megawatt-class hydrogen-fluoride laser" and the	The current ground-test program is technology demonstration for ballistic missile defense.

Comment No.	Drawing or Reference No.	Comment	Response
		"Large Optics Demonstration Experiment (LODE)". What has been left out of this account is the fact that Alpha and LODE were originally intended not for ballistic missile defense but "for offensive and defensive satellite weapons", as reported by USAF Lt. Col. William H. Possel, who noted ["New Concepts for Space-based and Ground-based Laser Weapons," Occasional Paper No. 5, Center for Strategy and Technology, Air War College, Maxwell AFB, Alabama]: "The original notions for the Alpha laser, LODE optics and Talon Gold ATP/FC were technology development programs that were conducted in the early 2980's [sic] for an antisatellite SBL concept." The United States did not suddenly lose interest in antisatellite weapons in 1983, when its directed-energy weapons programs were reorganized under SDIO. In fact, as recently as October, 1997, the MIRACL laser, also derived from Alpha, was tested against a satellite in orbit, in what is believed to be the only such test of a directed-energy antisatellite weapon ever conducted by any nation. While United States policy in this area remains ambiguous, the U.S. has refused repeated appeals by Russia, China, and other nations, to restart negotiations toward verifiable arms control of space weapons. U.S. military officers and official documents have in recent years spoken with increasing frequently and frankness about the goal of "Space Control," meaning the use of space or ground-based antisatellite weapons to attack targets in space and deny the use of space resources to other nations. For example, the United States Space Command's "Long Range Plan" of April 1998 states [Chap. 3, "USSPACECOM Vision for 2020]: "...we must protect our space assets and be able to deny other nations from gaining an advantage through their space systems." Chapter 5 of the same document, outlines the "Key Objectives," including "Negation [which] means applying military force to affect an adversary's space capability by targeting ground-support sites, ground-to-space links, or spacecraft." Figure 5-2 of the same document [attached to this email; entire document also available at http://www.fas.org/spp/military/docops/usspac/lrp/toc.htm] depicts the Space-Based Laser, in space, attacking a satellite, with the caption,	

Comment No.	Drawing or Reference No.	Comment	Response
		"Negation". Thus, while the draft EA strives to appear as exemplary in its consideration of possible impacts on endangered species, Native American cultural artifacts, environmental justice and the like, its statement as to the "Purpose Of and Need For Action" is fundamentally dishonest. A minimal correction, in order that the EA's statement of the "Purpose Of and Need For Action" be factually and meaningfully accurate, might be to amend the first sentence of Section 1.1 so that it reads, "The Space-Based Laser (SBL) is a research program aimed at developing and demonstrating the technology for a space-based directed energy weapon for ballistic missile defense and for space control, that has the global capability for negating ballistic missiles in the boost phase, and for attacking satellites and other spacecraft either during launch or in space."	
2	Sec 1.2	This section, subtitled "Purpose Of and Need For the Proposed Action," fails to make a case that there exists a need for the proposed action, but rather helpfully explains why there is in fact no such need. The text states, "For over fifty years, ballistic missiles have been a threat to the United States and its military operations. During the Cold War, the strategic balance between Soviet and U.S. forces held this threat in check through the ability of each side to destroy the other after an initial attack." The text then goes on to discuss the problem of the proliferation of missile and weapons of mass destruction capabilities. However, such proliferation has done nothing to alter the basic capability of the United States to destroy any attacking nation after an initial attack. Indeed, with respect to any of the proliferant "States of Concern," the U.S. position is much more favorable than that it held with respect to the Soviet Union during the Cold War, since the United States holds a unilateral capability to destroy newly-proliferant states, while the latter would have only the capability to inflict some level of damage on the United States or its forces.	The purpose of the proposed action is ground-testing relative to a technology demonstration program. No decision relative to an actual operational SBL system is intended.
3	Secs 4.1.1.1, 4.1.9.1, 4.2.4.1	The EA's finding of "No Significant Impact" is predicated on the expected functioning of the laser system itself as well as the scrubbers and recovery system to contain the toxic chemicals that will be used. At several points in the document, reference is made to the possibility of a catastrophic explosion that could result in a sudden release of a large quantity of toxic	Actually, the analysis in the EA does consider a catastrophic accident involving a release of the chemicals and gases associated with the laser. The conclusions noted were at the end of considering a catastrophic release scenario. Although the IFX test vehicle will have the laser chemicals loaded, in case of an explosion of the laser chemicals, the Quantity

Comment No.	Drawing or Reference No.	Comment	Response
		materials and/or destruction of surrounding structures with additional environmental consequences. In each of these references, it is stated that the such an accident is unlikely. However, no reason for such an assessment of risk is given. A priori, given the long history of catastrophic explosions occurring during the development and testing of rocket motors and other systems involving rapid combustion and high-velocity flows, the likelihood of such an accident occurring during operation of the SBL test facility cannot be discounted. Development of a successful laser weapon requires the management of extreme power densities and controlled removal of waste heat, since more energy is being converted into heat in the weapon system than will be deposited on the target. The design of the SBL is further stressed by the fact that it is a spacecraft so that materials, dimensions and material thicknesses must be chosen so as to minimize weight. The fact that this is an issue for the SBL is indicated by the EA's statement [Sect. 2.2, page 2-2] that one of the criteria for choosing a site is the need to "minimize the number of vertical-to-horizontal rotations for the assembled IFX and ITU during ground testing". Thus, we must assume that the SBL has been designed to minimize size and weight rather than to optimize safety for ground testing. Therefore, the EA cannot be considered complete without a thorough evaluation of the actual likelihood of a catastrophic explosion, and factoring of this into the overall assessment of likely impact.	Distance (QD) zone will protect against the destruction of surrounding structures, and the 0.75 miles radius buffer zone will protect against the dispersion of the toxic chemicals. No propellants for the IFX SV motors will be either loaded or tested in this ground testing phase, eliminating the possibility of explosion from motor propellants.
		Comments Made by: *Mike Serfas*	
1		I believe that the Environmental Assessment (http://ax.laafb.af.mil/axf/eaapgs/sblpubea.htm) has omitted the most probable source of ecological damage from testing of the SBL infrared laser: mistargeting of the laser beam following its reflection from the reflector satellite, resulting in its impact upon the Earth's surface. This mistargeting, whether resulting from software failure, hardware problems, or intentional misuse, could ignite dozens or hundreds of wild fires over a large geographic area. To illustrate, a one megawatt laser delivers one million joules in one second, which is approximately sufficient to raise the temperature of 2.5 liters of water by 100 degrees centigrade. Such a quantity of heat, delivered by infrared light to the surface of dry terrain	The decision that will be made is whether or not to proceed with ground testing of the IFX. As noted in the EA, all ground testing will be conducted within enclosed facilities, and the laser beam will not travel outside the facilities.

Comment No.	Drawing or Reference No.	Comment	Response
		within a small target area, seems quite sufficient to start a fire. Thus a programming flaw or intentional command could start one wildfire per second. Putting them out, needless to say, has been much more difficult, whether we speak of Indonesia, Brazil, Mexico, or the United States, all of which have had recent experience with the loss of life and property associated with such fires. Mistargeting can occur with any weapons system and is not always an environmental problem per se. However, the invisibility of the laser beam in space, and of infrared light to civilians, the inaccessible nature of the orbiting reflector, and the unique degree of personal secrecy potentially associated with targeting of the beam via coded communications, raise genuine environmental questions concerning how mistargeting is handled and whether it will even be detected within this particular context. A plane that drops a bomb on the wrong target is an accident. A plane that drops bombs randomly during flight without the knowledge of those in command is an environmental problem. Does a record of the targeted terrain exist which is independent of, and unalterable by, any command sent to the satellite, and any failure of its associated software? If an individual, agency, or organization uses the reflector without authorization to set fire to land, industrial facilities such as oil refineries and chemical plants, or personnel, is there any way to ensure full accountability for these actions? How long a time interval is required between the first mistargeting of the reflected beam (such as by a competing unauthorized control signal), and shut-down of the laser? Will secure encryption and signature protocols be in place that allow a larger class of persons other than the presumably very short list of authorized users to audit, but not create, the content of control signals? Unless such questions are considered, I see no way that the report can ensure that environmental quality of regions throughout the United States will be unaffected. These questions become particularly important to those members of the general public, such as myself, who are skeptical of the utility of this device in stopping nuclear missiles equipped with mirrors and chaff, and who suspect that covert use against military and civilian targets is the primary purpose of the SBL facility.	

From: Hal Brokaw [hal48104@yahoo.com]
Sent: Monday, October 09, 2000 1:48 PM
To: Adel.Hashad@losangeles.af.mil
Subject: Comment on DEA of Space Based Laser Program

I am writing because I feel that the environmental
assessment
fails to adequately address the socioeconomic impacts
of the program.
The development and testing of a space based laser
will have
devastating impacts upon our society as it will
consume huge
quantities of money which if not spent (the no action
alternative)
could be spent to better the lives of people who need
better
access to health care, food and adequate housing.
Every penny spent on
unnecessary military expenditures means lower quality
of
life for the people of our nation and the world. The
no action
alternative will more likely bring about a more just
and
peaceful world than proceding with this program. This
program
is destabilizing politically and long term will be
destabilizing
economically. The consumption of resources that this
program envisions
will hasten and add to Global Warming and overall
environmental
degradation. The No action alternative would not
consume precious resources and would give our
environment a little more slack to recover from
humankinds abuses. Thank you. My name is Harold
Brokaw, 362 London Rd., Asheville, NC, 28803

From: Mark Gubrud [mgubrud@squid.umd.edu]
Sent: Monday, October 09, 2000 2:30 PM
To: Adel.Hashad@losangeles.af.mil
Subject: Final edit, Public Comments on SBL IFXGT EA (w/ attached .jpg)

---------- Forwarded message ----------
Date: Mon, 9 Oct 2000 16:57:23 -0400 (EDT)
From: Mark Gubrud <mgubrud@squid.umd.edu>
Subject: Public Comments on SBL IFXGT EA (w/ attached .jpg)

Space-Based Laser Integrated Flight Experiment Ground Testing
Public Draft Environmental Assessment
August 2000

Comments Made by:

Mark A. Gubrud,

Physics Department,
University of Maryland, College Park
(These comments reflect the views of the individual named, and not of the University of Maryland or any of its units.)

Oct. 9, 2000

Comment No. 1
In reference to Section 1.1:

This section, subtitled "Background," misstates the history and significance of the SBL program as follows:

> "The Space-Based Laser (SBL) is a research program aimed at developing and demonstrating the technology for a space-based directed energy weapon for ballistic missile defense that has the global capability for negating ballistic missiles in the boost phase. The program has its roots in the Defense Advanced Research Projects Agency (DARPA), beginning over 20 years ago (ca. 1977). The program transitioned to the Strategic Defense Initiative Organization (SDIO).... The current SBL program is the culmination of previous space-based directed energy programs."

The text then goes on to acknowledge that the "previous space-based directed energy programs" which the SBL "is the culmination of" include the

> "Alpha High Energy Laser (HEL), a megawatt-class hydrogen-flouride laser"

and the

> "Large Optics Demonstration Experiment (LODE)".

What has been left out of this account is the fact that Alpha and LODE were originally intended not for ballistic missile defense but "for offensive and defensive satellite weapons", as reported by USAF Lt. Col. William H. Possel, who noted ["New Concepts for Space-based and Ground-based Laser Weapons," Occasional Paper No. 5, Center for Strategy and Technology, Air War College, Maxwell AFB, Alabama]:

> "The original notions for the Alpha laser, LODE optics and Talon Gold ATP/FC were technology development programs that were conducted in the early 2980's [sic] for an antisatellite SBL concept."

The United States did not suddenly lose interest in antisatellite weapons in 1983, when its directed-energy weapons programs were reorganized under SDIO. In fact, as recently as October, 1997, the MIRACL laser, also derived from Alpha, was tested against a satellite in orbit, in what is believed to be the only such test of a directed-energy antisatellite weapon ever conducted by any nation.

While United States policy in this area remains ambiguous, the U.S. has refused repeated appeals by Russia, China, and other nations, to restart negotiations toward verifiable arms control of space weapons. U.S. military officers and official documents have in recent years spoken with increasing frequently and frankness about the goal of "Space Control," meaning the use of space or ground-based antisatellite weapons to attack targets in space and deny the use of space resources to other nations. For example, the United States Space Command's "Long Range Plan" of April 1998 states [Chap. 3, "USSPACECOM Vision for 2020]:

> "...we must protect our space assets and be able to deny other nations from gaining an advantage through their space systems."

Chapter 5 of the same document, outlines the "Key Objectives," including

> "Negation [which] means applying military force to affect an adversary's space capability by targeting ground-support sites, ground-to-space links, or spacecraft."

Figure 5-2 of the same document

> [attached to this email; entire document also available at http://www.fas.org/spp/military/docops/usspac/lrp/toc.htm]

depicts the Space-Based Laser, in space, attacking a satellite, with the caption, "Negation".

Thus, while the draft EA strives to appear as exemplary in its consideration of possible impacts on endangered species, Native American cultural artifacts, environmental justice and the like, its statement as to the "Purpose Of and Need For Action" is fundamentally dishonest.

A minimal correction, in order that the EA's statement of the "Purpose Of and Need For Action" be factually and meaningfully accurate, might be to amend the first sentence of Section 1.1 so that it reads,

> "The Space-Based Laser (SBL) is a research program aimed

> at developing and demonstrating the technology for a space-based directed energy weapon for ballistic missile defense and for space control, that has the global capability for negating ballistic missiles in the boost phase, and for attacking satellites and other spacecraft either during launch or in space."

Comment No. 2

In reference to Section 1.2:

This section, subtitled "Purpose Of and Need For the Proposed Action," fails to make a case that there exists a need for the proposed action, but rather helpfully explains why there is in fact no such need. The text states,

> "For over fifty years, ballistic missiles have been a threat to the United States and its military operations. During the Cold War, the strategic balance between Soviet and U.S. forces held this threat in check through the ability of each side to destroy the other after an initial attack."

The text then goes on to discuss the problem of the proliferation of missile and weapons of mass destruction capabilities. However, such proliferation has done nothing to alter the basic capability of the United States to destroy any attacking nation after an initial attack. Indeed, with respect to any of the proliferant "States of Concern," the U.S. position is much more favorable than that it held with respect to the Soviet Union during the Cold War, since the United States holds a unilateral capability to destroy newly-proliferant states, while the latter would have only the capability to inflict some level of damage on the United States or its forces.

Comment No. 3

In reference to sections 4.1.1.1, 4.1.9.1, 4.2.4.1:

The EA's finding of "No Significant Impact" is predicated on the expected functioning of the laser system itself as well as the scrubbers and recovery system to contain the toxic chemicals that will be used. At several points in the document, reference is made to the possibility of a catastrophic explosion that could result in a sudden release of a large quantity of toxic materials and/or destruction of surrounding structures with additional environmental consequences. In each of these references, it is stated that the such an accident is unlikely. However, no reason for such an assessment of risk is given.

A priori, given the long history of catastrophic explosions ocurring during the development and testing of rocket motors and other systems involving rapid combustion and high-velocity flows, the likelihood of such an accident occuring during operation of the SBL test facility cannot be discounted. Development of a successful laser weapon requires the management of extreme power densities and controlled removal of waste heat, since more energy is being converted into heat in the weapon system than will be deposited on the target. The design of the SBL is further stressed by the fact that it is a spacecraft so that materials, dimensions and material thicknesses must be chosen so as to minimize weight. The fact that this is an issue for the SBL is indicated by the EA's statement [Sect. 2.2, page 2-2] that one of the criteria for choosing a site is the need to "minimize the number of vertical-to-horizontal rotations for the assembled IFX and ITU during ground testing". Thus, we must assume that the SBL has been designed to minimize size and weight rather than to optimize safety for ground testing.

Therefore, the EA cannot be considered complete without a thorough evaluation of the actual likelihood of a catastrophic explosion, and factoring of this into the overall assessment of likely impact.

From: Mike Serfas [Michael.Serfas@uic.edu]
Sent: Thursday, October 05, 2000 3:49 AM
To: Adel.Hashad@losangeles.af.mil
Cc: globalnet@mindspring.com
Subject: Comments: Environmental Assessment for the Space Based Laser Program

I believe that the Environmental Assessment (http://ax.laafb.af.mil/axf/eaapgs/sblpubea.htm) has omitted the most probable source of ecological damage from testing of the SBL infrared laser: mistargeting of the laser beam following its reflection from the reflector satellite, resulting in its impact upon the Earth's surface. This mistargeting, whether resulting from software failure, hardware problems, or intentional misuse, could ignite dozens or hundreds of wild fires over a large geographic area. To illustrate, a one megawatt laser delivers one million joules in one second, which is approximately sufficient to raise the temperature of 2.5 liters of water by 100 degrees centigrade. Such a quantity of heat, delivered by infrared light to the surface of dry terrain within a small target area, seems quite sufficient to start a fire. Thus a programming flaw or intentional command could start one wildfire per second. Putting them out, needless to say, has been much more diff!
!
icult, whether we speak of Indonesia, Brazil, Mexico, or the United States, all of which have had recent experience with the loss of life and property associated with such fires.

Mistargeting can occur with any weapons system and is not always an environmental problem per se. However, the invisibility of the laser beam in space, and of infrared light to civilians, the inaccessible nature of the orbiting reflector, and the unique degree of personal secrecy potentially associated with targeting of the beam via coded communications, raise genuine environmental questions concerning how mistargeting is handled and whether it will even be detected within this particular context. A plane that drops a bomb on the wrong target is an accident. A plane that drops bombs randomly during flight without the knowledge of those in command is an environmental problem.

Does a record of the targeted terrain exist which is independent of, and unalterable by, any command sent to the satellite, and any failure of its associated software? If an individual, agency, or organization uses the reflector without authorization to set fire to land, industrial facilities such as oil refineries and chemical plants, or personnel, is there any way to ensure full accountability for these actions? How long a time interval is required between the first mistargeting of the reflected beam (such as by a competing unauthorized control signal), and shut-down of the laser? Will secure encryption and signature protocols be in place that allow a larger class of persons other than the presumably very short list of authorized users to audit, but not create, the content of control signals? Unless such questions are considered, I see no way that the report can ensure that environmental quality of regions throughout the United States will be unaffected.

These questions become particularly important to those members of the general public, such as myself, who are skeptical of the utility of this device in stopping nuclear missiles equipped with mirrors and chaff, and who suspect that covert use against military and civilian targets is the primary purpose of the SBL facility.

Sincerely,
Mike Serfas
Chicago, IL

The following public comments do not raise environment safety and health (ESH) issues; therefore, no ESH response is provided.

From: alyse schrecongost [alyse_schrecongost@hotmail.com]
Sent: Monday, October 02, 2000 9:26 PM
To: Adel.Hashad@losangeles.af.mil
Subject: SBL Environmental Assesment

Dear Mr. Hashad,

I would like to comment on the Environmental Assesment of the proposed Space

Based Laser Program. The launching of such a program will spark a new arms race and waste untold billions of tax dollars.
We must face such national defense proposals as a race of people not only as

a nation, and we cannot afford the environmental, monetary or human costs of another arms race.
Discovering the wonders and bounds of technology should not be tied down to the burden of war games. Only human wisdom will evert world wars in the future, no bomb or defense will ever be "smart" enough to be wise.

Thank you for your thoughtful attention.

Sincerely,
Alyse Schrecongost

From: angela paschall [apaschall@email.com]
Sent: Wednesday, October 04, 2000 8:03 AM
To: Adel.Hashad@losangeles.af.mil
Subject: SBL

Dear Mr. Hashad:
I am writing to express my opposition to the Space Based Laser Program. This program ultimately wastes 30 BILLION taxpayer dollars, and will serve only to create an arms race, promoting the defense industry over the citizens of this country and elsewhere in the world. Please do what you can to halt this unneccessary expense and potential diplomatic boondoggle.

Sincerely,

Angela Paschall
2223 15th Street #4
Lubbock, TX 79401
USA

From: Bobbie Flowers [bobbie_dee@juno.com]
Sent: Wednesday, October 04, 2000 4:50 AM
To: Adel.Hashad@losangeles.af.mil
Cc: globalnet@mindspring.com
Subject: Against Star Wars

------Original Message------
From: Bobbie Flowers <bobbie_dee@juno.com>
To: Adel.Hashad@losangeles.af.mil
Sent: October 4, 2000 11:41:53 AM GMT
Subject: [No Subject]

10/04/00

I am sending my comments to (please copy us):
Adel Hashad, P.E.
HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles AFB, CA 90245
(310) 363-1170 (Fax)
e-mail: Adel.Hashad@losangeles.af.mil

My Suggested comments include:

1) There is no threat to justify developing a space based laser program

2) The costs, $30 billion for the whole program, is a waste of tax dollars.
(The test program itself is to cost at least $300 million.)

3) The development & testing of the SBL program will help to generate a new
arms race into space

4) We understand the key role that the SBL plays in the Space Command's desire to be the Master of Space. The SBL is the real Reagan-era "Star Wars" program.
It has nothing to do with "defending" the U.S. from attack.

Please help us by spreading word to your lists about this EA. Thanks for
your help.

Sincerely,

Mr. Bobbie D. Flowers
418 West 17th Street, Apt #22A
New York, NY 10011-5826
(775)743-5080 (Fax)
bobbie_dee@juno.com

Bruce K. Gagnon
Coordinator
Global Network Against Weapons & Nuclear Power in Space
PO Box 90083
Gainesville, FL. 32607

From: Bobbie Flowers [bobbie_dee@juno.com]
Sent: Wednesday, October 04, 2000 4:50 AM
To: Adel.Hashad@losangeles.af.mil
Cc: globalnet@mindspring.com
Subject: Against Star Wars

------Original Message------
From: Bobbie Flowers <bobbie_dee@juno.com>
To: Adel.Hashad@losangeles.af.mil
Sent: October 4, 2000 11:41:53 AM GMT
Subject: [No Subject]

10/04/00

I am sending my comments to (please copy us):
Adel Hashad, P.E.
HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles AFB, CA 90245
(310) 363-1170 (Fax)
e-mail: Adel.Hashad@losangeles.af.mil

My Suggested comments include:

1) There is no threat to justify developing a space based laser program

2) The costs, $30 billion for the whole program, is a waste of tax dollars.
(The test program itself is to cost at least $300 million.)

3) The development & testing of the SBL program will help to generate a new
arms race into space

4) We understand the key role that the SBL plays in the Space Command's desire to be the Master of Space. The SBL is the real Reagan-era "Star Wars" program.
It has nothing to do with "defending" the U.S. from attack.

Please help us by spreading word to your lists about this EA. Thanks for
your help.

Sincerely,

Mr. Bobbie D. Flowers
418 West 17th Street, Apt #22A
New York, NY 10011-5826
(775)743-5080 (Fax)
bobbie_dee@juno.com

Bruce K. Gagnon
Coordinator
Global Network Against Weapons & Nuclear Power in Space
PO Box 90083
Gainesville, FL. 32607

(352) 337-9274
http://www.space4peace.org
globalnet@mindspring.com

418 West 17th Street, Apt #22A
New York, N.Y. 10011-5826
Phone: 212/242-0319
Email: bobbie_dee@juno.com

418 West 17th Street, Apt #22A
New York, N.Y. 10011-5826
Phone: 212/242-0319
Email: bobbie_dee@juno.com

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418 West 17th Street, Apt #22A
New York, N.Y. 10011-5826
Phone: 212/242-0319
Email: bobbie_dee@juno.com

Global Network Against Weapons and Nuclear Power in Space

October 2, 2000

Adel Hashad, P.E.
HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles, CA. 90245

Dear Ms. Hashad:

We are writing in regard to the Pentagon's Environmental Assessment for the Space Based Laser Project that is now under public comment period.

We do not understand the need for the development and testing of the SBL program. There are no serious threats in the world today that would justify this program. Does your EA spell out who the threats are?

At a time when senior citizens cannot afford prescription drug medications, schools have leaks in their roofs, roads and bridges are in disrepair all over the nation, and our environment needs major clean-up, we cannot understand how the expenditure of over $30 billion on the SBL program can be justified.

We know that the U.S. Space Command has stated that they intend to "control and dominate" space and to "deny" other countries access to space. It is clear to us why the Pentagon and the aerospace corporations are pushing the SBL program. It is the linchpin in the plan to move the arms race into the heavens. It is the "follow-on" technology to national missile defense and will lead to a new arms race in space that will only benefit the aerospace industry and their allies in the Pentagon and Congress.

The taxpayers are being fleeced by this program, and others like it. Instead of developing and testing the SBL program we strongly demand the "no action" alternative. If you truly wish to protect the American people that would be the best course to take. Save the money for things that truly would benefit the people of this country and the world.

In peace,

Bruce K. Gagnon
Coordinator

P.O. Box 90083 • Gainesville, FL 32607 • (352) 337-9274
globalnet@mindspring.com • www.space4peace.org

From: colnstash@juno.com
Sent: Sunday, October 08, 2000 4:50 PM
To: Adel.Hashad@losangeles.af.mil
Cc: globalnet@mindspring; .com@staff.juno.com
Subject: SBL Protest!

I most vehemently oppose the development of a space-based laser program. There is no threat which justifies this massive use or, more rightly, mis-use of tax-payers money. All that such a misguided program could do would be to start a new arms race into space. We already have an excessive non-space arms buildup that robs education, heath, and other programs that truly promote the common good. How "spaced-out" are we that we can even consider a SBL program rather than attending to basic human needs that stare us directly in the face each day?

Sincerely,
Colette Corwin
2081 Tocobaga Lane
Nokomis, FL 34275

From: Craig Clark [cbc7craigclark@yahoo.com]
Sent: Monday, October 02, 2000 6:43 PM
To: Adel.Hashad@losangeles.af.mil
Subject: re: weapons in space

Dear Sir:
I am a Senior at Austin Seminary in Austin TX and would like very much to voice my opinions re: the implementation of weaponry in space.

I believe at the present there is no threat to justify developing a space based laser program. And with our infrastructures crumbling, the costs ($30 billion for the whole program) is a waste of poorly needed tax dollars. (The test program itself is to cost at least $300 million!) Think of how many teachers could benefit from these funds instead. Besides, I believe the development & testing of the SBL program will help to generate a new arms race into space, as the Chinese and Russian would then be lacking in equal footing.
It appears the key role that the SBL plays in the Space Command's plan is a flagrant desire to be the Master of Space, for the SBL is the real Reagan-era "Star Wars" program--I believe it has little or nothing to do with "defending" the U.S. from attack.

I write out of great concern and respect. As a Father and as a child of God, it doesn't make sense to journey off down "this road" so fraught with peril. There are better ways to spend our days and dollars. Please consider the above concerns.

Thank you for your time and consideration.

Sincerely,
Craig Clark
c/o Austin Presbyterian Theological Seminary
100 East 27th
Austin TX 78705
512.472.6736

From: David Perley [dperley@worldnet.att.net]
Sent: Wednesday, October 04, 2000 5:53 PM
To: Adel.Hashad@losangeles.af.mil
Subject: attack

The attempt to stop rocket attacks are ridiculous. Once a friend of mine wetted a kitchen match in school and struck it and threw it. The trail of smoke led directly to him and he was punished.
Missiles are the same. We can tell where they come from. But if a country wants to "wipe out" say, New York City with an atomic bomb in a car, no one can tell who did it. So attacks in the future will be done with "suit case" bombs and car bombs, and this expensive star wars stuff will be usless. Of course the companies making the starwar stuff will make a lot of money from the taxpayers, and that's what it's all about. Pork.
David J. Perley

From: deborah mcmanus [debbie370@home.com]
Sent: Thursday, October 05, 2000 1:50 AM
To: adel.hashad@losangeles.af.mil
Subject: EA of SBL

I think it is abominable that this type of spending is even proposed. It is technically impossible for such a "Star Wars" project to work effectively. If anything, it will only succeed in generating another arms race and taring up the Ozone even more; not to mention the minor detail that we can't possibly afford it anyway. We do still have a $6 trillion + debt, you know, and so many social ills. Why don't you smart people turn your brains to solving some of them?

Sincerely,

Debbe McManus

From: Di1066@cs.com
Sent: Tuesday, October 03, 2000 2:37 PM
To: Adel.Hashad@losangeles.af.mil
Subject: (no subject)

I dont understand what are you doing risking the environment and wasting300million dollars when there is no threat to justify a space based laser program. Why are we risking a new arms race. We understand the key role that the SBL plays in the Space Command's desire to be the Masters of Space. The SbL is the real Reagan-era "Star Wars" program It has nothing to

do with defending the US from attack. Be careful you are the space and race

destroyers not the defenders and history will not absolve you. Diane Marcks

From: dmitrid@connix.com
Sent: Wednesday, October 04, 2000 5:00 AM
To: Adel.Hashad@losangeles.af.mil
Subject: stop the madness

we need less weapons, not more. why don't we just be content with those nice high tech weapons that we already have???

Welcome to the Revolution.

From: Dr. Michael Phillips [holistichealth@earthlink.net]
Sent: Thursday, October 05, 2000 10:44 AM
To: Adel.Hashad@losangeles.af.mil
Subject: Space Based Missle Defense

I am totally in favor of a space based missile defense program and the USA needs on as soon as possible.

Dr. Michael Phillips

Ernest Goitein. P.E.
167 Almendral Avenue
Atherton, CA 94027
650 369 6690

October 2, 2000

Adel Hashad, P.E.
HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles AFB, CA 90245

EA for Space Based Laser Program

Dear Ms Hashad,

I believe the militarization of space is a violation of United Nations resolutions to which the US is a signatory. Therefore any planned program to provide lasers capable to be utilized as weapons is not admissible.

In addition, I have the following comments/questions:

- Which nation is the supposed enemy which this space based program is targeted at?

- Have the funds been appropriated by congress? If not, how can the Air Force proceed with this test program? If money has been appropriated, specifically how much and for what mission? Please list the budget item line number in your reply.

- What steps have been taken to exempt this program from the NEPA requirement for an EIS? If none have been taken, will the Air Force take the necessary steps to comply with the law?

- Will the introduction of laser based systems into space result in other nations then following suit? If so has the Air Force evaluated the cost for counter measures? Has this information been made public or revealed to the Armed Services committee of Congress?

- How does the Air Force compare the estimated cost of $30 billion for the program benefit "National Security" as compared to other programs, such as education, health care, environmental restoration.

- How will the laser program, if deployed, affect communication satellites, the space station, and other multinational peaceful and scientific space programs?

Please respond to these questions in response to the EA, as is required by NEPA.

Thank you for your consideration.

Ernest Goitein

cc Senator Boxer
Senator Feinstein

From: Essrea Cherin [essrea@notenetwork.com]
Sent: Friday, October 06, 2000 10:02 AM
To: Adel.Hashad@losangeles.af.mil
Cc: globalnet@mindspring.com; stjana@juno.com
Subject: Star Wars

Dear Mr. Hashad--

It has recently come to my attention that the Pentagon is currently considering developing a space based laser program.

I feel deeply that this is a misuse of tax dollars. Engaging in this type of activity can only further escalate like behavior world-wide, and is a poor use of the world's resources. Further, there is no threat to our security here in the U.S. -- not to mention the over-abundance of nuclear arsenal that we already have no use for.

I would like to convey to you my very strong opinion that you go no further with this program. Thank you very much for your consideration,

Sincerely,

Essrea Cherin
Vice President of Operations

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637 So Broadway St. Ste B-307,
Boulder, CO 80305
Voice: 303-499-7064
Fax: 303-543-9329
===

From: Franklin Wayne Poley [culturex@vcn.bc.ca]
Sent: Tuesday, October 03, 2000 4:46 PM
To: adel.hashad@losangeles.af.mil
Cc: thepentagonguru@egroups.com; bcpolitics@egroups.com
Subject: Laser Weapons and AI in Military

Dear Adel:
I just read that the US military will spend $30 b. on R&D in laser technology. How does that compare with budgets to develop AI to surpass human equivalency?
Thank you-FWP

--
Machine Psychology:
<http://users.uniserve.com/~culturex/Machine-Psychology.htm>

--

From: frbret@ifrance.com
Sent: Thursday, October 05, 2000 4:55 AM
To: Adel.Hashad@losangeles.af.mil
Subject: Against Space Laser Project

Hello,

I officially disagree with American Space Laser Project which, I think, can cause damage to :
- international defensive balance between USA and other countries,
- earth protection,
- international Peace by restarting National Weapons Progams ...

Frédéric BRET

France

From: JULIOGRACE [juliograce@cybersnet.com.ar]
Sent: Tuesday, October 03, 2000 5:48 PM
To: Adel.Hashad@losangeles.af.mil
Subject: about space based laser program a waste!!

Please note:

>
> 1) There is no threat to justify developing a space based laser program
>
> 2) The costs, $30 billion for the whole program, is a waste of tax dollars.
> (The test program itself is to cost at least $300 million.)
>
> 3) The development & testing of the SBL program will help to generate a new
> arms race into space
>
> 4) We understand the key role that the SBL plays in the Space Command's
> desire to be the Master of Space. The SBL is the real Reagan-era "Star
> Wars" program.
> It has nothing to do with "defending" the U.S. from attack.

From Lihue Association in Patagonia, Argentina Grace de Haro, Susanne Shultz

From: Helene R. Hill
266 Merrimon Ave., Apt. D
Asheville, NC, 28801

October 5, 2000

To: Adel Hashad, P.E.
HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles AFB. CA 90245

Dear Sir:

I wish to comment on the ill-conceived Space Based Laser Program.

This program has nothing to do with the reality of people who live on Planet Earth. The people who live on the earth I know are not interested in wasting their hard-earned money, nor their time and energy, on an arms race in space, which wastes money, time and energy on stupid outer-space (and out-of-one's mind) ventures. They need all of the time and energy and money they can possibly find just to survive on Planet Earth.

They are people who respond to decency and respect when those qualities are shown to them. Why don't we try that?

You know that such a program will help to generate a new arms race in space - for what? We who are the gentle people do not plan to live in space, even though we (The United States) are certainly the biggest waster of this earth's resources. Your ill-conceived plan is one more piece of evidence of that waste.

I am a United States citizen, and I strongly oppose the Pentagon's Environmental Assessment program, essential to the Space Based Laser Program. Please do not waste my money or that of my fellow-citizens on such stupidity.

Sincerely,

Helene R. Hill

Helene R. Hill

From: Holly Gwinn Graham [saki@uswest.net]
Sent: Monday, October 02, 2000 2:58 PM
To: Adel.Hashad@losangeles.af.mil; globalnet@mindspring.com
Subject: No Space Based Laser, please

Dear Mr. Hashad,

This is a comment from a member of the public regarding the EIS of the SBL.

I must object to the entire concept of space based lasers. There is no threat in the world that justifies the United States spending $30 billion (present estimate only, guaranteed to rise) for this program, nor is there a threat that justifies putting such a dangerous and oppressive system in place to "protect" US economic interests. We all know that this "protection" is bogus, a corporate and militaristic pork barrel designed to achieve some mythical US Master of Space status, oppressing the entire world. Even considering this system is a terrorist act all by itself.

Developing and testing this hideous system, the Space Based Laser, will begin a new arms race, this time in space. All the other nations signed a treaty to keep space for peace, but the US and Israel abstained. I am ashamed to be misrepresented in this way in the world...I am ashamed of the aggressive ploys the US military and US war industries use to proliferate the threat of global disaster, now, when we should be turning to peace and the pursuit of understanding and justice on the planet. This has everything to do with world domination, and nothing to do with protecting us. It is a waste of money, energy, thought, and vision. It is a Death Star, and you who promote it are not thinking straight. The environmental impact statement is a joke...everyone knows that these technologies can't even be properly tested without cheating. And where will you test it? In places where the people already are beleaguered by too much military action, places already environmentally compromised to the max, places where the people are regarded as part of a national sacrifice area. How dare you continue this kind of thought?

No to the SBL! No to the spending of billions of tax payer dollars to support a death-dealing, capitalist space empire. No to your bogus assessment of the minimal dangers of this insidious technology. No to the bloated monsters promoting war in space. NO SBL!

Holly Graham
Washington State

From: Jaclyn Dispensa [unicorn114@hotmail.com]
Sent: Thursday, October 05, 2000 7:50 AM
To: Adel.Hashad@losangeles.af.mil
Cc: butterflyink@hotmail.com
Subject: STOP the Arms Race

I would hope that our tax dollars would be spent to establishing peace not agitating a nuclear war. We cannot survive on this earth unless we start respecting our home and all the people that live on it. We need to stop producing weapons and start to actively create a better world for ourselves and our future generations. I would hope that you would take into consideration the people's opinion about nuclear weapons, since we are a democracy, and assess the pros and cons before making a decision.
Jaclyn Dispensa
Philadelphia, PA

From: stjana@juno.com
Sent: Thursday, October 05, 2000 10:42 AM
To: Adel.Hashad@losangeles.af.mil
Subject: No Space Based Laser Program

e-mail: Adel.Hashad@losangeles.af.mil

1) There is no threat to justify developing a space based laser program

2) The costs, $30 billion for the whole program, is a waste of tax dollars.
(The test program itself is to cost at least $300 million.)

3) The development & testing of the SBL program will help to generate a new arms race into space

4) We understand the key role that the SBL plays in the Space Command's desire to be the Master of Space. The SBL is the real Reagan-era "Star Wars" program.

It has nothing to do with "defending" the U.S. from attack.

Stop!

Jana Stephens

From: shepett@juno.com
Sent: Monday, October 02, 2000 1:28 PM
To: Adel.Hashad@losangeles.af.mil
Subject: SBL

I oppose any testing of the SBL for the following reasons:
There is no threat to our security to justify it.
Its cost is prohibitive.
It will generate a new arms race.
It is part of the whole unacceptable plan to dominate this planet which we have no moral right to do.

Jean Petty
400 Seabury Drive #5164
Bloomfield, Ct. 06002
email <shepett@juno.com>

From: JWhar76024@aol.com
Sent: Tuesday, October 03, 2000 12:06 PM
To: Adel.Hashad@losangeles.af.mil
Cc: globalnet@mindspring.com
Subject: Enough!

There is no possible justification for wasting $30 billion tax dollars to develop an unneeded space-based laser program. This Reagan-era Star Wars fantasy has nothing to do with either sound science or national defense. We need no arms race in space. We need no arms in space. Stop NOW.

Jerry Wharton & Lois Putzier-Wharton

From: Jesse O'Brien [jobrien1@swarthmore.edu]
Sent: Wednesday, October 04, 2000 8:06 PM
To: Adel.Hashad@losangeles.af.mil
Subject: re: the Space-Based Laser Program

I urge you to consider the following and formulate some sort of reply--I would be interested in any reply you might have. In light of the following points, I am writing to protest the proposed testing of this new technology:

1) There is no threat to justify developing a space based laser program.

2) The costs, $30 billion for the whole program, is a waste of tax dollars. (The test program itself is to cost at least $300 million.)

3) The development & testing of the SBL program will help to generate a dangerous new arms race in space.

4) I understand the key role that the SBL plays in the Space Command's desire to be the Master of Space. The SBL is the real Reagan-era "Star Wars" program. It has nothing to do with defending the U.S. from attack.

I have no hidden agenda here--I merely want to point out that following this path is dangerous, expensive, and, in fact, makes the people of this country LESS safe.

thank you for your time and consideration

jesse o'brien

From: Joan Marler [jmarler@ap.net]
Sent: Monday, October 02, 2000 2:17 PM
To: Adel.Hashad@losangeles.af.mil
Cc: globalnet@mindspring.com

Abel Hashad PE:

It has come to my attention that the Pentagon's Environmental Assesment for the Space Based Laser Program is considering three test sites: Cape Canaveral,
Fl.; Huntsville, AL.; and Stennis Missile Test Center, MS.

As a tax paying citizen, I oppose the use of $300 million for this test program, not to mention the enormous cost of $30 billion for the whole program. This is an enormous waste of tax dollars for a program that is sure to foster a new arms race into space.

This Reagan-era "Star Wars" program will do nothing to defend the US from attack. The best thing our country can do is to provide a model for disarmament, not a model for escalation and the destruction of the ABM treaty. Our actions are critical for the future of this planet. Peace between nations can never be achieved by such a program.

Most sincerely,

Joan Marler

9759 El Arco Dr.
Whittier, CA 90603-1303

October 5, 2000

Adel Hashad, P.E.
HQ SMC/AXFV
2420 Vela Wy., Ste. 1467
Los Angeles AFB, CA 90245

Dear Mr. Hashad:

The space based laser (SBL) currently being proposed jointly by the US Air Force and Army is a ridiculous waste of taxpayer money. Thirty billion dollars is far too much to spend on technology that has not yet been proven, and the $300 million price tag for the test program is exorbitant.

The Cold War has been over for almost ten years now, yet defense contractors and military personnel are teaming up to propose anachronistic Star Wars policies whose usefulness is more than questionable. There is currently no major ballistic missile threat to the US. The so-called "Rogue States" are boogiemen created by paranoid defense contractors and top military brass who might be afraid of foreign threats but are more likely just worried about increasing US military spending and, thus, lining their own wallets. Countries like India, Pakistan, and North Korea are highly unlikely to have the ability to target the US; and there is no reason for them to attack our country anyway. If anything, recent advances in diplomacy between India and Pakistan and North and South Korea have shown that the world is much better served by compromise than by a continued arms buildup. China and Russia are the only two nations able to attack the US with ballistic missiles, and both governments have expressed serious doubts about any US plan to upgrade defense against ballistic missiles. Deterrence has been the cornerstone of the tenuous peace between the US and its nuclear-able counterparts since the 1950s, and an SBL would undermine China's and Russia's abilities to effectively threaten the US, thereby forcing those countries to develop new and better weapons. And the weapons buildup continues.

Clearly, the SBL is not intended for defense but rather plays a major role in the US Space Command's desire to dominate space for American economic investments. The will to expand the waging of warfare into outer space is a clear violation of both the 1972 treaty signed by the US and USSR (now Russia) and a UN resolution that calls on the preservation of space for peaceful purposes. This sort of hawkishness is sure to cause many nations to develop their own space and nuclear programs. The results of such increased military spending would be disastrous for people all over the world.

Sincerely,

John Serop Simonian

CC: Global Network Against Weapons & Nuclear Power in Space

From: kirsten stade [vonstade@hotmail.com]
Sent: Monday, October 02, 2000 1:01 PM
To: Adel.Hashad@losangeles.af.mil
Cc: globalnet@mindspring.com
Subject: RE: Space Based Laser Program EA

Greetings:

I have recently viewed the Pentagon's Environmental Assesment (EA) for the Space Based Laser Program and wanted to provide some comments.

I am appalled that in a time of relative world peace, and when the United States arms budget is already numerous times greater than the combined budgets of the next greatest world powers, the Pentagon continues to insist that more funding is needed to produce more weapons of mass destruction and to fund the militarization of space.

There is absolutely no justification for the development of a space based laser program, and the cost, $30 billion for the whole program, is a tragic waste of taxpayer dollars. These monies are sorely needed for public schools, for public health programs, and for environmental protection. Instead, the Pentagon wants to use them to make the wealthy executives of the military industrial complex even wealthier.

Furthermore, the development and testing of the SBL program will help to generate a new arms race into space. This is a frightening prospect and one that, if it were to come about, would be ours to regret for generations to come. I understand the key role that the SBL plays in the Space Command's desire to be the Master of Space. The SBL is the real Reagan-era "Star Wars" program. It has nothing to do with "defending" the U.S. from attack.

Thank you for taking the time to consider these comments. Please bear in mind that for the cost of one fraction of the implementation of this project, many societal ills could be remedied.

Kirsten Stade
1490 Camino Corralles
Santa Fe, NM 87505

From: lce@hotrmhmr.org
Sent: Thursday, October 05, 2000 2:57 PM
To: Adel.Hashad@losangeles.af.mil
Subject: Space Based Laser Program's Environmental Assesement

Adel Hashad, P.E.
HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles AFB, CA 90245

Dear Mr. Hashad:

I am contacting you to offer in public comment my strong opposition to the proposed development of a Space Based Laser Program test site as discussed in the Environmental Assessment for that project.

There are a number of salient reasons why the SBL program should not continue under any circumstances:

Such a weapons system will violate the United Nations Outer Space Treaty.

The continuation of the SBL will certainly accelerate the arms race, making the world (and cosmos) much less safe for all peoples.

The $30 billion cost of the program would be much more constructively spent if it were used to provide food, housing, or medical care for the poor of our country.

The United States is already the dominant military force in the world. There is no threat to justify building this system.

I, among others, categorically reject the U.S. Space Command's Vision for 2020 which calls for U.S. military domination of space. The SBL is part of this egregious vision.

In short, I totally oppose any more of my tax dollars being grossly misused on the Space Based Laser.

Sincerely,

Larry Egly
4400 N. 19th #254
Waco, TX 76708

IM4PEACE

Leah R. Karpen

400 Charlotte St #803
Asheville NC
28801

Phone: 828-254-5489
FAX: 828-254-4589
email:

Monday, October 2, 2000

Adel Hashad, P.E.
HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles AFB, CA 90245

Dear Sir:

Environmental Assessment, Space Based Laser Program

I understand that the Pentagon's Environmental Assessment for the Space Based Laser Program has been released. Please consider my comments for the record.

Three test sites were considered: Cape Canaveral, Huntsville, and Stennis Missile Test Center.

Such a space based laser program is not justified, as there is no threat or enemy.

The cost for the program is a huge waste of money: $30 billion for the whole program (think what else that money could buy!), and the test program alone would cost $300 million (what a lot of childhood vaccinations that would buy!).

The whole purpose of the Space Based Laser program is to generate a new arms race into space. Let's **keep space for peace**, as per the United Nations resolutions.

The whole Space Based Laser program has nothing to do with "defending" the U.S from a (fictional) attack. Let's get reasonable.

As a citizen I demand that this entire program be scrapped! I'm tired of the government deceiving us with unncecessary programs such as this.

Sincerely yours,

Leah R. Karpen

(Mrs.) Leah R. Karpen

Space-Based Laser Integrated Flight Experiment Ground Testing
Public Draft Environmental Assessment
August 2000

Comments Made by: ***Reviewer, Organization, Date***

Comment No.	Drawing or Reference No.	Comment	Response
1		There is no threat to justify developing a space based laser program	
2		The $30 billion ~~ta~~cost is a waste of tax dollars	
3		The SBL development + testing will help generate a new armsrace into space	
4		SBL has nothing to do with defending the US from attack.	

From:
A Concerned Citizen
LeeAnn S. Kendall
P.O. Box 6474
San Diego, CA 92166

From: Lee Brown [LeeBrown807@prodigy.net]
Sent: Tuesday, October 03, 2000 5:05 AM
To: Adel Hashad, P.E.
Subject: Stop Space Based Laser Program
Adel Hashad, P.E.:

I am horrified to learn that the United States government is sponsoring a $300 million test to make way for the $30 billion program for a Space Based Laser Program.

Surely this is contrary to the Outer Space Treaty of 1967 which declared that Space was to be used for the benefit of all human beings.

This money should be spent to assure all people on planet earth access to safe drinking water, enough food to eat, and decent housing. U.S. citizens could make a living accomplishing these beneficial things for other people.

Why extend the arms race to Space? Why try to figure out more ways to destroy our wonderful earth which is already showing signs of environmental damage?

Please stop this program.

Lee Brown

From: Cicada Messenger [ab414@seorf.Ohiou.Edu]
Sent: Monday, October 09, 2000 1:23 PM
To: Adel.Hashad@losangeles.af.mil
Subject: No Nukes in Space!

Adel Hashad,

I'm writting to inform you of my deep oposition to the Space-Based Laser Integrated Flight (IFX) Experimental Facilities construction and ground testing program. As thorough testing would certainly reviel, such a program would certainly risk public health, via damage to air quality, cultural resources, geology, soils, land use astetics, noise, water, and depending on location site could pose a problem with enviornmental injustice.

We must go along with the large majority of U.N. Member Nations and sign a treaty for Peace in Space. Not doing so encourages rouge nations to increase their armament endevors. For our saftey and that of the planet we must realize that no Nation has the right to be Master of Space.

Thankyou in advance for your consideration of my comnents.

Lola La Fey

From: madeleine.lanham [madeleine.lanham@wanadoo.fr]
Sent: Sunday, October 08, 2000 10:10 PM
To: adel.Hashad@losangeles.af.mil
Cc: Adel Hashad
Subject: SBL

Dear Ms Hashad: This email will express my concern and objection to steps which will lead to a SBL. There are many objections but I shall chose only one and that is a quote from Lewis & Postal in the Bulletin of the Atomic Scientists: "

By abandoning 25 years of carefully constructed political and technical policies regarding the application of the ABM Treaty, the United States is entering uncharted territory that is filled with potential for disaster. If the United States does not confront the fact that the ABM Treaty will no longer exist if current policies continue, it will be setting itself up for nasty surprises down the road, whether in the form of a Russian refusal to reduce nuclear forces, a Chinese buildup, or a Russian deployment of strategic-capable, but perfectly legal, TMD systems.

If any of these possible outcomes ultimately occur, history will not fail to connect these events to the agreements reached at the March summit."

Thank you for your consideration, Sincerely yours, John E. Chambers, Ph.D.

From: Fred Sanford [mistermookie@playful.com]
Sent: Wednesday, October 04, 2000 3:32 AM
To: Adel.Hashad@losangeles.af.mil
Subject: space based laser program

To Adel Hashsad P.E.,
Good day to you. I am writing to you today to voice my opposition to proceeding with the space based laser program. The justification for my point of view is as follows:

1) There is no threat to justify developing a space based laser program

2) The costs, $30 billion for the whole program, is a waste of tax dollars. (The test program itself is to cost at least $300 million.)

3) These funds would be far better invested in raising the standard of social services provided by the government, such as providing health insurance for the 11 million or so children in the United States who don't currently have access to said.

4) The development & testing of the SBL program will help to generate a new arms race into space

5) I understand the key role that the SBL plays in the Space Command's desire to be the Master of Space. The SBL is the real Reagan-era "Star Wars" program.
It has nothing to do with "defending" the U.S. from attack.

Please respond with your comments and intention, and thank you for considering mine.

In all sincerity,
Mark D. Ingel
U.S. citizen and taxpayer

****
USE OF ADVANCED COMPUTING TECHNOLOGY
DOES NOT IMPLY ENDORSEMENT OF WESTERN
INDUSTRIALIZED CIVILIZATION!

From: Malyshus . [lodoberon@hotmail.com]
Sent: Thursday, October 05, 2000 1:39 PM
To: Adel.Hashad@losangeles.af.mil
Subject: laser programs

There is no threat to justify space based laser programs.
PLEASE, use our tax dollars wisely!
Sincerely,Melissa McGovern

From: Into199@aol.com
Sent: Wednesday, October 04, 2000 8:57 AM
To: Adel.Hashad@losangeles.af.mil
Subject: comments on star wars plan

Mr. Hashad,

I am appalled to find out that the US Air Force Space Based Laser Program (Star Wars Program) is not only still under consideration, but that our government is quietly moving ahead with such a program. The cold war is over, and we are the only great empire left on the planet. The only thing the production of such a weapons/defense system will achieve is the rebirth of an arm race, and increasing the level of fear people feel when they think

of our empire (The United States of America) and all the countries in which we maintain an unwarranted and unwelcome military presence. The greatest threat to America is our militaristic and imperialistic view of the world and our role therein. I call for an end to this program. We live in what some say is the riches nation in the world, yet more than 45 million people do not have access to basic health care, our educational system is crumbling, 20 percent of our population lives below the poverty line, which is artificially low ($16,600 for a family of four), and half of our tax dollars goes to the military either directly or indirectly; we spend twice as much money on our military as the next 10 largest military spending budgets combined -- this absurd. Surely the $30 billion we would spend on developing a stars war program could be better spent on the people of this country.

Sincerely,
Michael Kaplan

From: Monica Cappelli [mcs_cappelli@yahoo.com]
Sent: Wednesday, October 04, 2000 2:54 AM
To: Adel.Hashad@losangeles.af.mil
Subject: Space Based Laser Program

Don't do it.

There is no need for new toys- they will not solve the multitude of problems we, as a global society, face today. The developpment of a space based laser program is unjustified. Not only are there no threats which cannot be addressed by already exisiting means, but the huge sum of money needed for the venture can be used to greater profit in many other ways. Who is this system suppsed to protect? People on the brink of poverty, people who have no real hope for life, people who do not care? If this system has been created with the aim to "protect", it is at fault.

Contemporary history has shown that the most dangerous threats are those which we least expect. There is no danger of an all-out attack from a more powerful state- there is no reason to increment the production of lethal technology. The United States has proven that scaling back military budgets does not endanger national security. So why this step?

Use the incredible power of knowledge and money for good- do not waste energy on shiny new toys which will become usless and osbolete in minutes. You do not need this. And neither do we.

Monica Cappelli

From: Nancy Stiefel [nas5580@ircc.net]
Sent: Tuesday, October 03, 2000 6:36 PM
To: Adel.Hashad@losangeles.af.mil
Cc: globalnet@mindspring.com
Subject: EA For Space Based Laser Program

The Space Laser Program must be terminated, not expanded. I am opposed to the development of any and all test sites for the following reasons: There is no threat to justify developing a space based laser program. The expenditure of $300 million for the test program (not to mention the estimated $30 billion for the whole program) is a waste of tax dollars. The development and testing of the SBL program will help to generate a new arms race into space. We understand the key role that the SBL plays in the Space Command's desire to be the Master of Space. The SBL is the real Reagan-era "Star Wars" program. It has nothing to do with "defending" the U.S. from attack and must be abandoned.

5. October 2000

Dear Adel,

I've just learned about the Pentagon's EA for the Space Based Laser Program. I hope this letter of objection arrives by Oct. 9th!

As a taxpayer of this country, I see no reason ~~to spend~~ for the necessity to spend $30 billion for the program, wasting an incredible amount of money. It is the Reagan-era "Star Wars" program and has nothing to do with "defending" the U.S. from attack. This will only further a new arms race into space, hence spending much more money on a useless program in the future.

Please respond with an update.
Thank you.

Paul Attemann
78 Third St.
Westport, Mass. 02790

From: Phyliss Blandino [pblandino@earthlink.net]
Sent: Sunday, October 08, 2000 12:21 PM
To: Adel.Hashad@losangeles.af.mil
Cc: globalnet@mindspring.com
Subject: Envirmental Assessment for the Space Based Laser Program

To Whom It May Concern:

As a concerned citizen, I would like to express my opinion of the proposed SBL program. First, there is no threat to our national security that would justify this program. Second, spending thirty billion dollars on this unnecessary program is unconscionable when so many children in our country live in poverty. Third, the development and testing of this program would generate a new arms race into space - to what end? Do not waste any more taxpayer dollars on this nonsense.
Thank you.

From: Plattform gegen Atomgefahren (P.L.A.G.E.) [plage@salzburg.co.at]
Sent: Tuesday, October 03, 2000 1:12 PM
To: Adel.Hashad@losangeles.af.mil
Subject: EA for SBL Program
Dear Sirs,
Dear Mr Hashad,

It is clear not only to "grassroots groups" but even to national governments of countries that are close friends of the United States that a space-based laser program (SBL) would spark a new arms race. (The only configuration in which this would *not* be the case would be if the other nuclear weapons states had the immense self-discipline of *not* responding to such a US move with an analogous move. You will admit that, judging from experience, this is a highly unlikely perspective.)

Since nuclear weapons would inevitably be involved in this new arms race as well as in an actual military conflict where SBL would come into action, the environmental consequences of SBL concern the entire globe and all mankind.

We keep wondering: If the present military superiority of the United States of America does not seem sufficient to its political and miltary leaders, what will ever do seem sufficient to them in terms of armament? Can one arm oneself far beyond one's neighbors'
scope of armament, and continue to believe and make believe that the *neighbors* are the threat, instead of recognizing that oneself is becoming the threat to others?

Much of the existing armament in the world is a threat to the decent survival of mankind, or of large parts of it, in a comparatively sound environment. Instead of reducing the risk of such destruction on the global scale, the SBL program would further increase it.
Therefore, we call on you and all decision-makers involved to step back from developing and testing this "defense" system.

Yours sincerely,

Prof. Heinz Stockinger, Chair,
Überparteiliche Plattform gegen Atomgefahren (PLAGE) *(Independent Coalition Against Nuclear Perils),*
Arenbergstrasse 10, A-5020 Salzburg, Austria, Europe;
T: +43/662/643 567, F: -643 7344.

From: Laurence Kirby [vanini@netstep.net]
Sent: Tuesday, October 03, 2000 8:09 AM
To: Adel.Hashad@losangeles.af.mil
Cc: globalnet@mindspring.com
Subject: environmental assessment

This is a comment on the Environmental Assessment for the Space Based Laser program.

The overall environmental impact of the Ballistic Missile Defense program could be catastrophic, as it would increase the chances of nuclear war and accelerate another arms race. Thus, to say that the testing phase has no significant impact is to obscure the underlying threat to the environment that the testing phase can only contribute to.

In addition, the program is unnecessary, as the alleged threat it is based on is nonexistent. The test program is a waste of money. Since this money could be better spent on helping the remediation of the environmental disasters of previous missile programs, including toxic radioactive waste disposal, this is another unacceptable environmental cost of the program.

Sincerely,

Laurence Kirby
Professor of Mathematics
Baruch College, City University of New York

From: Richard K. Heacock, Jr. [akimpact@mosquitonet.com]
Sent: Sunday, October 08, 2000 10:08 PM
To: Adel.Hashad@losangeles.af.mil
Subject: Militarization of Space

Importance: High

Alaska IMPACT, an interfaith 501(c)(4) corporation in the State of Alaska has been authorized by its Board of Directors to join with other organizations in opposing the costly, dangerous and unnecessary weaponization of space.

This effort is contrary to the international treaty on peaceful uses of outer space. I have read the EA for the space based laser program online and wish to point out that the real impact on American taxpayers and probable international responses are not considered in this assessment.

We oppose this proposed effort toward U.S. militarization and domination of space.

Sincerely,

Richard K. Heacock, Jr.
Executive Director
Alaska IMPACT
3012 Riverview Drive
Fairbanks, AK 99709-4735

Comment to „Environmental Assessment – Space-Based Laser Integrated Flight Experiment Ground Testing"

TELEFAX

To:

Adel Hashad, P.E.
HQ SMC/AXFV
2400 Vela Way, Suite 1467
Los Angeles AFB
California
USA

Fax 001-310 11 70
363

october
9, 2000

From:

Regina Hagen
Teichhausstr. 46
D-64287 Darmstadt
Germany

Fon: [49] (6151) 47 114
Fax: [49) (6151) 47 105

E-mail: regina.hagen
@jugendstil.da.shuttle.de

Dear Adel Hashad,

I checked through part of the 350 pages of the „Public Draft, Environmental Assessment – Space-Based Laser Integrated Flight Experiment Ground Testing" document.

To me, it seems utterly absurd to go through a detailed Environmental Assessment process for ground testing of a space-based weapon. Even if testing should not pose any environmental risks – which not being a scientist I cannot judge – this is not the point in question.

Developing, testing, and eventually deploying a Space-Based Laser will have long-lasting effects on international security. In US Space Command documents like „Vision for 2020", „Long Range Plan" for the implementation of Vision 2020, etc. it is made very clear that the US Space Command – and therefore the US – aim at maintaining dominance in space, gaining control of space, and thus gaining control of the world (no, I am not making this up – this *is* said in these documents).

As other nations will not put up with these intentions, this will lead to a new spiral in the international arms race. I seriously believe that the true threat posed by the SBL design for the environment, for international security, for mankind, will not occur in the test phase but will evolve over time and become very real once this space-based weapons will be deployed.

The US plan to break a taboo. Although space has been used for military purposes since the first rocket was launched by the German Nazis, space has yet remained weapons-free. Deploying the SBL would mean to deploy a weapon in space. If the US set a precedence, other states will follow.

Therefore, I strongly oppose to any plans to ground-test the SBL. For the sake of the environment and of us all.

Please keep me updated on the further SBL EA process.

In peace, sincerely yours

Regina Hagen

From: beckers@thegrid.net
Sent: Saturday, October 07, 2000 9:37 AM
To: Adel.Hashad@losangeles.af.mil
Subject: EA for the Space Based Laser Program

Dear Mr. Hashad:

Please include these comments in your EA for the Space Based Laser Program:

-Cost effectiveness studies must be done to determine if the $30 billion for this program is a appropriate use of taxpayer dollars at a time when the clean up of past military and industrial programs is at a standstill for lack of funding.

-In a time where so many countries are struggling just to feed and house their citizens, how can the Pentagon substantiate a threat that would justify this program?

It appears to the public who would be forced to foot this astronomical bill that you are attempting once again to revamp President Reagan's Star Wars program. The American people have spoken, we do not want and cannot afford these programs. More importantly, these programs have nothing to do with defense and are truly offensive in every sense of the word.

Rochelle Becker
San Luis Obispo Mothers for Peace

From: Sally Light [sallight1@earthlink.net]
Sent: Monday, October 02, 2000 2:58 AM
To: Adel.Hashad@losangeles.af.mil
Subject: Public Comment on DEA of Space Based Laser Program

Nevada Desert Experience
P.O. Box 7849
Oakland, CA 94601
(510) 849-1540

October 2, 2000

Adel Hashad, P.E.
HQ SMC/AXFV
2420 Vela Way, Suite 1467
Los Angeles AFB, CA 90245
Email: Adel.Hashad@losangeles.af.mil

Re: Public Comment on the Draft Environmental Assessment (DEA) for the Space Based Laser Program (SBLP)

Dear Mr. Hashad:

On behalf of Nevada Desert Experience, I am submitting herewith a public comment re: the above-mentioned Draft Environmental Assessment (DEA).

Nevada Desert Experience is a 19-year-old, faith-based, nonprofit organization with an approximate readership of 4,500 ? 5,000 of our newsletter, ?Desert Voices.? We are part of the peace movement, and have organized thousands of people in peaceful, nonviolent demonstrations, primarily at the Nevada Test Site, over the years.

We totally oppose the design, funding, testing and implementation of any space based laser program, including that listed above, as we believe such a move would invite war, regardless of any statements by the US that it would be motivated purely to defend against aggression.

Specifically, we offer the following comments about the DEA:

1. The United States is the world?s most powerful nation, economically and militarily. There is, therefore, absolutely no viable justification for the US, in this post-cold war ear, to create new weapons, conventional or nuclear, including a space-based laser.

2. Such a space based laser program would violate the 1967 Outer Space Treaty, which ensures only peaceful uses of space. Therefore, the DEA(and any future iteration of a DEA, as well as a final EA) also supports the violation of this treaty.

3. Looking at the US Space Command?s ?Vision for 2020? document, which proposed integrating space technology, nuclear technology and laser technology to rule the planet from space by the year 2020, it seems obvious that the DEA proposes a space-based laser program as part of this goal. This is a return of ?Star Wars? as proposed by Reagan. We utterly oppose any ?Star Wars? project.

From: SatyaRudin@aol.com
Sent: Monday, October 09, 2000 8:28 AM
To: Adel.Hashad@losangeles.af.mil
Subject: Space Based Laser Program

1) There is no threat to justify developing a space based laser program

2) The costs, $30 billion for the whole program, is a waste of tax dollars.
(The test program itself is to cost at least $300 million.)

3) The development & testing of the SBL program will help to generate a new arms race into space.

4) We understand the key role that the SBL plays in the Space Command's desire to be the Master of Space. The SBL is the real Reagan-era "Star Wars" program.
It has nothing to do with "defending" the U.S. from attack.

4. Other nations would likely view a US space based laser program as evidence of a trend toward increased militarism, most probably resulting in another arms race. It is not in the best interests of our or any other country to take such aggressive steps (i.e., developing a space based laser program), putting extra pressure on the current international situation re: balance of power.

5. Finally, the estimated cost of the space based laser program ($30 billion) would be an outrageous example of wasting tax dollars!

For these, and many other reasons, we sincerely hope that you will take serious note of this comment. Please do not hesitate to contact me (see above for contact information, or respond to my email address: sallight1@earthlink.net) if you have any questions regarding this submittal.

Sincerely,

Sally Light, JD
Executive Director
Nevada Desert Experience

From: Fitt Todd L Civ AFRL/VSSE [todd.fitt@kirtland.af.mil]
Sent: Thursday, October 05, 2000 6:09 AM
To: Hashad Adel A Civ SMC/AXF
Subject: SBL Program

Dear Adel Hashad,

Your e-mail address and participation in the SBL Program were brought to my attention through the efforts of a group advocating the peaceful use of space.

I do not agree with their opinions.

While I ever hope that all safety precations will be taken in the research and application of the technologies your group is developing, I support the advancement of technology that will defend the USA from the threat of the recent crop of would-be dictators wearing funny hats. History shows that America has only been threatened or attacked when it was believed we had neither the will nor the ability to respond forcefully.

If we were to follow the lead of groups such as the one that opposes your efforts, to paraphrase Scott Adams, "We would still be sitting in caves, trying to decide if rocks were edible."

Having worked in the fields of nuclear energy and nuclear research, I am aware of what people can be like when they close their minds.
Proceed with enthusiasm.

Todd Fitt.

From: Scott Ryan Whinery [butterflyink@hotmail.com]
Sent: Wednesday, October 04, 2000 12:10 PM
To: Adel.Hashad@losangeles.af.mil
Subject: No Space Based Laser Program
Adel Hashad,

I am writing you to express my thoughts about the Space Based Laser Program. I am **against implementation and** further testing of the program.

First of all, there is no threat to our country to justify spending $30 billion dollars on this program. Especially when that $30 billion is tax dollars.

Secondly, the testing and development of this program will create the kind of climate that will contribute to a NEW ARMS RACE in space.

Finally, I do know th role that the SBL plays in the Space Command's desire to be the "Master" of space. I also understand that the SBL is truly the Reagan "Star Wars" program.

The United States plays an important role in the future of this planet. Which is becoming a world culture more and more every day. We can become a kinder nation that doesn't rush to start wars, or we can start a new arms race that could easily end up in war.

I choose the first option.

Thank you for your time.

Scott Whinery

Kansas City

From: shawn kelley [cleverspider@excite.com]
Sent: Friday, October 06, 2000 8:43 PM
To: Adel.Hashad@losangeles.af.mil
Subject: URGENT

There is no threat to justify developing a space based laser program. The costs, $30 billion for the whole program, is a waste of tax dollars. The test program itself is to cost at least $300 million. The development & testing of the SBL program will help to generate a new arms race into space. I understand the key role that the SBL plays in the Space Command's desire to be the Master of Space. The SBL is the real Reagan-era "Star Wars" program. It has nothing to do with "defending" the U.S. from attack.

To hell with the SBL,

Shawn P. Kelley

From: Buonaiuto [goodhelp@nets.com]
Sent: Monday, October 02, 2000 9:34 PM
To: Adel.Hashad@losangeles.af.mil
Subject: EA for SBL

Dear Mr. Hashad,

I would like to comment on the development of the Space-based Laser Program.

1. There is no need for it.
2. It is a waste of precious taxpayer dollars that are badly needed for infrastructure, health care and education.
3. The development of SBL will most likely generate a new arms race into space.
4. It is time our nation gave up its terrorist tactics in an attempt to control the world for the continued amassing of profits by international consortiums. SBL is not needed for our defense and is an effort to extend our hegemony into space.
5. It is time we as a nation began to perceive the world in a spiritual rather than in an hegemonistic manner. The way we are proceeding means death to us all.

Thank you,
Shelley Buonaiuto
goodhelp@nets.com

From: Caroline (Dr) Lucas [clucas@europarl.eu.int]
Sent: Wednesday, October 04, 2000 2:52 AM
To: Adel.Hashad@losangeles.af.mil
Subject: Spaced Based Laser Programe

Dear Adel Hashad,

I have recently been informed that the Pentagon's Enivironmental Assesment for the Spaced Based Laser Programme has been released. As i am working from the office of a member of the European Parliament I can inform you of a few reasons why developing such a programme is very likely to harmful implications US-Europe relations.

Firstly, the threat posed by 'rogue nations' is not great enough to justify spending $30Billion Dollars of tax payers money. The intelligence community has had a history of predicting a faster threat than accords with reality. For instance, estimates of when North Korea would test-flight its long range Taepo Dong Missiles have been out by several years. Moreover, if a rogue nation was to inflict serious harm on the US would it not be far easier to do this by attacking US citizens by means of eg.putting anthrax into the NY subway (such as happenned in Tokyo)? I believe that many countries of the EU merely view this as a futile waste of time..perhaps an effort by the military industrial complex to renew its status and importance in the post cold war environment.

Secondly, the NMD clearly violates the ABM treaty and could trigger a new global arms race. The very reason why the ABM treaty was set up in the first place was to prevent us needlessly massing nuclear arms in order to compensate for a defence system. The stability of Nuclear relationships rests on mutual deterrence not defence. If Russia for instance feels that its Nuclear threat is worthless due to a US defence system would this not make the political situation far more volatile? The Russian Duma has linked the preservation of the ABM treaty to the ratification of START II , so any modification of this treaty could have serious repercussions to the continued reduction of Nuclear Arms.

Fianlly, the tests that haver already occurred have already failed. Does the US military seriously consider it possible that it could realistically build a defence system? Has it not learnt its lesson from the Reagan star wars era that such a system seems to be inherently flawed? Moreover, can US politicians not also see that it is the US rather than so called 'states of concern' that has so far behaved most irresponsibly with nuclear weapons. It was President Clinton that included their possible use in the Defence review. It is also the US that has failed to sign the CTBT.

I hope to hear from you soon with an American defence of my arguments!

Luke Robinson
Office of Caroline Lucas

Office of Dr Caroline Lucas
Green Member of the European Parliament for S.E. England
Brussels: +32 2 28 45153   Fax: +32 2 28 49153
London: +44 20 7407 6281   Fax: +44 20 7234 0183
web: www.europarl.eu.int/greens-efa

William H. Warrick III, M.D., P.A.
420 S.W. 8th Street
Gainesville, Florida 32601
Telephone (904) 372-3471

10/2/2000

Col. Haskead
HQ SMC/AXFV
2420 Vela Way
Suite 1467
Los Angeles AFB, Cal 90245

Re: Space based laser

Dear Mr Haskead,

There is no justification for the SBL program. It violates UN treaties that the US has signed, the cost $30 billion plus overruns needs to be spent on schools and heathcare, and this program will create another stupid arms race. It is a Star wars fantasy and is not needed for defence. It must be cancelled.

W. H. Warrick III MD

APPENDIX D

PUBLIC NOTICES

The Sea Coast Echo

POST OFFICE BOX 2009
BAY SAINT LOUIS, MS 39521-2009

STATE OF MISSISSIPPI
HANCOCK COUNTY

PERSONALLY appeared before me the undersigned in and for said County and State, JAMES R. PONDER, publisher of THE SEA COAST ECHO, a newspaper printed and published in the City of Bay Saint Louis, said County, who being duly sworn, deposes and says the publication of this notice hereunto annexed has been made in the said publication 1 weeks to-wit:

In No. 43 Vol. 109 DATED Sept. 10 2000

In No. ________ Vol. ________ DATED ________ 2000

In No. ________ Vol. ________ DATED ________ 2000

In No. ________ Vol. ________ DATED ________ 2000

In No. ________ Vol. ________ DATED ________ 2000

In No. ________ Vol. ________ DATED ________ 2000

Jim R. Ponder
Publisher

Sworn to and subscribed before me A NOTARY PUBLIC

Trina Lynn Lizana

this September 11, 2000

My Commission Expires Nov 8, 2001

Cost of publication: 30.60

PUBLIC NOTICE

In accordance with the National Environmental Policy Act (NEPA), the Space and Missile Systems Center (SMC), as the Executing Agency for the Ballistic Missile Defense Organization (BMDO), offers for public comment the Draft Environmental Assessment (DEA) and the Draft Finding of No Significant Impact (DFONSI) of the Space-Based Laser Integrated Flight (IFX) Experiment Facilities construction and ground testing, a technology development program. The National Aeronautics and Space Administration has been a cooperating agency in the NEPA process. The DEA assessed potential impacts to air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste management, health and safety, land use and aesthetics, noise, socioeconomics, transportation, utilities, water resources, and environmental justice. The DEA, DFONSI and the Comment Sheet are posted on the following web site: [illegible]. Copies of the DEA and DFONSI are also available for review at the Hancock County Library, Bay St. Louis, MS; the Margaret Reed Crosby Library, Picayune, MS; the St. Tammany Parish Library, Slidell, LA; and the Maury Oceanographic Library, Stennis Space Center, MS. Comments as well as requests for more information about the DEA may be addressed to Adel Hashad, P.E., HQ SMC/AXFV, 2420 Vela Way, Suite 1467, Los Angeles AFB, California 90245-4659. Telephone: (310) 363-0934, Fax: 1170, or e-mail to Adel.Hashad@losangeles.af.mil. The Public Comments period starts on September 10, 2000 and continues through October 9, 2000.
[illegible]

TODAY

Published Daily

STATE OF FLORIDA
COUNTY OF BREVARD

Before the undersigned authority personally appeared **MAUREEN FARR** who on oath says that she is **LEGAL ADVERTISING CLERK** of the **FLORIDA TODAY**, a newspaper published in Brevard County, Florida; that the attached copy of advertising being a LEGAL NOTICE (Ad#575360-$119.10) in the matter of PARSONS ENGINEERING-SCIENCE in the ______ Court ______ RE: NEPA

738121.010000

was published in the **FLORIDA TODAY NEWSPAPER** in the issues of SEPTEMBER 10, 2000

Affiant further says that the said **FLORIDA TODAY NEWSPAPER** is a newspaper in said Brevard County, Florida, and that the said newspaper has heretofore been continuously published in said Brevard County, Florida, regularly as stated above, and has been entered as periodicals matter at the post office in **MELBOURNE** in said Brevard County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that she has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in said newspaper.

Maureen Farr
(Signature of Affiant)

Sworn to and subscribed before me this 10th day of SEPTEMBER 2000.

OFFICIAL NOTARY SEAL
LINDA L. BRAUD
COMMISSION NUMBER
CC640584
MY COMMISSION EXPIRES
MAY 4,2001

Linda L. Braud
(Signature of Notary Public)

LINDA L. BRAUD
(Name of Notary Typed, Printed or Stamped)

Personally Known ✓ or Produced Identification ______

Type of Identification Produced ______

AD#575360-9/10,2000

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PUBLIC NOTICE

In accordance with the National Environmental Policy Act (NEPA), the Space and Missile Systems Center (SMC), as the Executing Agency for the Ballistic Missile Defense Organization (BMDO), offers for public comment the Draft Environmental Assessment (DEA) and the Draft Finding of No Significant Impact (DFONSI) of the Space-Based Laser Integrated Flight (IFX) Experiment Facilities construction and ground testing, a technology development program. The National Aeronautics and Space Administration has been a cooperating agency in the NEPA process. The DEA assessed potential impacts to air quality, airspace, biological resources, cultural resources, geology and soils, hazardous materials and hazardous waste management, health and safety, land use and aesthetics, noise, socioeconomics, transportation, utilities, water resources, and environmental justice. The DEA, DFONSI and the Comments Sheet are posted on the following web site: [illegible]. Copies of the DEA and DFONSI are also available for review at the Huntsville-Madison County Public Library located at 915 Monroe Street in Huntsville, Alabama; the Triana Public Library, located at 280 Zierdt Road in Triana, Alabama; and the Environmental and History Offices located at Redstone Arsenal. Comments as well as requests for more information about the DEA may contact Adel Rashad, P.E., HQ SMC/AXFV, 2420 Vela Way, Suite 1467, Los Angeles AFB, California 90245-4659, Telephone (310) 363-0934, Fax: 1170, or e-mail to Adel.Rashad@losangeles.af.mil. The Public Comments period starts on September 8, 2000 and continues through October 8, 2000.

Publication date: Sept. 13, 2000

STATE OF ALABAMA
MADISON COUNTY

Before me, Faith L. Owens, a Notary Public in and for Said State and County, personally appeared Michelle L. Cross, known to me, who being by me first duly sworn, deposes and said person is the Legal Advertising Manager of the Huntsville Times, a newspaper published and printed at Huntsville, Madison County, Alabama, and that the attached legal notice was published in said newspaper on

Sept. 13. 2000

Michelle L. Cross
Legal Advertising Manager

Sworn to before me this the

21 day of Sept.

Faith L. Owens
Notary Public

My commission expires February 18, 2001

Public notices were also published in the following newspapers:

Redstone Rocket

Sun Herald

Speakin' Out News